

Draft proposal for a
European Partnership under Horizon Europe
European Open Science Cloud (EOSC) Partnership
Version 28 May 2020



The purpose of this document is to propose the European Open Science Cloud (EOSC) Partnership based on the criteria set out in the Horizon Europe regulation (Article 8 and Annex III)¹ and the draft Criteria Framework for European Partnerships². The proposal is a living document which is developed by the EOSC Executive Board, in close collaboration with the EOSC Governance Board and with the Commission services leading the preparation of the partnership.

¹ Common understanding on the Framework Programme:

<https://data.consilium.europa.eu/doc/document/ST-7942-2019-INIT/en/pdf>

Corrigendum on Annex III: <https://data.consilium.europa.eu/doc/document/ST-7942-2019-COR-1/en/pdf>

PGA on the Specific Programme: <https://data.consilium.europa.eu/doc/document/ST-8550-2019-INIT/en/pdf>

² <https://www.era-learn.eu/documents/wk-14470-2018-init-en.pdf>

About this draft

In autumn 2019 the Commission services asked potential partners to further elaborate proposals for the candidate European Partnerships identified during the strategic planning of Horizon Europe. These proposals have been developed by potential partners based on common guidance and template, taking into account the initial concepts developed by the Commission and feedback received from Member States during early consultation³. The Commission Services have guided revisions during drafting to facilitate alignment with the overall EU political ambition and compliance with the criteria for Partnerships.

This document is a stable draft of the partnership proposal, released for the purpose of ensuring transparency of information on the current status of preparation (including on the process for developing the Strategic Research and Innovation Agenda). As such, it aims to contribute to further collaboration, synergies and alignment between partnership candidates, as well as more broadly with related R&I stakeholders in the EU, and beyond where relevant.

This informal document does not reflect the final views of the Commission, nor pre-empt the formal decision-making (comitology or legislative procedure) on the establishment of European Partnerships.

In the next steps of preparations, the Commission Services will further assess these proposals against the selection criteria for European Partnerships. The final decision on launching a Partnership will depend on progress in their preparation (incl. compliance with selection criteria) and the formal decisions on European Partnerships (linked with the adoption of Strategic Plan, work programmes, and legislative procedures, depending on the form). Key precondition is the existence of an agreed Strategic Research and Innovation Agenda / Roadmap. The launch of a Partnership is also conditional to partners signing up to final, commonly agreed objectives and committing the resources and investments needed from their side to achieve them.

The remaining issues will be addressed in the context of the development of the Strategic Research and Innovation Agendas/ Roadmaps, and as part of the overall policy (notably in the respective legal frameworks). In particular, it is important that all Partnerships further develop their framework of objectives. All Partnerships need to have a well-developed logical framework with concrete objectives and targets and with a set of Key Performance Indicators to monitor achievement of objectives and the resources that are invested.

Aspects related to implementation, programme design, monitoring and evaluation system will be streamlined and harmonised at a later stage across initiatives to ensure compliance with the implementation criteria, comparability across initiatives and to simplify the overall landscape.

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³ https://www.era-learn.eu/documents/final_report_ms_partnerships.pdf

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1 General information

1.1 Title of the European Partnership

European Open Science Cloud (EOSC) Partnership

1.2 Lead entity (main contact)

A new legal entity will be founded.

The new legal entity (aisbl under Belgian law) will be the contractual body for the Partnership.

The EOSC Governance (2018-2020)⁴ – including the Governance Board and Executive Board – jointly support this EOSC European Partnership.

1.3 Commission services (main contact)

RTD.G4 and CNECT.C1

1.4 Summary

The European Open Science Cloud (EOSC) Partnership will enable a trusted, virtual, federated environment in Europe to store, share and re-use research data across borders and scientific disciplines. The Partnership will bring together institutional, national and European initiatives and engage all relevant stakeholders to co-design and 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 enhance the possibilities for researchers to find, share and reuse publications, data, and software leading to new insights and innovations, higher research productivity and improved reproducibility in science.

⁴ <https://www.eoscsecretariat.eu/eosc-governance>

2 Context, objectives, expected impacts

“Wouldn’t it be good if many more of the data resulting from scientific work would be well curated? Wouldn’t it be great if we would be able to combine any dataset with any other dataset we would want to? Of course, many combinations will not be relevant. However, most of the problems in this world will need the help of several if not many disciplines to come closer to solutions. In other words, if relevant data would be findable, accessible and interoperable for scientists, these combinations would lead to (unforeseen) reuse and to a faster development of science.

This is the aim of what we call the European Open Science Cloud. The ultimate aim is, of course, that this will lead to a global structure where, as a result of the right standardization, data repositories with relevant data can be used by scientists and others to the benefit of mankind.

In building EOSC, we are designing a virtual commons where science producers and science consumers come together for more insights, new ideas and more innovation. EOSC is greater than the sum of its parts: by federating data and services we add value. EOSC uses information technologies to revolutionize the way we do research, the way collective scientific knowledge is created in all disciplines, in all geographies.”

Box 1: EOSC vision (extract from the EOSC Strategic Implementation Plan⁵)

The Vision

Enabling the EOSC vision with a multi-stakeholder European partnership

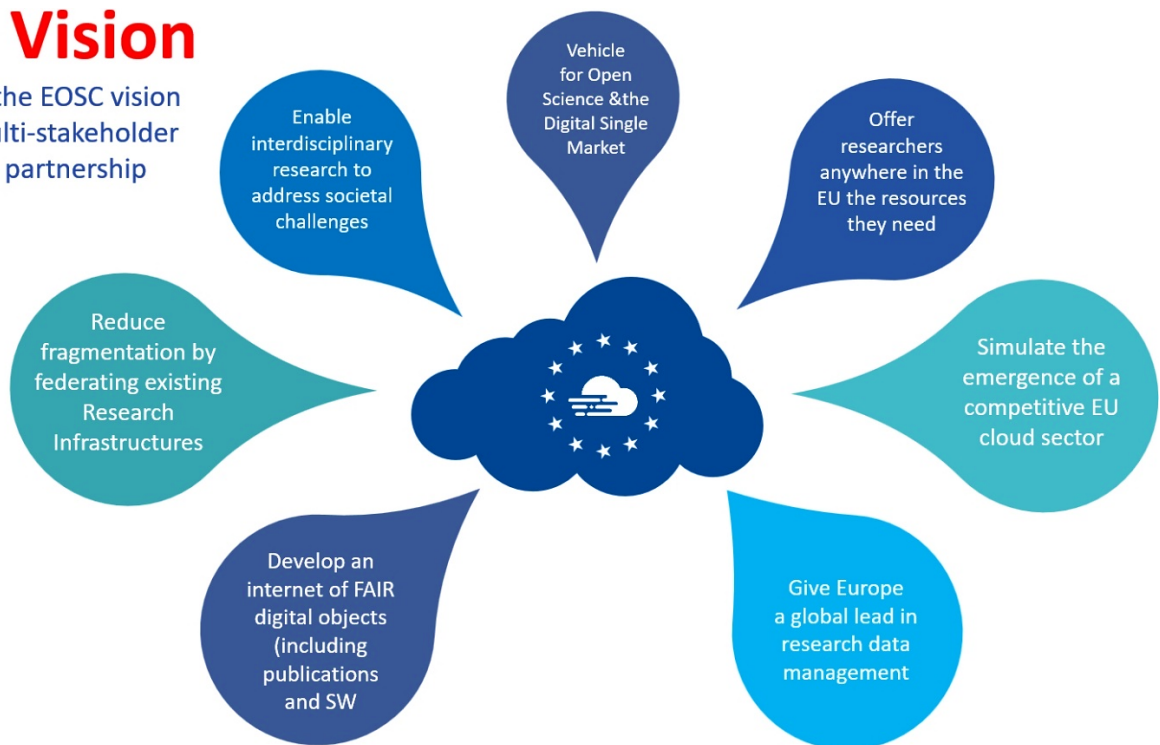


Figure 1: EOSC vision (II)

⁵ https://ec.europa.eu/info/publications/european-open-science-cloud-eosc-strategic-implementation-plan_en

2.1 Context and problem definition

The EOSC Partnership will be the European focal point to reduce the fragmentation of research information, harmonise access policies, and make the necessary links for eliminating silos and enhancing the circulation of knowledge in digital form. The Partnership will be instrumental to develop an ecosystem of research data⁶ and related services, covering the whole data life cycle, from discovery and mining to storage, management, analysis and re-use.

This Partnership will enable a new scale of cross-disciplinary and collaborative research that addresses major societal challenges and accelerates Europe's transition to open science, as presented in the Communication "European strategy for data"⁷ in 2020. EOSC will be supported by high-speed connectivity to transport data and powerful high-performance computers to process data⁸. New data produced by laboratories, observatories, analytical, computational and scholarly work will become progressively FAIR-by-design feeding the EOSC with quality-verified datasets ready for exploitation and reuse.

In order to realise these ambitions, **the EOSC Partnership will capitalise on initial efforts in 2018-2020 to federate existing and emerging research data infrastructures and initiatives and will drive the progressive implementation of a "Web of FAIR data" supporting across the whole of Europe the transition to a more effective research.**

The Web of FAIR data for Science is defined in the context of this Partnership as the set of services that will allow scientists and machines to collaborate in storing, processing, finding, accessing and reusing scientific data.

These services will leverage the interoperability of data sets offered by services complying to EOSC rules of participation. These services will be generic as well as specific: **Generic services** will be used by any scientist (e.g. data onboarding, data transfer, data discovery, helpdesk services, ...).

Specific services (also called applications) will be used by scientists depending upon their domain of expertise (e.g. visualization services, statistical analysis services, domain specific services, cross-domain services, ...).

Europe has all the expertise needed to progress rapidly in the deployment of this EOSC ecosystem but it needs to bring coherence and directionality at European, national and institutional levels to direct future R&I efforts and stimulate deployment and adoption.

With the initial phase of the EOSC initiative ending in 2020, Europe needs now to accelerate the development and implementation of EOSC, to operationalise a wider engagement of multiple stakeholders and to coordinate and synchronise the multiple relevant activities in the field that are yet too fragmented among Member States national plans and research communities.

⁶ The scope of the EOSC partnership covers all digital objects including data, publications, software, etc. The term research data is often used along this document in its broader sense referring to all these digital objects and not only to datasets.

⁷ https://ec.europa.eu/info/sites/info/files/communication-european-strategy-data-19feb2020_en.pdf

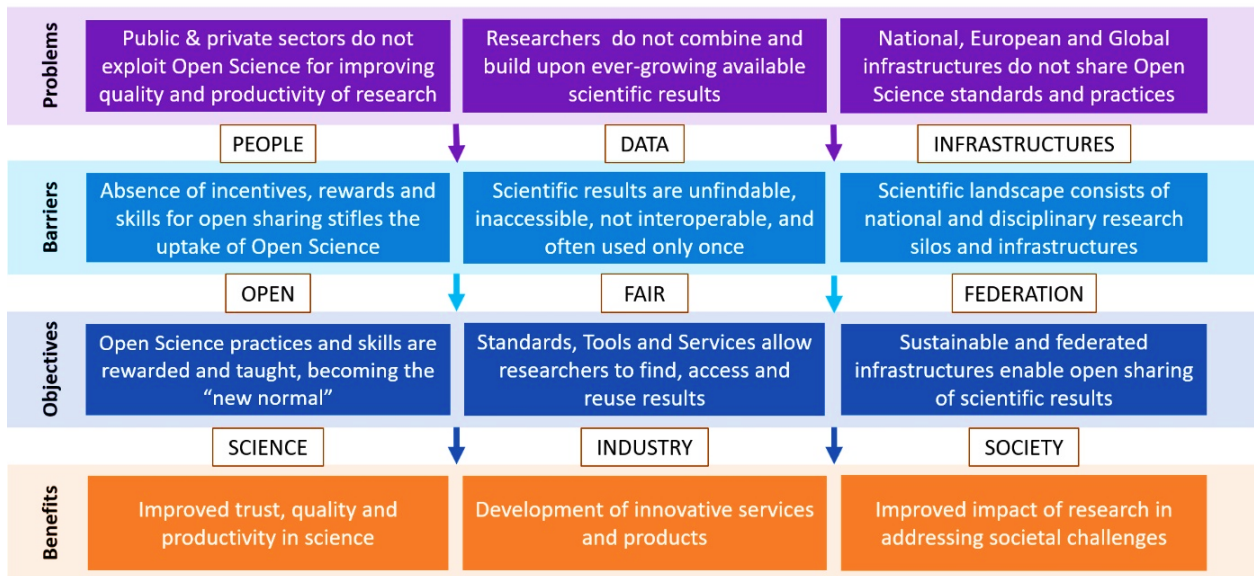
⁸ European Cloud Initiative - Building a competitive data and knowledge economy in Europe {SWD(2016) 106 final}

The Partnership is largely driven by:

1. **Exponential growth** in the quantity of research data;
2. Science and innovation becoming increasingly **data-intensive**;
3. The need to **bridge existing European infrastructures** and to connect research data silos by creating interoperable data commons addressing global challenges;
4. The need to **connect research data with robust computing technologies and fast connectivity networks** to allow mastering and (re)using the increasing volumes and complexity of research data;
5. The policy drive for **Open Science** and **Open Innovation** in Europe, requiring more coordination at institutional, national and European levels.

These drivers and the main problems that the EOSC partnership will address are described in the following figure (Figure 2) and addressed in the sections 2.1.1 to 2.1.4.

European Open Science Cloud Objectives Tree



v11

Figure 2: European Open Science Cloud Objectives Tree

2.1.1 Exponential growth in the quantity of research data

Today's data generation is growing exponentially and is measured in Zettabytes (10^{21} bytes). The vast increase in data production equally applies to the domain of research, whereby researchers are already unable to read (in terms of amount) or access (in case of data) all relevant digital knowledge in their field. In particular, the underlying research data remains predominantly unpublished and are thus unfindable and inaccessible.

This problem concerns the whole Europe and beyond and has been politically addressed at international level: the 2013 G8 Science Ministers' Statement drew together properties mentioned in earlier policies:

‘Open scientific research data should be easily discoverable, accessible, assessable, intelligible, useable, and wherever possible interoperable to specific quality standards.’⁹

These criteria were adopted in the European Commission’s first set of data guidelines for the Horizon 2020 framework and they drew the foundation of the FAIR principles conceived at the Lorentz conference in 2014¹⁰ (for the FAIR principles, see Box 3 in section 2.2.1).

With support and coordination by the Commission, Member States have started considering the FAIR principles in their Open Science policies applied to publicly funded research. Nevertheless, to ensure access to and re-use of scientific information all over Europe, a common framework of policies, standards and services is required that is not achievable without a coordination supported by an EU-wide partnership.

The present coronavirus pandemic illustrates the necessity of early sharing of research data¹¹ and of connecting research data infrastructures and research communities. The value of such an approach is demonstrated by the example of the largest outbreak of Ebola that ever happened in the history of West Africa in 2014. To deal with it, the government of Sierra Leone created data-driven initiatives and tools that opened up incoming data from multiple sources¹².

2.1.2 Open data commons for data intensive research and innovation

The more FAIR data resources will become available, the more it will be possible to use novel tools such as distributed machine learning and emerging artificial intelligence techniques to extract and analyse new valuable information. The main challenge is to master the interoperability and quality of research data. This challenge shall be addressed in the light of the trends characterising the evolution of the Internet.

George Strawn, Director of the Board on Research Data and Information at the National Academies of Sciences, Engineering, and Medicine in the USA, has described this evolution in three stages:

- Era one (1951-1995): **from few to many computers and many datasets**
- Era two (1995-2025?): **to one computer and many datasets**
(SUN Computer’s line was “the network is the computer”)
- Era three (2025?-): **to one computer and one dataset**
The network is the computer and all data are interoperable

This vision cannot be realised without specifications and standards for common components to enable interoperability across the research data ecosystem. More specifically there are two priorities:

⁹ G8 Science Ministers Statement, 13 June 2013 <https://www.gov.uk/government/news/g8-science-ministers-statement>

¹⁰ <https://www.force11.org/group/fairgroup/fairprinciples> and Wilkinson et al, (2016) ‘The FAIR Guiding Principles for scientific data management and stewardship’, Scientific Data 3:160018, <https://doi.org/10.1038/sdata.2016.18>

¹¹ <https://www.washingtonpost.com/science/2020/01/24/scientists-are-unraveling-chinese-coronavirus-with-unprecedented-speed-openness/>

¹² <http://odimimpact.org/case-battling-ebola-in-sierra-leone.html>

- 1) the development, refinement and adoption of shared vocabularies, ontologies, metadata specifications and standards which are central to data interoperability and reuse at scale; and
- 2) increasing the supply and professionalisation of data stewardship, data repositories and data services.

The first priority area requires further community efforts extending what the Commission has been supporting through the five ESFRI cluster projects¹³ (launched in early 2019) providing a gathering point for various ESFRI Projects and Landmarks to connect to the EOSC and to foster the FAIR principles and data interoperability in specific research communities. The ongoing actions are paving the way but the long tail of science and several research communities that are still limited by a lack of services or national boundaries, need further support and coordination at national and European level. In fact, data-driven science in Europe is moving fast, mainly driven by domain-oriented approaches and the complexity of coordinating the development of FAIR standards has increased due to the high number and the diversity of the scientific domains.

The second priority area requires the engagement of the Member States, research infrastructures, e-infrastructures and data repositories with community standards for certification. Currently, researchers spend significant time in the process of transforming and mapping data for lack of standards, services or culture: in Europe there is an urgent need of professionals in data curation and data stewardship to offer training and to help deploying wide-open data commons for data-intensive science. New initiatives related to Data Competence Centres (DCCs) are being piloted by several institutions in various Member States (Annex 1). However, upscaling these practices at national and European scales has only recently started.

At the same time, Europe needs a robust European-scale environment for storage and data analysis and computing. Access policies for networking, data storage, computing and processing differ across Europe. This makes scientific cooperation in the EU more difficult, especially if we want to leverage on existing e-infrastructures across countries and disciplines. Shareable research data, open data analysis tools and connected computing facilities need to become available for all researchers.

The ecosystem of FAIR data is another fundamental factor that requires coordination to allow data that are FAIR-by-design to be fed in a timely and effective way to the EOSC. This requires the development of technologies for automated collection of metadata in all applicable cases and the standardization of metadata descriptions in order to support the work of the data producers.

The European data strategy¹⁴ also underlines the role of EOSC for providing “*seamless access and reliable re-use of research data to European researchers, innovators,*

¹³<https://cordis.europa.eu/search/en?q=contenttype%3D%27project%27%20AND%20programme%2Fcode%3D%27INFRAEOSC-04-2018%27&p=1&num=10&srt=contentUpdateDate:decreasing>

¹⁴ COM(2020) 66 final

companies and citizens through a trusted and open distributed data environment and related services”.

In summary, the Partnership will enable research data to be easily made Findable, Accessible, Interoperable and Reusable, by providing standards and services for interoperability, certification, based on appropriate identifiers, metadata, ontologies, etc. Doing so, it will allow the researchers from different countries and disciplines, who currently work in silos, to verify, combine and build upon existing scientific data. EOSC can be seen as a thin federation layer bringing together existing infrastructures and new emerging ones, based on FAIR principles.

2.1.3 Bridging existing infrastructures / Connecting research data silos

The landscape of research data repositories in Europe is highly fragmented. The majority of data that is published nowadays is stored in local institutional or disciplinary repositories, resulting in a landscape of disconnected research data silos, in the storing of data that are largely unfindable, inaccessible and definitely not interoperable. This clearly hampers the data re-use and the knowledge circulation and more importantly, it reduces significantly the impact science could have on society in the broadest sense. Societal and global challenges demand cross-disciplinary research, and thus data sets from different disciplines must be interoperable. **By federating scientific data infrastructures and overcoming fragmentation, access and re-use of data will become easier, cheaper and more efficient.**

The consolidation of basic and common (FAIR) data services, as data commons, will constitute the core of the federation. The on-going EOSC related e-infrastructure projects (topics EINFRA-2017 and the expected project from INFRAEOSC-03), together with initiatives promoted by thematic research infrastructures such as the ESFRIs, EIROForum and internationally open (national) infrastructures, are identifying the common and the specific services that are potentially intended for populating and continuously enriching the EOSC. Moreover, the Member States are supported by the so called ‘EOSC regional projects’ (topic INFRAEOSC-05¹⁵) to identify national and local services that have the potential to be on-boarded in the federated environment.

The challenge is to reinforce ongoing interconnection efforts in collaboration with the many concerned European stakeholders. The processes engaged to bridge the existing infrastructures and e-infrastructure, and to define, maintain and operate and further develop the EOSC ecosystem of data and services cannot be simply supported by limited projects in different thematic and technology areas. It requires a holistic approach and a coordinated effort among all Member States and scientific communities.

The consolidation of (FAIR) data commons and the interconnection of research data silos will also enable the creation of new opportunities and new solutions in key thematic sectors such as health, food, transport or environment.

¹⁵<https://cordis.europa.eu/search/en?q=contenttype%3D%27project%27%20AND%20programme%2Fcode%3D%27INFRAEOSC-05-2018-2019%27&p=1&num=10&srt=contentUpdateDate:decreasing>

The Partnership will play a major role in helping to bridge the existing research data infrastructures and initiatives in Europe, by providing, among others, the EOSC core services (i.e. means to discover, share, access and re-use data and services across different data infrastructures, such as AAI, technical architecture standards, registries and catalogues, etc.) and the EOSC Exchange (i.e. marketplaces for tools and services, shared by diverse infrastructures). It will stimulate cross-disciplinary and frontier science and help tackling societal challenges like implementing the Sustainable Development Goals (SDGs) fixed in the UN context.

2.1.4 Policy drive for Open Science and Open Innovation in Europe

Open Science¹⁶ and Open Innovation¹⁷ have been policy priorities for the Commission since May 2016¹⁸. They continue to be widely recognised as key transformative, enabling elements of the European R&I policy driving a renewed European Research Area (ERA).

This policy drive for Open Science is shared by the Science and Technology Ministers of the Group of Seven (G7) countries, who have established (May 2016) a G7 Open Science Working Group to share common international principles for Open Science, and put these principles into practice through open access to scholarly publications and open data¹⁹. The development of a federated international research data infrastructure has been identified as a priority by this G7 Working Group.

Support for the transition to Open Science has also come from the Lindau Nobel Laureate Meeting (June 2019) in the form of the draft Lindau Declaration 2020 on Sustainable Cooperative Open Science (expected June 2020) . The Lindau Declaration 2020 presents ten goals to support a new approach to global, sustainable and cooperative Open Science. Two of these goals focus on sharing knowledge openly (including research data) via modern technologies and publishing well annotated data in trusted repositories.

The momentum existing at European level offers the opportunity to set a coherent Open Science policy framework among the EU Member States. The landscape of policy development across Europe regarding open science and EOSC presents a positive situation (according to a survey run by the Landscape Working Group of the EOSC Executive Board²⁰):

- Almost all EU Member States and Associated countries have research evaluation policies in place but generally linked to bibliometric methods;
- The majority (61%) of the Member States and Associated Countries have policies in place regarding open access to scholarly publications, but only 34% have defined

¹⁶ Open Science will help Europe benefit from digitisation and support new ways of doing research and innovation as well as opening up access to research data and results via digital technologies and collaborative tools.

¹⁷ Open Innovation will help Europe to capitalise socially and economically on research and innovation results by bringing more actors and investments into the research and innovation process.

¹⁸ <https://ec.europa.eu/digital-single-market/en/news/open-innovation-open-science-open-world-vision-europe>

¹⁹ <http://www.g8.utoronto.ca/science/2017-G7-Annex4-Open-Science.pdf>

²⁰ EOSC Landscape report [to be published in Q3-Q4 of 2020, figures might need some correction]

policies regarding FAIR data (though encouragingly 44% have one either in planning or under development).

- Relatively few countries (21%) mention EOSC in their policies, but 38% plan to do so in the future.

To achieve the goal of a harmonised Open Science policy framework and to allow EOSC to become the Open Science commons serving all European researchers, a strong coordination is required not only between the Union and the Member States but also with the other stakeholders (e.g. research organisations, service providers in the public and private sectors).

The Partnership will support the implementation of the Horizon Europe programme which makes Open Science its new *modus operandi*, by providing standards, tools and services for open access to publications and data.

The Partnership will also promote the deployment of ‘data stewards’ in academic institutions, transnational organisations and data-intensive industry by coordinating the development of training modules and certification mechanisms for EOSC-related digital skills.

Finally, the Partnership will create synergies with the research data producers in order to develop methodologies and technologies for new data being FAIR-by-design and EOSC-ready in a timely and sustainable manner.

In summary, the Partnership will support the European Research Area, Open Science and Open Innovation, the European strategy for data²¹ and the strategy on the Digital Single Market by developing and progressively opening up the EOSC ecosystem not only to European academics and researchers from public institutions but also to innovators, companies and the society.

2.1.5 Action is needed now

“If we do not act, there might be a looming crisis on the horizon. The vast majority of all data in the world (in fact up to 90%) has been generated in the last two years. Computers have long surpassed individuals in their ability to perform pattern recognition over large data sets. Scientific data is in direct need of openness, better handling, careful management, machine actionability and sheer re-use”

First High Level Expert Group on the European Open Science Cloud, 2016²²

The EOSC initiative is a policy priority of the European Union since 2016. It has been strongly supported by the European Council (in its conclusions of May 2015, May 2016²³, May 2018), the European Parliament (in a resolution of January 2017)²⁴ and the European

²¹ [COM\(2020\) 66 final](#)

²² <https://op.europa.eu/en/publication-detail/-/publication/78ae5276-ae8e-11e9-9d01-01aa75ed71a1/language-en>

²³ <http://data.consilium.europa.eu/doc/document/ST-9526-2016-INIT/en/pdf>

²⁴ http://www.europarl.europa.eu/doceo/document/TA-8-2017-0052_EN.html

research community (via the EOSC Declaration of 2017²⁵ and the EOSC Summit of 2018²⁶). Favourable opinions have also been given by the Economic and Social Committee (September 2016)²⁷ and the Committee of the Regions (October 2016).

An implementation roadmap was communicated by the Commission in March 2018, followed the launch in November 2018 of the initial phase of EOSC implementation (2018-2020). On that occasion, the ministers did reaffirm the EOSC vision and their commitment to help realising the EOSC (Vienna Declaration of November 2018)²⁸.

A three-tier EOSC governance was established in 2018 to help steering the initial implementation phase till end of 2020. It includes:

- the EOSC Executive Board²⁹ (consisting of 8 members representing stakeholder organisations and 3 independent experts);
- the Governance Board³⁰ (consisting of representatives from the EU Member States and countries associated to the research framework programme as well as the European Commission);
- and the Stakeholder Forum that gives voice to the wider community of users, service providers, industry and the public sector.

The Executive Board has produced a Strategic Implementation Plan (July 2019)³¹ of activities that will contribute to the implementation of EOSC and a Work Plan (October 2019)³² of key outputs that will be delivered in this first phase of implementation in 2019-2020.

In parallel, the European Commission has made a direct EU financial investment of about € 350 Mio in the initial phase of the EOSC implementation through calls in the Work Programmes 2016-2017³³ and 2018-2020³⁴ under Horizon 2020. Projects supported the pan-European access mechanism to public e-infrastructures, the coordination of national activities, the connection of European Research Infrastructures to the EOSC, the setting and beginning of the operationalisation of the FAIR principles, and the start of a FAIR-compliant certification scheme for research data infrastructures. Several of these projects have contributed to a steadily developing EOSC-ecosystem and an EOSC portal. A list of EOSC related EU-projects is available in Annex 2.

²⁵ https://ec.europa.eu/research/openscience/pdf/eosc_declaration.pdf

²⁶ <https://ec.europa.eu/research/index.cfm?eventcode=44D86060-FBA1-1BD1-9355822B162BB0EE&pg=events>

²⁷ <https://www.eesc.europa.eu/en/our-work/opinions-information-reports/opinions/european-cloud-initiative-building-competitive-data-and-knowledge-economy-europe>

²⁸ <https://eosc-launch.eu/declaration>

²⁹ <https://www.eoscsecretariat.eu/eosc-governance/eosc-executive-board>

³⁰ <https://www.eoscsecretariat.eu/eosc-governance/eosc-governance-board>

³¹ https://ec.europa.eu/info/publications/european-open-science-cloud-eosc-strategic-implementation-plan_en

³² <https://publications.europa.eu/en/publication-detail/-/publication/3c379ccc-ee2c-11e9-a32c-01aa75ed71a1/language-en>

³³ https://ec.europa.eu/research/participants/data/ref/h2020/wp/2016_2017/main/h2020-wp1617-infrastructures_en.pdf

³⁴ https://ec.europa.eu/research/participants/data/ref/h2020/wp/2018-2020/main/h2020-wp1820-infrastructures_en.pdf

The start in 2021 of the next implementation phase of the EOSC represents a key milestone and opportunity. Lessons on the initial steps are still being collected by the current EOSC Governance³⁵ but already indicate the need for:

- further communicating and explaining to a wide range of research stakeholders of the EOSC federating vision and of the concrete benefits its implementation will bring to them, in order to incentivise their participation;
- more ‘convergence’ between current and future EOSC activities;
- agreeing upon a set of EOSC related concrete and measurable targets to reach in the next few years and mobilise the relevant actors and available financial resources for achieving them;
- an overarching Strategic Research and Innovation Agenda aligning actions at EU level and actions at national and institutional level that would permit to realise the EOSC vision and implementation targets;
- a revised governance structure involving the Commission, the Member States and Associated Countries (gathered in an external Steering Board) and all other EOSC stakeholders (represented in a European Partnership).

2.2 Common vision, objectives and expected impacts

“We are creating a European Open Science Cloud now. It is a trusted space for researchers to store their data and to access data from researchers from all other disciplines. We will create a pool of interlinked information, a ‘web of research data’. Every researcher will be able to better use not only their own data, but also those of others”³⁶

Ursula von der Leyen, President of the European Commission

Framed in the overall context and current trends of this proposal, the previous section already describes key elements of the Partnership’s vision. The EOSC partnership will support the EOSC vision to put in place an EOSC environment for **transforming the way research is done in Europe**. EOSC will demonstrate its value by enhancing the possibilities for researchers to share publications, data, and software leading to new discoveries, insights and solutions. After an initial start-up phase, the EOSC ecosystem will expand its user base to the public sector as well as innovative companies. It will demonstrate its potential to run self-sustained over time and to ensure Europe’s leading role in addressing global challenges for the benefit of society at large. By principle, the EOSC ecosystem shall be designed as an inclusive system, thus also targeting societal participation in the long run.

The European Commission leading by example

The European Commission aims to continue acting as a frontrunner in open access and Open Science. In Horizon Europe, the European Commission proposes notably that:

³⁵ <https://www.eoscsecretariat.eu/eosc-governance>

³⁶ Special address at the World Economic Forum Commission:
https://ec.europa.eu/commission/presscorner/detail/en/speech_20_102

- Research data will be open by default, with exceptions in the cases justified in the Model Grant Agreement, thus following the principle 'as open as possible, as closed as necessary';
- The development and implementation of a Data Management Plan (DMP) will become mandatory, even if not making research data open;
- Emphasis will be placed on supporting as much as possible the proliferation of research data that are as far as possible Findable, Accessible, Interoperable and Re-usable (FAIR);
- Use of trusted repositories and infrastructures connected to EOSC will be encouraged and possibly required in some work programmes depending on the state of deployment of the EOSC-core functions.

Box 2: The European Commission leading by example

In particular, the EOSC partnership will be instrumental for bringing strategic coherence and pooling EOSC-related R&I resources and initiatives happening at European, national and institutional scales and to align them towards this common vision and ensure that the circa 2 million European researchers get access to the EOSC open, trusted virtual environment to store, share and reuse research data across borders and disciplines.

2.2.1 General objectives of the EOSC partnership

The Objectives tree presented in Figure 2 sets the foundations for the EOSC partnership intervention logic along the following three main general objectives, together with an additional crosscutting one. These three general objectives will be subsequently developed (in section 2.2.2.) into specific and operational objectives:

- ❖ **General objective 1: *Open science practices and skills are rewarded and taught, becoming the “new normal”***
 - Main milestone: *The EOSC ecosystem underpins the reward of open science practices and data stewardship that improve trust, quality and productivity in science.*
- ❖ **General objective 2: *Standards, tools and services allow researchers to find, access and reuse results***
 - Main milestone: *The EOSC provides a trusted platform supporting the development of innovative services and products.*
- ❖ **General objective 3: *Sustainable and federated infrastructures enable open sharing of scientific results***
 - Main milestone: *The EOSC infrastructure is in operation, providing a web of FAIR data and related services underpinning research addressing major societal challenges.*
- ❖ **Crosscutting objective: *Boosting the impact of EOSC through collaboration and alliances***

General Objective 1: Open science practices and skills are rewarded and taught, becoming the “new normal”

A key goal of the EOSC Partnership is to help in shifting the research enterprise in Europe towards an Open Science model as there is a political will towards the notion of open research and many European countries are implementing national programmes that are aligned with the European Commission Recommendation (EU) 2018/790 of 25 April 2018 on access to and preservation of scientific information³⁷.

EOSC will be established as the EU wide infrastructure for open research. Assuming the European Commission and national funders will require from researchers to use ‘EOSC-approved’ infrastructures, this will lead to output in line the “new normal”.

General Objective 2: Standards, tools and services allow researchers to find, access and reuse results

The launch of initial EOSC projects and the work of the Commission expert group on FAIR data (with its report Turning FAIR into reality³⁸) has allowed stakeholders to agree on the shared FAIR principles that are now at the core of EOSC. Making data and any other digital research object (such as algorithms, tools, and workflows) as FAIR as possible across all European research infrastructures will be a key expectation for joining the EOSC Partnership and sharing/reusing research results.

The FAIR guiding principles, by Mark Wilkinson et al (2016)³⁹:

Findable: Data are assigned a globally unique, persistent and resolvable identifier. They are described with rich metadata which are registered or indexed in a searchable resource.

Accessible: Metadata are retrievable by their identifier using a standardised communications protocol which is open, free and universally implementable.

Interoperable: Data and metadata use a formal, accessible, shared and broadly applicable language for knowledge representation.

Reusable: Data and metadata are released with a clear and accessible data usage license. They are associated with detailed provenance and meet domain-relevant community standards.

‘Importantly, it is our intent that the principles apply not only to ‘data’ in the conventional sense, but also to the algorithms, tools, and workflows that led to that data. All scholarly digital research objects—from data to analytical pipelines—benefit from application of these principles, since all components of the research process must be available to ensure transparency, reproducibility, and reusability’

³⁷ <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32018H0790>

³⁸ <https://op.europa.eu/en/publication-detail/-/publication/7769a148-f1f6-11e8-9982-01aa75ed71a1>

³⁹ <https://www.nature.com/articles/sdata201618>

*'Distinct from peer initiatives that focus on the human scholar, the FAIR Principles put specific emphasis on enhancing the ability of **machines to automatically find and use the data**, in addition to supporting its reuse by individuals'*

Box 3: FAIR principles

The FAIR principles provide high-level answers to the challenges in managing research data:

- **Heterogeneity:** Data are defined by the scientific discipline that produces or studies them. They are coming from equipment, surveys or any other data production /collection process. Data are also the results of processing steps developed after the raw data collection. As a consequence of this multifaceted landscape, a very wide variety of data frameworks have been designed by research communities.
- **Granularity:** While raw data may be produced in large volumes, users may not need access to raw data but only to the results of post-processing steps. Deciding at what stage data should be preserved and made available to users is also specific to the scientific domain.
- **Versioning:** Data are collected as time goes by. The sampling rate, the importance of preserving knowledge on the sequence of events also depends on the domain.
- **Disambiguation:** When it comes to representing data in digital form, the choice of identifiers is a problem in itself. It may occur that one identifier points to multiple objects introducing one more level of complexity for the user.
- **Diffusion prevention:** On the other hand, it may also occur that multiple identifiers point to the same object introducing a different level of complexity.

The availability of data that are FAIR by design will allow scientists to make the best use of new data by leveraging the power of machines. FAIR data being machine-actionable allow to develop software services, applications and tools that deliver the proper information for scientists to nurture their research.

Researchers are increasingly relying on computational and machine-assisted support to deal with research data as a result of the increase in volume, complexity, and creation speed of data. There is thus currently a scientific and policy consensus that research data must be made machine-actionable, when applicable, to allow computational systems to find, access, interoperate, and reuse research data. The digital objects (as described below) can serve the need for machine-actionability.

Putting it in simple terms: The machine must be able to find data (“**knows where it is**”), then the machine needs to be able to access and identify (“**know what it is**”); in order to operate on the data the machine needs to know what can be done with this object (“**know how it can be handled**”) and for re-using the data object the machine needs to know what it is allowed to do with it (“**know which actions are allowed**”). This all needs to be well described in the metadata.

FAIR are the requirements that ensure that digital objects within EOSC can be discovered and reused. The FAIR principles articulate a set of mutual responsibilities between content creators and curators. Digital objects must be described with rich metadata, assigned a globally unique persistent identifier, and be released with a clear and

accessible usage license. There is an onus on researchers to adopt relevant community standards and select appropriate data services which enable digital objects to be discovered and retrieved using standard protocols, applicable for both humans and machines. Research communities need to define data standards, sharing agreements and services to enable FAIR digital objects. Some, such as astronomy, life sciences and linguistics have self-organised, but many others require support to avoid widening the gap between communities which can make the most of EOSC.

Within the report “Turning FAIR into Reality”⁴⁰ several non-exclusive components of a FAIR ecosystem were proposed. These address the core metadata and identifiers needed for digital Objects, as well as the policies, plans and repository services to enable FAIR. There should be registries cataloguing each component and automated workflow between them. At present, Task Forces within the Architecture and FAIR Working Groups⁴¹ of the EOSC Executive Board are specifying a Persistent Identifier (PID) policy, FAIR metrics, repository certification, AAI protocols, common APIs and the overall EOSC Architecture. Jointly an EOSC Interoperability Framework is being designed which will specify base level requirements for semantic, legal, technical and organisational interoperability. This thin layer of common standards will have to enable machines to identify and resolve different types of FAIR digital objects. A variety of applications will be available in the EOSC Exchange to enable researchers to combine datasets and perform analyses.

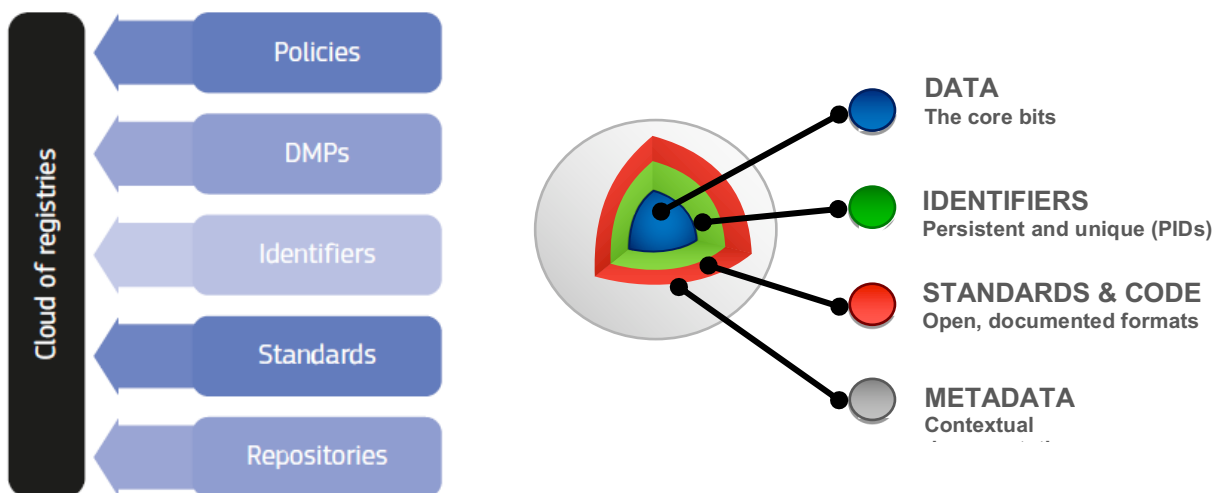


Figure 3: FAIR ecosystem

The strength of the FAIR principles is in generalising a small set of common characteristics required in all digital objects, irrespective of type, discipline and content. This enables machines to act across a broad set of content, enabling interdisciplinary research. Many aspects of the FAIR principles however speak to community standards and practices. The principles will be applied differently according to the needs and requirements in the different fields of knowledge. Crosswalks and brokering are needed to support interoperability across disciplinary standards as noted in recommendation 4 from the FAIR

⁴⁰ <https://www.nature.com/articles/sdata201618>

⁴¹ <https://www.eoscsecretariat.eu/eosc-working-groups>

Expert Group: “Develop interoperability frameworks for FAIR sharing within disciplines and for interdisciplinary research”.

Research communities need to be supported to develop and maintain interoperability frameworks that define their practices for data sharing, data formats, metadata standards, tools and infrastructure. To support interdisciplinary research, these interoperability frameworks should be articulated in common ways and adopt global standards where relevant. Intelligent crosswalks, brokering mechanisms and semantic and other cutting-edge technologies like artificial intelligence, should all be explored to break down silos and allow for cross-disciplinary data exploration, analysis and visualisation.

General Objective 3: Sustainable and federated infrastructures enable open sharing of scientific results

This objective aims to enable the core functions of an operational EOSC ecosystem. The Partnership envisions the core of EOSC as the federation of infrastructures, forming a **Web of FAIR Data and related Services for Science**. The FAIR principles and metadata standards act as guidance for interoperable data and allow maximum sharing and exploitation of research by the academic, private and public sector.

This system will be based in three layers: (1) The federating Core (or **EOSC-Core**), (2) the **federation** of existing and planned research data infrastructures; and (3) a service layer comprising Common Services and Thematic services (**EOSC-Exchange**). Building on existing research data infrastructures, EOSC will grow through a series of iterations. Each iteration will add more functionalities and services for a wider user base and satisfying a broader range of use-cases.

(1) The **EOSC-Core** assembles all the basic elements to operate and provide the means to discover, share, access and re-use data and services. These elements address key technical, cultural and policy decisions of EOSC and they must be maintained over the long term. Specifically:

- A standard mechanism for naming and locating data and services
- A mechanism for discovery of and access to data and services across the federated EOSC ecosystem.
- A common framework for managing user identity and access

It will need to assemble a number of basic functionalities, including:

- Data sets complying with an open charter describing what users can expect from the service, like description of the data with rich, community defined and FAIR metadata (including granularity levels, versioning policy); sustainability commitments; quality goals; etc.
- Networking connectivity with commitments on upload and download capabilities,

- Authentication and authorisation rules and services for allowing access by users. These rules and services have to comply with the EOSC AAI (Authentication & Authorisation Infrastructure) standards,
- Persistent Identifier (PID) services complying with the EOSC PID policy,
- Metadata services describing the data available in order, for example, to allow for discovery by end-users,
- Application Programming Interfaces for access by machines. These APIs are necessary to allow the development of applications using the data. Their description must be public.

(2) **Federation**: the FAIR principles and metadata standards enable the federation of existing and planned research data infrastructures, adding a soft overlay to connect them and forming a Web of FAIR Data and services.

As the national, European and international research (data) infrastructures composing the EOSC and other regional infrastructures are by definition not centralised, but distributed, as well as supported by a wide variety of institutions (public and private) throughout the world, the envisioned EOSC can only be realised in a decentralised federated way. As just described, this needs an underlying frame based on commonly agreed, minimal standards and maximal freedom to operate with agility, whilst still ensuring global and interdisciplinary interoperability. This does not rule out multiple ‘portals’ in the sense of more traditional websites, where people can enter the EOSC environment, find data and related services, learn about commonly adopted approaches, formats, standards and EOSC rules of participation, register their data resources, tooling and services etc. Currently, the projects funded under EOSC-related calls in Horizon 2020 have developed an initial EOSC Portal. In order to enable innovative value adding services to be developed, it is essential that such access point have an API for machine access.

(3) The **EOSC-Exchange** builds on the EOSC-Core to ensure a rich set of services (common and thematic) exploiting FAIR data and encouraging its reuse are available to publicly funded researchers. It is expected that rivalrous services, such as those that store, preserve or transport research data as well as those that compute against it, will be made available via EOSC-Exchange. Service providers that participate in EOSC-Exchange will be required to conform to predefined Rules of Participation.

- **Common Services**: This layer is composed of services that need to exist but may not be shared by all stakeholders. The main reason for such a layer is that domains or countries have already developed those services. There is no reason for them to change while other domains or countries would benefit from using common services rather than develop their own. A good example is the archival service. All domains and countries need archival services to ensure the sustainability of their artefacts (publications, data and software). Some stakeholders have developed their own and have no reason to change. Their experiences may, however, be useful in developing common services for other stakeholders.

- **Thematic services:** This layer has no limit. It covers all the services that communities need to develop to contribute. These services are delivered to researchers and all stakeholders to enhance their working environment. These services are built using the relevant elements of the federating core (EOSC-Core) and may leverage common services. They will use the Application Programming Interfaces mentioned above when necessary. There are already many projects engaged in such developments in vertical domains. The mission of EOSC is to allow for those services to flourish and to support the ecosystem while stimulating the creation of new innovative services.

Crosscutting objective: *Boosting the impact of EOSC through collaboration and alliances*

The EOSC partnership is a key partnership in a wide network of other partnerships, initiatives and infrastructures that conform the digital and the research ecosystems in Europe and globally. The necessary shared activities and alliances should be built in order for Europe to optimize the outcomes of its efforts for the benefit of the research community and society at large. Those initiatives that have already been identified as relevant for cooperation are listed below and more concrete objectives to be achieved are preliminary included in the next section; however, it is important to mention that these synergies will need to be further defined and prioritized building in the strategy that is currently being defined by the current EOSC governance.

European Partnerships

All partnerships can take benefit from a successful development of the EOSC. Interaction and a multilateral collaboration with many of these partnerships, in particular, challenge-driven partnerships (thematic), will thus increase the potential to bring value to researchers in Europe and beyond and provide access to data infrastructures and services that would not be available otherwise.

At the same time, the EOSC partnership will join forces with partnerships established under Horizon 2020 and other Horizon Europe partnerships working on specific technologies and areas where clear synergies can be established in order to align activities and strengthen the common impact. In particular, these partnerships are the following:

- European Partnership for High Performance Computing whose mission is to establish an integrated world-class supercomputing and data infrastructure. Synergies with EuroHPC will stimulate the use of the high-performance computing capacity using FAIR data and federated infrastructures.
- European Partnership on Artificial Intelligence, Data & Robotics whose mission is to federate efforts around Artificial Intelligence. This Partnership results from the merger of contractual PPPs on Robotics and on Big Data. The latter, the European Big Data Value (PPP under H2020) aims to create a functional Data Market and Data Economy in Europe.

- Alliance for internet of things innovation, aiming to strengthen the dialogue and interaction among Internet of Things (IoT) players in Europe,

European Data Spaces⁴²

The EOSC Partnership will also seek synergies with the European Data Spaces. While EOSC focuses on federating research data infrastructures, the research data made accessible through EOSC will be relevant for several dataspace (e.g. health, Destination Earth). EOSC will build primarily on FAIR data. Where appropriate, access to such data will be provided.

Open Science organisations

Open Science has become a shared goal all over the world. While Europe is in a leadership and pioneering position, there are many other initiatives all around the world. Existing Open Science Commons initiatives include the Australian Research Data Commons (ARDC)⁴³, the African Open Science Platform (AOSP)⁴⁴, NIH Data Commons⁴⁵, Canada's National Data Services Framework (NDSF)⁴⁶, the Chinese CSTCloud⁴⁷ and the Association of Southeast Asian Nations (ASEAN)⁴⁸ initiative. In the thematic realm, examples are: the Australian Biocommons, the Data Commons for Food Security and CSIROs Managed Data Ecosystem. The technical and communication teams of EOSC will have to engage at a global level in order to ensure complementarity.

The Research Data Alliance⁴⁹ (RDA) has become a recognised actor in the development of standards and good practices for managing research data. CODATA⁵⁰, as the standing committee of the International Science Council works closely with the RDA and GO FAIR⁵¹ working groups and implementation networks, while the World Data System focuses on high quality data services with an emphasis on repositories and their certification. Many EOSC-projects have already taken concrete initiatives to partner with these organisations and to participate in RDA Working Groups. These relationships will be extended as EOSC reaches new milestones.

2.2.2 Specific and operational objectives

For each general objective of the Partnership, more specific and operational objectives can be derived as shown in Tables 1, 2, 3 and 4. In particular, Specific objectives define measurable targets that are applicable within the scope of the members of the EOSC Association. It must be noted that the general objectives are very much interlinked and therefore, most of the specific and operational objectives listed under one general

⁴² <https://ec.europa.eu/digital-single-market/en/policies/building-european-data-economy>

⁴³ <https://ardc.edu.au/>

⁴⁴ <http://africanopenscience.org.za/>

⁴⁵ <https://commonfund.nih.gov/commons>

⁴⁶ <https://www.rd-alliance.org/national-data-services-framework-ndsf-summit>

⁴⁷ <http://cstcloud.net/>

⁴⁸ <https://asean.org/>

⁴⁹ <https://www.rd-alliance.org/>

⁵⁰ <https://council.science/what-we-do/research-programmes/data-and-information/committee-on-data-for-science-and-technology-codata/>

⁵¹ <https://www.go-fair.org/>

objective are relevant for the others as well. However, for the sake of clarity they are only mentioned once.

At present, the EOSC Working Groups are working on developing further some of the concepts and specific needs linked to the objectives. Therefore, the current list of specific and operational objectives might need to be updated in the upcoming months before the final submission of this partnership proposal and will need to be confirmed in the SRIA, as well as the tentative target years that are provided in the stages 1,2 and 3 below.

- Note:**
- 1) In the tables below the targets specifically relate to the members of the EOSC Association, unless stated otherwise.
 - 2) The timeframe of Horizon Europe has been divided into three stages. Stage 1: 2021-2023; Stage 2: 2024-2025; Stage 3: 2026-2027

Table 1: General Objective 1

General Objective 1	
Open science practices and skills are rewarded and taught, becoming the “new normal”	
Specific Objectives	Operational Objectives
<p>1.1 Researchers doing publicly funded research make relevant results available, as openly as possible</p> <ul style="list-style-type: none"> • KPI (2023) 90 % of publications from EOSC Association members are open access • KPI (2025) <i>KPI for software to be determined</i> • KPI (2027) 70 % of research data from EOSC Association members that researchers deem to be of relevance are made as FAIR as possible, ideally open <p>1.2. Professional data stewards are available in research performing organisations in Europe to support Open Science:</p> <ul style="list-style-type: none"> • KPI (2025) European curricula for data stewards are defined • KPI (2027) All research done by EOSC Association members is supported by professional data stewards <p>1.3 Researchers are incentivized to perform Open Science</p> <ul style="list-style-type: none"> • KPI (2025) All association members endorse a commitment to recognize open science activities in research career assessments <p>1.4. The scope of EOSC is widened to serve the public and private sectors</p> <ul style="list-style-type: none"> • <i>KPI's to be determined</i> 	<p>Stage 1 (2021-2023):</p> <ul style="list-style-type: none"> • an online dashboard will be operational to visualize the evolving landscape of policies, infrastructures, and initiatives relevant to the EOSC (1.1) • EOSC supports the training and deployment of professional data stewards together with European curriculum frameworks. (1.2) • Encourage the recognition and reward of Open Science, data skills and data stewardship among members of the EOSC. (1.3) • Monitoring system that will gather usage data, evidence and best practices valuable to academics, industry, the public sector and the policy-makers <p>Stage 2 (2024-2025):</p> <ul style="list-style-type: none"> • Provide alternative or new infrastructure that enables rewards and incentives for Open Science (1.3) • The EOSC ecosystem (e.g. data, software, services, tools) is equipped to serve entities from the private sector and public authorities so that they can access and re-use results of publicly funded research, innovating new data services (1.4) <p>Stage 3 (2026-2027):</p> <ul style="list-style-type: none"> • EOSC ecosystem facilitates and provides the capacity for Open Science for the majority of

	researchers of the EOSC Association members (1.1)
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Table 2: General Objective 2

General Objective 2	
Standards, tools and services allow researchers to find, access and reuse results"	
Specific Objectives	Operational Objectives
<p>2.1. Research data produced by publicly funded research in Europe is FAIR by design</p> <ul style="list-style-type: none"> • KPI (2023) 40% of the repositories in the EOSC will have a certification (e.g. CoreTrustSeal); by 2027 60% will be certified. • KPI The number of research communities with documented standards and protocols for data sharing and reuse increases by 20% during each stage of Horizon Europe • KPI (2025) 60% of the members of the EOSC Association have policies which require FAIR to be implemented in project design via Data Management Plans <p>2.2. The EOSC interoperability framework supports a wide range of FAIR digital objects including data, software and other research artefacts.</p> <ul style="list-style-type: none"> • KPI (2023) the EOSC Interoperability Framework is adopted by at least 5 major research infrastructures in Europe, enabling their data to be federated into EOSC; by 10 in 2025 and by 15 in 2027 • KPI (2023) data from EOSC cluster projects is made FAIR and can be accessed through EOSC • KPI (2025) data and other digital objects from a wide spectrum of disciplines are FAIR and available in EOSC <p>2.3 European research is increasingly discovered and reused across disciplines as a result of EOSC</p> <ul style="list-style-type: none"> • KPI (2023) a significant proportion of European research data is discoverable through EOSC • KPI (2025) a large majority of research funding members of the EOSC Association require data sharing and incentivise reuse 	<p>Stage 1 (2021-2023):</p> <ul style="list-style-type: none"> • an online dashboard will be operational to Further define FAIR for implementation within the different disciplines. (2.1) • Develop metrics for FAIR Digital Objects to measure and increase FAIRness. (2.3) • Interoperability frameworks are available for FAIR sharing within disciplines and for interdisciplinary research to facilitate research collaboration and networking. (2.1) • Facilitate stepwise European alignment of key elements (such as national policies and standards) towards open and "FAIR by design" for all digital research objects (2.1) • Implement the EOSC Interoperability Framework to support FAIR Digital Objects. (2.2) • Provide the capacity to develop the components of a FAIR ecosystem (including standards, identifiers, etc.) (2.2) • Provide assessment frameworks to certify that repository services enable FAIR. (2.3) <p>Stage 2 (2024-2025):</p> <ul style="list-style-type: none"> • Semantic and other technologies have been implemented to facilitate automated processing • Members of the EOSC legal entity recognise and reward adoption of FAIR, strongly incentivising data reuse. (2.3) • Researchers are incentivized to explore and implement FAIR-by-design practices in their laboratories / observatories / analytical resources <p>Stage 3 (2026-2027):</p> <ul style="list-style-type: none"> • The EOSC ecosystem integrates all types of digital objects, including publications, data and software. (2.2)

Table 3: General Objective 3

General Objective 3 <i>Sustainable and federated infrastructures enable open sharing of scientific results</i>	
Specific Objectives	Operational Objectives
<p>3.1. EOSC is operational and provides a stable infrastructure supporting research addressing societal challenges</p> <ul style="list-style-type: none"> • KPI (2023) core functions of Minimum Viable EOSC are developed and the EOSC ecosystem is accessible to researchers across disciplines and countries • KPI (2025) incentives and models for commercial providers to join EOSC Exchange • KPI (2027) several commercial service providers provide research related services through EOSC • KPI (2027) EOSC Core and EOSC Exchange become accessible to users from the private sector, the public sector and society at large. • KPI (2027) significant number of tools and services from several national research infrastructures also become accessible through EOSC <p>3.2. EOSC is populated with a valuable corpus of interoperable data</p> <ul style="list-style-type: none"> • KPI (2023) data and other digital objects from domains with interoperable data strategies are available through EOSC • KPI (2025) significant amount of data from the major national research infrastructures is available through EOSC. • KPI (2025) significant amount of data are FAIR-by-design • KPI (2027) significant amount of data from publicly funded research is available through EOSC <p>3.3 EOSC is a valuable resource to a wide range of users from the public and private sectors</p> <ul style="list-style-type: none"> • KPI (2025) several use cases of researchers engaging with stakeholders from the public and private sector to address societal challenges • KPI (2027) EOSC in use by public sector outside of academia • KPI (2027) EOSC in use by private sector innovators 	<p>Stage 1 (2021-2023):</p> <ul style="list-style-type: none"> • Establish a common framework for managing user identity and access. • Establish a mechanism for discovery of and access to data and services across the federated EOSC ecosystem. • Ensure an efficient and smooth onboarding process for service providers. <p>Stage 2 (2024-2025):</p> <ul style="list-style-type: none"> • Adopt a standard mechanism for naming and locating data and services. • Assemble the components of the EOSC architecture (AAI, APIs for access by machines service management, minimum metadata framework, open metrics, PID services, helpdesk, portal, etc.). • Ensure that service providers that participate in EOSC-Exchange conform to predefined Rules of Participation. • Establish a monitoring system for the uptake of the EOSC core services, and the access to EOSC exchange services. • Ensure a feedback mechanism to engage with users and further develop the EOSC Core and EOSC Exchange tools and services. • Develop models for the long-term sustainability of the EOSC-Core and EOSC-Exchange. <p>Stage 3 (2026-2027):</p> <ul style="list-style-type: none"> • Support research institutions in capacity development for FAIR sharing within disciplines and for interdisciplinary research through interoperability frameworks. • Implement the essential additional functionalities dedicated to the requirements of end-users from the public and private sector.

Table 4: Crosscutting Objective

Crosscutting Objective <i>Boosting the impact of EOSC through collaboration and alliances</i>	
Specific Objectives	Operational Objectives
<p>CO.1. All challenge-driven partnerships include activities and provisions linked to EOSC and FAIR practices.</p> <ul style="list-style-type: none"> KPI to be developed in SRIA <p>CO.2. Synergies with partnerships working on specific technologies are established</p> <ul style="list-style-type: none"> KPI (2025) the EOSC ecosystem is available to the EuroHPC federated service platform KPI (2025) AI and big data enhance user experience and functionality of working with and across data sets in EOSC KPI (2027) data resources from Big Data ecosystem are available through EOSC <p>CO.3. Connection of the EOSC data space to other Data Spaces in the European data strategy</p> <ul style="list-style-type: none"> KPI (2027) pilots realised for connecting EOSC to two sectoral Data Spaces as part of the European data strategy <p>CO.4. Connection of EOSC to similar ‘cloud’-initiatives from regions around the world (subject to reciprocity)</p> <ul style="list-style-type: none"> KPI (2027) several use cases realized of access and interoperability between EOSC and other similar initiatives. 	<p>Stage 1 (2021-2023):</p> <ul style="list-style-type: none"> Develop and align activities with the identified partnerships Identify challenge-driven partnership that can maximize its added value as use cases of EOSC. Collaboration in place with the European Partnership on Artificial Intelligence, Data & Robotics and Big Data Value PPP. Align activities with the Alliance for Internet of Things Innovation with regards to the implementation FAIR principles Align activities with the Data Spaces in the European data strategy with regards to the implementation FAIR principles.
	<p>Stage 2 (2024-2025):</p> <ul style="list-style-type: none"> Collaboration with EuroHPC Joint Undertaking
	<p>Stage 3 (2026-2027):</p> <ul style="list-style-type: none"> Interact with global partners and initiatives for interoperability and alignment of infrastructures to promote Open Science globally.

2.2.3 The overall timeframe

In order to structure the high-level priorities along the period of the partnership, three phases are considered. Serving many of the stakeholders from the science sector will be, during the 7 years of the duration of Horizon Europe, a continuum for EOSC. However, from 2025, the Partnership will also dedicate efforts to bring the benefits of Open Science and the EOSC ecosystem to users in the public and private sectors. This is reflected in the targets indicated in tables 1, 2 and 3 and encapsulated in the following overall timeframe (table 5):

Table 5: Overall timeframe – stages 1, 2 and 3

<p>Stage 1: period 2021-2023</p> <p>Creating the European Open Science Cloud operations (EOSC-Core) to provide authentication & authorization infrastructure (AAI) and other necessary core functions of the Minimum Viable EOSC.</p> <p>Stage 2: period 2024-2025</p> <p>Expanding the Minimal Viable EOSC with access to added value services, applications and tools (EOSC-Exchange) supporting the full cycle of scientific workflows.</p> <p>First pilots / demonstrators on linking EOSC beyond the research communities with the wider public sector and the private sector from 2024 onwards, for addressing societal challenges</p> <p>Stage 3: period 2026-2027 and beyond</p> <p>Deployment of the Web of FAIR Data and related Services, including the EOSC-core, EOSC-Exchange and other framework conditions for interoperability and machine-actionability of data. This Web of FAIR Data and Services is part of a developing global Open Science Commons.</p> <p>Continuous support to enhancing the ecosystem of the Web of FAIR data and related services for the research community.</p>
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2.2.4 Key Performance Indicators and methodology

The current initial phase of EOSC (2018-2020) shall be concluded by a (quantitative and qualitative) assessment of its outcomes by the European Commission and the Member States⁵². Key Performance Indicators (KPIs) and the assessment methodology, which are currently developed, will serve as a basis for the metrics on the partnership performance.

Some examples of metrics for the Partnership are the following:

- Level of engagement: to be measured by the number and diversity of members of the future EOSC Association or the level of endorsement of the EOSC future SRIA.
- Level of uptake of the FAIR principles and Open Science: by the new members of the EOSC Association implementing EOSC.
- Impact of the synergies and collaborations: by the number of formalized cooperation agreements with other partnerships, etc.
- Attractiveness of the EOSC ecosystem for service providers: number of service providers, range of services, numbers of countries/disciplines of services providers in EOSC-Exchange, efficiency of on-boarding.

⁵² Council Conclusions of May 2018

2.2.5 Objectives translated into activities: Strategic Research and Innovation Agenda

The translation of the objectives described in tables 1 - 4 into a comprehensive set of activities to be performed in the period 2021-2027 will result into the definition of a Strategic Research and Innovation Agenda (SRIA).

An initial version of the SRIA is currently under development by the current EOSC Governance Structure. Consultation with the EOSC stakeholders' community has already been foreseen in order to ensure openness and transparency. Together with the SRIA, a Multi-Annual Roadmap (MAR) of the Partnership is also under development. The MAR will indicate the envelope of priorities in an overall timeframe for the partnership and the process to derive annual activities from them. A more detailed description of the priorities for the first years of the partnership is also expected before Q4 2020.

The current schedule for developing the initial SRIA is the following:

- May 2020 Executive Board approves initial draft
- June 2020 Governing Board reviews initial draft
- July 2020 Launch of the open consultation
- August 2020 Interim version during open consultation
- September 2020 End of the open consultation
- October 2020 EOSC SRIA1.0 becomes public during EOSC Symposium

From 2021 onwards, the SRIA will be further developed and updated by the new EOSC Association (the contractual body for the Partnership) in broad consultation with the members of the EOSC Association and the wider community. It will be reviewed by the Steering Board and adopted by the General Assembly (see section 3.3).

More details about the content of the future SRIA1.0 together with concrete examples and types of activities are provided in section 3.1.

2.2.6 Investments needed for EOSC

It is not easy to assess accurately the amount of investments necessary, over the coming years, to implement the EOSC through the realisation of its specific objectives. Although the elements described in the previous sections provide a picture of the scope of the proposed action for the partnership, further details are required. Therefore, the proposed budget of the EOSC Partnership-programme will be determined along with the development of the Strategic Research and Innovation Agenda (SRIA) and the Multi-Annual Roadmap (MAR) of the Partnership.

However, it is worth already identifying initial sets of measurements that are available. These first inputs can provide guidance when determining the budget needed to achieve the ambitious goals of EOSC.

For instance, the European Bioinformatics Institute (EMBL-EBI), an international research infrastructure and open data repository for the life sciences, underwent an independent and in-depth evaluation of its value and impact in 2016. The report values the benefits to users and their funders at £1 billion per annum worldwide – equivalent to more than 20 times the direct operational cost of the institute.

Another example is the financial analysis⁵³ that has been conducted in the Netherlands in 2019. The public expenses on Open Science support is in the order of €150 million per year. Taking the ratio of the amount of money spent on research in the Netherlands to that in the European Union, one can estimate the total yearly expenses in Open Science support required across Europe to be in the order of €2 billion. This could be seen as an upper limit of the overall 'EOSC related budget' (including Commission and member states commitments).

About the emerging market of FAIR-certified research data

To show that the Web of FAIR data and services can be sustained in the long run an estimation of the 'market' for data services in the research domain can be made as follows:

- A reasonable assumption⁵⁴ can be made that the costs for handling data in research projects is on average 5% of the research budget of future projects;
- In 2017, the Member States of the European Union spent⁵⁵ all together almost €320 billion on Research & Development (R&D). If we estimate that one fifth of the 5% (i.e., 1%) for handling data will be spent external of the research performing organisations, this leads to a 'market' for *certified* data service providers of over €3 billion per year in the Member States alone;
- The services of these service providers can, of course, be used worldwide. The worldwide R&D expenditure⁵⁶ is more than \$2 trillion. This would mean a global market of \$20 billion for providers of services on data. Large providers regard that as a very significant market and are already 'moving in'. In the US, the Open Knowledge Network (OKN) interacts with major cloud providers like Google, Amazon and Microsoft for example on the issue of certification. And many more professional organisations (start to) offer their services on data. Cutting-edge services provided by European actors, relying on European values and rules of law, can provide a robust and safe alternative for European research communities when choosing amongst the available service providers worldwide.

More and more research funders in Europe are considering setting rules (requirements and boundary conditions) to enforce data management in the grants they fund. As a result, providers are likely to position themselves as providers of services that support the researchers and the data stewards along the data life cycle. Public (and later also private) providers will propose services through the Web of FAIR data for science. In the light of the estimations given above, this should help to make the EOSC services and tooling ultimately self-sustainable.

Box 4: About the emerging market of FAIR-certified research data

⁵³ <https://www.openscience.nl/projecten/project-a-transitiekosten-open-science>

⁵⁴ https://ec.europa.eu/research/openscience/pdf/realising_the_european_open_science_cloud_2016.pdf#view=fit&pagemode=none

⁵⁵ <https://ec.europa.eu/eurostat/documents/2995521/9483597/9-10012019-AP-EN.pdf/856ce1d3-b8a8-4fa6-bf00-a8ded6dd1cc1>

⁵⁶ <https://fas.org/sgp/crs/misc/R44283.pdf>

A recent report from PWC⁵⁷ states that the current lack of availability of FAIR data is costing €10 billion per year to European user organisations.

As an initial estimate, a mean annual EU investment of € 75 million by the European Commission would be needed to transform the current data infrastructures into the connected infrastructures that scientists need to face the challenges of this century. This would extend proportionally the annual dedicated H2020 investment already made during the initial EOSC implementation phase (2018-2020). If these investments allowed to reduce the costs mentioned by PWC only by 10%, this would already present a very significant return on investments. This rough estimate needs to be aligned with clear R&I objectives deriving from the Strategic Research and Innovation Agenda under development.

A significant, additional contribution has to come from the members of the EOSC Association, in terms of membership fees and other commitments (see examples of types of commitments in Section 2.3.3 and section 3.2.1). It is expected that the contributions coming from the members of the association will mainly be “in-kind” and originate from the countries where the participating members are established. These commitments by other parties than the European Union will be set out as annexes to the instrument setting up the EOSC Partnership (contractual arrangement / MoU), in line with technical guidance to be provided by the European Commission.

Table 6 gives an overview of the synergies the investment in EOSC should result in.

Table 6: Overview of synergies with programmes at EU, national and regional level

Programme at EU, national or regional level	Purpose	Details
<i>Digital Europe Programme</i>	To exploit potential synergies for the digital transformation of ERA (researchers and research infrastructures).	Synchronisation of the support provided by HE and DEP in the area of Digital Skills, in particular for open science. Capitalising the support to supercomputing and artificial intelligence.
<i>Connecting Europe Facility</i>	To guarantee the required connectivity underlying the EOSC ecosystem.	An area of potential coordination is in the support to the deployment of a trusted Authorisation, Authentication and Identification framework for EOSC users across borders and disciplines.
<i>European Data Spaces</i>	To enable cross-border access and use of data and data enabled services by the researchers, public authorities and the commercial sector.	Joint design and deployment of sectoral common European data spaces, including through multi-stakeholder’s interoperability use cases.

⁵⁷ <https://op.europa.eu/en/publication-detail/-/publication/d375368c-1a0a-11e9-8d04-01aa75ed71a1>

Structural funds	To leverage the investments through structural funds in research data infrastructures that can be federated as part of the EOSC ecosystem.	Linking with national users and national investments, reinforcing the expansion of the EOSC at other levels than the EU level, linking with smart specialisation strategies related to research data storage and management, data curation centres or data stewards education and skills
National/regional programmes supporting research infrastructures and data sharing	To leverage national investments and other initiatives with regards to research data infrastructures that can be federated as part of the EOSC ecosystem and support to open science practices.	<ul style="list-style-type: none"> - EOSC partnership supports the coordination for MS/AC initiatives. - Gathering good practices and evidence regarding data policies and investments. - Identifying synergies and overlaps in data services (supply and demand)
Other initiatives in Horizon Europe		
Missions	To support the wide spreading of open science practices and the implementation of the FAIR principles for data to enable research data sharing across disciplines so that Missions can <i>link activities across different disciplines and different types of research and innovation.</i>	Multilateral collaboration including support to the development of interoperability frameworks and access to data, tools and services.

2.2.7 Impact of the EOSC partnership

The Partnership will transform the broader research and innovation ecosystem along multiple dimensions (cultural, technical, organisational, educational, policy) and multiple levels (international, European, national, institutional). Ultimately, when the EOSC ecosystem will be fully deployed and when new research datasets, tools and services will become systematically FAIR-by-design, then researchers will be able to deliver research output such as data and software as they are delivering publications today. Publications, data and software will be shared openly and accessed seamlessly so as to optimise reuse and research efficiency.

By realizing this ambition, the Partnership will have a major impact around the following aspects (as presented in the Objectives tree):

Improved trust in science through increased openness and quality of scientific research in Europe

By realising the Partnership’s objectives, it is expected that a transformation in the research culture will take place in which open research will become “the new normal”.

This will lead to widely recognized incentives for academics, industry and public services to **share their data and other research digital objects**, and improve data management training, literacy and data stewardship skills. This will ultimately help researchers to exploit high quality data in new and efficient ways, whether that be in the form of managing, sharing, computing, analysing or storing their data. This increased support at all stages of the research data lifecycle will help researchers make maximum use of both their data and time so that they achieve the best possible results.

The opening of the research data lifecycle will also positively lead to a change in the research incentives and rewards systems and structures. As more FAIR data are made available, the possibilities of rewarding researchers, not only for publishing their articles but also for publishing their data sets and analytical tools, increases. This opening, in turn, leads to a more meaningful monitoring and better **reproducibility** and **validation** of research results.

This will also allow researchers to produce more reliable science at the service of the society at large, and minimise the impacts of false claims or unsupported statements. **Trust** in scientific insights will thus increase.

Stimulate the development of innovative services and products in Europe

The implementation of the EOSC ecosystem data will enable European research to make its digital transition while ensuring transparency, reproducibility and societal impact. By providing seamless access to increasing volumes of research data, EOSC will stimulate the uptake of different services, both from public and commercial providers, that align with the principles of EOSC. Therefore, the Web of FAIR Data will provide the ideal ground for building a **wide range of new innovative and value-added services** (from visualisation and analytics to long-term preservation). It will be as transformative as the World-Wide Web has been to business and our everyday life.

EOSC can be instrumental in **stimulating the European private sector**, as for example, the cloud industry, that is willing to align to these principles while, at the same time, it ensures that European researchers remain in control of their data, stored in trusted and FAIR certified European repositories, and that scientific knowledge will stay “as open as possible as close as necessary”.

Better quality and more productive research and innovation, addressing societal challenges

“The European Open Science Cloud will make science respond better and faster to what society needs”

Ursula von der Leyen, president of the European Commission⁵⁸

⁵⁸ https://ec.europa.eu/commission/presscorner/detail/en/ip_20_680

These words of the European Commission president in the context of the COVID-19 crisis and the development of a COVID-19 data sharing platform⁵⁹ by bringing together infrastructure, resources and data from different sources, are a good example of the potential impact that EOSC will have in addressing the societal challenges.

Scientists are increasingly being asked to help in developing solutions to the global societal challenges of the 21st century and must employ new and innovative technologies on research data to be able to deal with these complex and interconnected issues. EOSC will lead to a fundamental revolution in the way researchers, companies and administrations share and exploit research data, somewhat similar to how the internet revolutionised our sharing and exploitation of information. Ultimately, each and every scientist will do research differently than the way that it used to be performed. When the ecosystem of new tools and services will be available, and as many as possible FAIR-by-design new datasets will be generated, researchers will be able to deliver much more rapidly the outputs of each part of the research life cycle, including data and software, with the same level of precision as they are delivering publications today. For research teams and laboratories, publications, data and software will not be managed in a holistic way, as interrelated digital objects, in order to optimise the use of research results.

The impact of EOSC in the capacity of research to address the current and future challenges of the world, will be based on the following elements:

- **More multidisciplinary research through data sharing and cross usage of services:** within each discipline, the communication and collaboration between scientists will benefit from faster and seamless sharing of publications, data, software, services, tools and other digital research outputs.
- Better and faster data and results sharing will **strengthen collaboration among researchers and disciplines** and open opportunities for new levels of integration. For the cooperation between teams to address multidisciplinary challenges, the use of data and software across research silos will allow the exploration of new avenues as has never been possible before.
- **Increased added value of the services** in the EOSC ecosystem: A European-scale environment for computational, storage, data analysis and other data-related services and tools will facilitate scientific multi-disciplinary cooperation, leading to discoveries and solutions in key areas such as environment and health.

2.2.8 EOSC partnership contribution to European and global policies and the realisation of Horizon Europe objectives

The main contribution of EOSC to European and global policies are summarized in the table below:

⁵⁹ <https://www.covid19dataportal.org/>

Table 7: EOSC partnership contribution to key policies

	Contribution of the EOSC partnership	Elements of the EOSC partnership impacts:
Political priorities of the European Commission - A Europe fit for the digital age: European Data Strategy	The EOSC partnership will contribute to make sure the EU becomes a role model and a leader for a society empowered by data. <i>“People, businesses and organisations should be empowered to make better decisions based on insights from non-personal data, which should be available to all”</i>	Reproducibility of research; increased added value of the services in the EOSC ecosystem; business opportunities for innovative companies; better and faster data and results sharing
Political priorities of the European Commission - European Green Deal, SDGs	Example: SDGs 13 and 14 (Climate Action and Life under water) by enabling the interconnection of research data from marine research, meteorological data from earth observation systems to study the impact of climate change on different regions and ecosystems. Other examples could cover the medical and health research dimension, aligned with the Horizon Europe mission on cancer.	Multidisciplinary research through data sharing and cross usage of services; more research cooperation.
- Science responding better and faster to what society needs	Rapid open sharing of data greatly accelerates research and discovery, allowing for an effective response to society’s need, as demonstrated in the case of the COVID-19 crisis.	Better and faster data and results sharing; more research cooperation
European Research Area	Connectivity for knowledge creation, circulation, diffusion and uptake is essential both to consolidate an ERA fit for the digital age and for developing a single EU market for data across sectors. EOSC will support ERA by ensuring the federation of data infrastructures and services to enable data-intensive research across borders and disciplines and of improving the ‘FAIR-ness’ of these data.	Increased access to data and digital technologies for researchers; Increased added value of the services in the EOSC ecosystem; more research cooperation.
Open Science at European and Global level	The Partnership will foster open science and ensure visibility to the public and open access to scientific publications, research data and accompanying tools and services; The Partnership will increase European leadership in Open science and provide opportunities to strengthen international cooperation. Although EOSC has begun as a European initiative federating research data repositories and infrastructures across Europe, the ultimate goal of the EOSC is to lead in the development of a Global Open Research Commons, whereby EOSC will form the European component.	Increased access to data and digital technologies for researchers; Increased added value of the services in the EOSC ecosystem; Reproducibility of research

Table 8: EOSC partnership contribution to realising the objectives of Horizon Europe

Horizon Europe	Contribution of the EOSC partnership
<p>Specific Objectives of Horizon Europe <i>(a) to develop, promote and advance scientific excellence, support the creation and diffusion of high-quality new fundamental and applied knowledge, skills, technologies and solutions, training and mobility of researchers, attract talent at all levels and contribute to full engagement of Union's talent pool in actions supported under this Programme</i></p>	<p>The EOSC partnership will contribute to strengthening and spreading excellent basic and frontier research by enabling researchers from different disciplines and countries to access an increased amount of data, share their own data and to collaborate. This will increase the quality of science by fostering reproducibility and interdisciplinary research.</p>
<p><i>(b) to generate knowledge, strengthen the impact of research and innovation in developing, supporting and implementing Union policies and support the access to and uptake of innovative solutions in European industry, notably in SMEs, and society to address global challenges, including climate change and the Sustainable Development Goals;</i></p>	<p>The EOSC partnership will encourage ground-breaking discoveries with the capacity to tackle global challenges via fostering machine actionability and the opening of research data, the combination and distributed querying of multi-disciplinary data sets, innovative services and enhanced user experience that is assisted, among others, by Artificial Intelligence.</p>
<p><i>(c) to foster all forms of innovation, facilitate technological development, demonstration and knowledge and technology transfer, strengthen deployment and exploitation of innovative solutions;</i></p>	<p>The EOSC partnership will enable the additional functionalities and services that are required for EOSC to serve not only the research community but also the public and the private sector so that they can exploit open data and associated services in such a manner that it greatly increases the potential for innovation and economic impact in Europe. The EOSC partnership will bring more actors and investments into the research and innovation process.</p>
<p><i>(d) to optimise the Programme's delivery for strengthening and increasing the impact and attractiveness of the European Research Area, to foster the excellence-based participations from all Member States, including low R&I performing Member States, in Horizon Europe and to facilitate collaborative links in European research and innovation.</i></p>	<p>The EOSC Partnership will optimize Horizon Europe's delivery by underpinning and accelerating all other European partnerships and Missions and any research initiatives to be developed under Horizon Europe, by offering them an interoperability framework and added value services to handle their data. The partnership will ensure that through EOSC, researchers anywhere in Europe will have access to the resources they need to support their research fostering a level playing field for Science in Europe.</p>

<p>Measuring impact of Horizon Europe <i>Key Impact Pathway 3: Fostering diffusion of knowledge and open science</i></p>	<p>EOSC will bring evidence on Horizon Europe research outputs and underpin the measuring of progress and evaluation of the difference the Framework Programme makes. It will be possible to monitor the total quantity and share of FAIR and open digital objects, the uptake in the scientific community, and new collaborations explored through the lens of the beneficiaries having developed high-impact outputs. These collaborations can be classified by who is involved: collaboration within the scientific discipline, across disciplines, with industry, with citizens, and also with regard to the geographical coverage of the collaboration.</p>
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2.3 Necessity for a European Partnership

As described in section 2.2.8, the partnership addresses common political priorities of the EU and its Member States such as making Europe fit for the digital age, interlinking data spaces across a more efficient European Research Area, mainstreaming Open Science and enabling European innovation to become more data-driven. FAIR-by-design research outputs, combined with top-class digital infrastructures and artificial intelligence solutions, will ensure a true European capacity to tackle the Sustainable Development Goals (SDGs), to reach the Union’s ambition for the Green Deal and to implement other national or sectoral policies. At the same time, its domain-agnostic objectives to federate infrastructures and develop a web of FAIR digital objects bring new potential to contribute to the Horizon Europe missions and clusters.

Ensuring impact along these main policy targets requires however engaging further with a wide diversity and large number of stakeholders across borders and disciplines who are involved in research data generation, storage, curation and processing, as well as in research data policies, funding, skills and education.

2.3.1 Need for a multiple stakeholder approach

All scientific communities generate today growing numbers of research digital objects of all kinds from raw data to publications including workflows and software. Over the last decade or so, there have been significant investments across Europe in data-oriented research infrastructures and e-Infrastructures. The outcome is a vast quantity of infrastructure components of various scales and scopes, centralised or distributed, being generic, domain-specific or cross-disciplinary.

The challenge for the EOSC is to interface to this large variety of platforms on the subdomain, domain and interdisciplinary levels and to deliver an inclusive virtual data environment to the European researchers. Many of these components have not been initially designed to work together. The challenge is not limited to linking datasets,

federating infrastructures or aligning policies; it starts by linking people and organisations across the EOSC ecosystem.

A European Partnership is identified as the best instrument to overcome this fragmentation and to provide a framework collaboration and pooling of resources at European, national, regional and institutional levels.

The range of stakeholders targeted by the Partnership includes typically the Member States (for instance through national organisations having received a mandate from their ministry to represent their national research landscape) but also research performing organisations, research infrastructures and e-Infrastructures (e.g. related to storage, computing and communications), research libraries, research associations, international research centres, as well as public and, at a later stage, also commercial service providers.

The Partnership will support co-creation, multi-stakeholder involvement and experimentation from local to European scales. It will share, showcase and upscale best practices to the European level. By proposing, through an open and transparent process, a common Strategic Research and Innovation Agenda reflecting the views of the EOSC communities, the Partnership will demonstrate a shared vision and SMART⁶⁰ operational objectives for the next seven years and beyond. The partnership will also provide a unique focal point to gather members' contributions and commitments. Moreover, the Partnership will explore how to exploit at best the range of activities of the European partnership "toolbox" taking experience of other partnerships into account.

More generally, researchers also need to trust that the environment they are working with is sustainable and that the publications, data and software delivered will remain available to them and other researchers over time. The Partnership will build the long-term vision, coordination, stability, professionalism and continuity needed to create trust in the EOSC ecosystem.

2.3.2 Beyond traditional EU calls

Preliminary lessons⁶¹ learnt from the initial period of EOSC implementation (2018-2020) show that, in addition to a robust "European initiative" implemented through traditional calls for EU grants, what is needed is an open and inclusive partnership that can help ensuring directionality (common vision and objectives) and additionality (complementary commitments and contributions).

The initial phase of EOSC implementation (formally launched in November 2018 under the Austrian Presidency of the Union) will end in December this year. It is driven by an EOSC roadmap communicated by the Commission in March 2018⁶² and resulting from a wide and open consultation across Europe. This implementation essentially relies on EU level activities⁶³ carried out by about thirty-five H2020 projects (annex 2). The involved

⁶⁰ SMART: Specific, Measurable, Achievable, Relevant and Time-bound

⁶¹ In its conclusions of May 2018, the Council has called for an evaluation by the Commission and the Member States of the initial phase of EOSC implementation. This evaluation is ongoing with input from the EOSC secretariat. Final delivery is expected by Q4 2020.

⁶² <https://ec.europa.eu/transparency/regdoc/rep/10102/2018/EN/SWD-2018-83-F1-EN-MAIN-PART-1.PDF>

⁶³ Total EU investment of about € 350 million in the period 2017-2020.

consortia are developing and testing solutions along the six action lines described in the EOSC roadmap (data, services, architecture, access, rules and governance).

While this EU grant-based approach is successful to involve hundreds of European stakeholders across borders and communities, it also shows limitations to develop the coherent and operational EOSC capacity expected during the second phase Post-2020.

- EOSC is not only a matter of creating new R&I knowledge and evidence but also about building capacities to take better use of existing experiences;
- Each project has its own timeline for delivery, thus sometimes hampering convergence towards a coherent system shared by the different disciplines. Moreover, there is no guaranteed follow-up after the end of the lifetime of the projects;
- Developing wider synergies between multiple EOSC stakeholders will be essential to realise the EOSC ambition.

The motivation for the EOSC Partnership is multifaceted:

- Agree on a common strategy with support of all involved stakeholders to achieve the common vision/goals as defined in section 2.2;
- Get commitments, pool investments (in kind and/or cash) from the involved parties;
- Ensure systemic and structural collaboration between the EOSC stakeholders;
- Provide the necessary cutting-edge services to the European researchers;
- Develop the necessary skills for European researchers;
- Bring the EOSC-ecosystem to the level of trust that will convince more researchers and institutions to join it.

The motivation by the Member States and Associated Countries to establish an EOSC co-programmed partnership in Horizon Europe was already confirmed in December 2019 through the EOSC Governance Board. This reflects a broad interest by the Member States and Associated Countries to make the EOSC evolve from a call-based approach to an all-encompassing ecosystem where the different stakeholders take the necessary commitments to accomplish it. Doing so, the partnership will strengthen ownership by the research communities, achieve scale by aggregating demand by researchers and other users and pool existing capacities and expertise at all levels.

The researchers need to trust that the environment they are working with is sustainable and that the publications, data and software delivered will remain available to them and other researchers over time. The partnership will build the long-term vision, coordination, stability, professionalism and continuity needed to create long-term trust in EOSC:

- Trust in the technical environment: When a researcher is at the stage where she/he is ready to share her/his results, preparing publications, data and software and making them available to the research community, she/he requires trust in the technical infrastructure. Federating infrastructures requires the development and

deployment of standards. The Partnership will overview the developments of these good practices and standards.

- Trust in the operational services: While the EOSC architecture will be decentralised, there may be a need for shared services. Trust in the availability, the easiness of use and the reliability of those services will be essential. The Partnership will provide a roadmap to guide the development and deployment of both core and thematic services. It will also ensure the monitoring of the EOSC deployment and the level of take up / satisfaction and suggested improvements by the users.
- Trust in the availability of the necessary skills: The deployment of FAIR data principles requires the contributions of new jobs, such as data stewards, data curators, data engineers, data scientists and data analysts. Many of these jobs did not exist a few years ago. The partnership will promote the development and provision of training initiatives specific to research data management.

2.3.3 Collaboration with the Member States

The COVID-19 crisis has shown that EOSC collaboration between the European and national levels can be activated very quickly and efficiently to engage and deliver on research data sharing and interoperability.

The mandate of the current EOSC governance structure will end in December 2020. This interim structure was established last year by the Commission according to H2020 comitology and rules applicable to Commission experts' groups. There is an opportunity to re-think the EOSC governance model in the light of the overall EOSC ambition described in section 2.2. This must take into account the wish by many Member States to get directly involved in the high-level strategic steering of the next phase of EOSC implementation in collaboration with the Partnership.

Collaboration with the Member States in the context of the EOSC partnership will be essential in order to deploy a robust and user-driven EOSC ecosystem that leverages national investments and national research infrastructures. The European landscape of Research Infrastructures is largely influenced by national roadmaps. Preliminary findings of the ongoing mapping by the EOSC Governance has confirmed that a majority of Member States are making significant investments in national infrastructures that could in principle be federated as part of the EOSC ecosystem. The same applies to many of the more thematic data intensive ESFRI landmark infrastructures, also supported by several Member States. The scale of such investments over the past decade is certainly in the order of billions of euros.

The Member States and Associated countries currently involved in the EOSC governance 2019-2020 have recognized the strategic value of improved alignment and compatibility of national plans for data infrastructures in the EOSC context. This requires a coordination structure, some readiness by the Member States to interconnect with and promote the use of the EOSC, as well as the capacity to identify commonalities and differences in data services supply and demand by the countries and the communities.

The Partnership will seek engagement with the Member States and Associated Countries on two levels:

1. The governance of the Partnership (described in section 3.3) foresees a coordination structure (called “Steering Board”), external to the Association, which shall provide strategic guidance by the Member States and Associated Countries to the EOSC Association running the partnership. The “Steering Board” will play an essential role to enable progressive alignment of infrastructural and policy planning at national level with the EOSC deployment planning at European level;
2. In addition, the Member States will have to possibility to mandate national organisations who will become members of the Association and represent all national research stakeholders in the Partnership. These nationally-mandated organisations are those who will bring concrete national commitments to the partnership (see table 9). In April 2020, more than ten countries have already identified candidate founding members of the Association.

Developing and deploying the partnership concept is already implying today a stronger coordination at national level between relevant national policy makers, funding agencies, programme owners, research networks and centers.

The Member States also play an essential role to bring EOSC closer to their national research community and to stimulate active participation of their researchers as providers and users of FAIR digital content. Enabling feedback loops will be crucial to evolve EOSC into a user-friendly, trusted, reliable and open virtual environment serving the circa 2 million European researchers and beyond.

Table 9: Examples of commitments at national level

<p>Examples of types of commitments at national level⁶⁴</p> <ul style="list-style-type: none">• Adoption of policies on Open Science referring to the use of the EOSC and the implementation of the FAIR principles. Definition of clear policy targets over time and detailed action plans for the implementation of those policies, eventually supported by dedicated portals for open science;• Adoption of policies promoting open research data commons and requiring open access to research publications and research data;• Introduction of EOSC-specific references in national research programmes and EOSC-related criteria for R&I funding;• Deployment of online tools to help creating FAIR Data Management Plans (DMPs) and managing them through the lifetime of a research project (including documentation, training and support on publication of datasets with a proper metadata document);• Nomination of contact points for Open Science and for EOSC in the context of European networks; reinforced national coordination mechanisms for EOSC connection and FAIR implementation;

⁶⁴ Compiled from the internal draft EOSC Landscape report produced in April 2020 by the Landscape Working Group of the EOSC Executive Board

- Adoption of national strategies for digital transformation and related roadmaps including a reference to the EOSC; EOSC-connected national roadmaps and investment strategies for Research Infrastructures and e-infrastructures (including HPC, distributed computing, scientific data and networks);
- Guidelines for the effective provision and use of high-quality scientific data, with effective FAIR descriptors, ease of access, interoperability and reusability, fully implementing the FAIR principles;
- Development and sharing of advanced solutions for research data FAIRification;
- Interfacing national initiatives and solutions for data storage with the EOSC core services. Contribution of long-term open data archive and preservation capacity supporting the EOSC environment;
- Development of user-friendly search engines to allow the researchers to explore rich metadata and semantic descriptions in EOSC-connected registers;
- Contribution to operating core functions of a Minimum Viable EOSC ecosystem;
- Building capability and skills for research data management.
- We want the EOSC to allow a new way of doing research, this also means a new way of looking at research and the people who work in the field.

2.3.4 Characteristics of the Partnership (including future phasing-out)

The Partnership will operate through a new Association (Belgian AISBL) along the principles of decentralisation, transparency and openness. At inception (in 2020), the Association will be a relatively small-sized association. New members will be able to join at any time. The ambition is to expand the membership to become wide and inclusive. Specific attention will be given to the representativeness (diversity of types of stakeholders) and inclusiveness (including geographical spread) of the members. The timeline for forming the association is illustrated as follows. (More details on the Association are given in section 3.3.2).

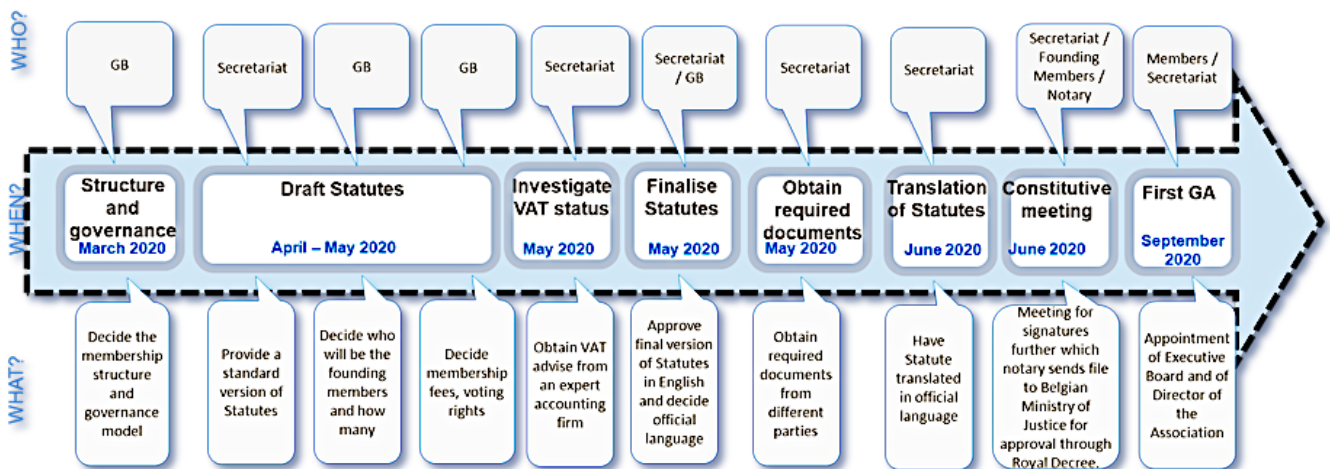


Figure 4: Process to set-up the association

The “core tasks” of the Association will cover the following dimensions:

- Coordination and alignment: to engage, pool and help aligning EOSC federated resources along the objectives described in section 2.2 notably through the development and update of a common Strategic Research and Innovation Agenda (SRIA);
- Monitoring and reporting: monitoring the implementation of the EOSC activities and the degree to which progress is achieved towards the operational objectives of the Partnership and the overall transformative impact on European research;
- EOSC technical guidance: to steer consensus building and uptake of best practices, common standards, tools and services needed to enable the Web of FAIR data;
- FAIR training: to broker and promote FAIR training and education resources supporting new roles and responsibilities towards FAIR data stewardship and curation;
- Communication: to act as the European source of information on what happens within the EOSC ecosystem, complementing the policy communication by the Commission and the Member States.

These “core-tasks” of the Association will be essentially resourced via the membership fees coming from its members. The activities resulting from the SRIA will be resourced through commitments by the European Commission, at European level, and by the members of the Association at national and institutional level.

The need for an EOSC partnership will phase out when tools, systems and practices enabling Open Science will be widely available and deployed. Their uptake by research communities will then become the responsibility of local and national stakeholders in the Member States and Associated Countries and/or even at the level of individual organisations. It is reasonable to anticipate that this will take more than seven years. Therefore, at the end of the EOSC Partnership in its present form, there will be a need for decisions regarding the next phase of the EOSC. At the end of Horizon Europe, there will be multiple options:

- *No more partnership.* The Association has the capability and the recognised leadership to pursue its activities in federating the European efforts in the context of a 'Global Open Science Commons' system. The partnership has become a self-sustained, cross-border collaboration.
- *Renewed partnership.* The Commission, the Member States and the Associated Countries see added value or need of a continued partnership (in its current or another form) in order to further stimulate the influence which EOSC will have on the global development of Open Science commons;

2.4 *New form of support by Commission*

The evolution of the European landscape may offer novel approaches for supporting the deployment of Open Science commons in Europe.

2.4.1 Member states and Associated Countries: benefits for researchers

The Partnership will offer direct benefits to researchers from the Member States and countries associated to the Horizon Europe Framework Programme in supporting their research and innovation communities. By federating existing infrastructures, EOSC will extend the reach of each and every researcher to a Web of FAIR Data for related services for Science.

For communities already using existing infrastructures, implementing the EOSC vision of the Partnership will offer additional support and resources in managing a wider range of data. It will further increase the findability and reusability of these data sets across Europe as well as support linking this data to other cross-disciplinary data to stimulate new research and innovation activities and discoveries.

For other communities, the EOSC enabled by the Partnership will provide easy access to a pool of data sets and services that may not be available through their own national research infrastructures. This will allow institutions and researchers, with less resources, to draw from this pool of data and services, compensate for national gaps, and develop their research. The countries involved will benefit from having their investments in infrastructures multiplied by aggregation/connection through the EOSC-partnership.

The partners will be organised inside an EOSC Association expected to be established around summer 2020 and be operational before the end of 2020.

The EOSC Association will have a very broad membership base. It is expected to bring together research performing organisations, research funding organisations, research infrastructures and e-Infrastructures, researcher associations as well as (data)service providers, such as digital libraries. Member States and countries associated to the Horizon Europe Framework Programme will not participate as members of the Association but will mandate organisations established in their territory to participate in it. In this setting, mandated organisations will be able to express views that represent the broader engagement and specificities of their national research system (e.g. national EOSC-related policies) in a coherent manner across the EU and beyond.

The Partnership will further support the collaboration between Member States and countries associated to the Horizon Europe Framework Programme. The federation of infrastructures and interlinking of data sets will naturally stimulate collaboration between institutions and researchers, not only across research projects and disciplines, but also across professional sectors and countries.

The Partnership will support the Member States and Associated Countries to Horizon Europe in developing at their own pace the transition to Open Science. Countries that are already advanced in FAIR data and Open Science policies can share their best practices and lead in developing EOSC. Access to publications, data, software and services will

mitigate the need for researchers to move 'next' to the content that they need to perform their research.

By enabling access to data and services at European level, the Partnership will facilitate and widen the opportunities of researchers for collaboration, and will enable them to start new research activities in their home country without relocating. The Partnership will therefore further strengthen a balanced and fair 'brain circulation' and achieve a more symmetric mobility of researchers.

The Partnership will also address the differences in economic development in the research and innovation sector by creating equitable access to data and services from both users and providers. Researchers and innovators will be able to jointly create innovative new technologies and services, which in turn will lead to the creation of new jobs and markets. The education, training and support needed to develop the necessary expertise will be facilitated by the use of virtual, shared environments.

2.4.2 Open to all

All relevant research and innovation stakeholders, including scientific communities, research institutions, learned societies, community fora, national and international infrastructures (generic or thematic), funders (public or private) and industry actors (including data and journal publishers) are ultimately welcome to join the Partnership if they agree to the minimal Rules of Participation⁶⁵. The Partnership's association will start with members from the public domain. Certification of the services is foreseen to avoid vendor lock-in and the monopolisation of standards.

The transparent and inclusive nature of the partnership will allow all stakeholders to have their voice heard. The Partnership aims to become the place where stakeholders go to express their needs and exchange their views regarding research data infrastructures, services, applications and tools.

The development of standards and good practices, access to new training capabilities and the possibility to jointly contribute to the European research and innovation agenda through the SRIA will incentivise stakeholders to join the association and participate as members.

2.4.3 From research to society at large, from Europe to the world

Scientists are both providers and users of research data. The Partnership will need to engage this main group of stakeholders and demonstrate the value of EOSC for their research as soon as possible. As the first results are available, new users will be targeted. Involving society at large will be essential in order for the research community to properly address societal challenges.

First results of this broad approach will have to be communicated at the international level in order for Europe to exercise its leadership in setting up global initiatives for the benefit of society.

⁶⁵ <https://repository.eoscsecretariat.eu/index.php/s/QWd7tZ7xSWJsesn#pdfviewer>

3 Planned Implementation

3.1 Activities and milestones

[This section will be updated once an appropriate version of the EOSC SRIA/Multiannual Roadmap will be available]

Section 2.2. provides a description of the objectives and the outcomes that are envisioned in a specific timeline. In a nutshell, EOSC aims at underpinning Open Science, turning FAIR principles into reality across Europe, building a web of FAIR data, enabling the core functions and service layers of an operational EOSC ecosystem, linking the development with other major initiatives and gradually expanding the offer to public and private sectors. These objectives will be achieved through a combination of activities and instruments that will be further defined by the end of 2020 when the work of the different EOSC Working Groups and the first version of the EOSC Strategic Research and Innovation Agenda will provide the necessary input.

Section 2.3.4 already describes the five dimensions of the tasks that will be undertaken by the future EOSC Association: Coordination and alignment, Monitoring and reporting, EOSC technical guidance, FAIR training and Communication.

The activities resulting from the SRIA will be funded through commitments by the European Commission and the members of the Association. More specific Research, Innovation, Coordination and Support actions will be identified in the SRIA.

Through the work being done by the EOSC Executive Board during the years 2019 and 2020, the initial areas where efforts are needed in order to develop and deploy EOSC beyond its current stage have been identified and will be further developed:

Technical Issues	Societal issues
<ul style="list-style-type: none">• Persistent Identifiers• Metadata and Ontologies• Authentication and Authorization Infrastructure (AAI)• User environments• Resource providers environments• Standards	<ul style="list-style-type: none">• Rules of Participation• Landscape Monitoring• Skills and Training• Rewards and recognition• Engaging with industry and society at large (dissemination)

3.1.1 Timeline

The first results will be obtained in domains where data are broadly and openly available. During the forthcoming 7 years of the Horizon Europe programme, the EOSC Partnership will enable the coordinated harvest of multidisciplinary, cross-country results from sectors that applied strategies on interoperable data. At the same time, important constraints such as privacy or security requirements will be addressed. Having designed the GDPR regulation, the EU is well positioned to develop the expertise, tools and services that will allow to strike the right balance between using data sets and respecting privacy preferences of individuals. In the longer term, seamlessly federated data infrastructures

will become pervasive and allow scientists, and other actors, like practitioners, teachers and even citizen scientists, in all disciplines to leverage the potential of digital technologies.

An initial description of the timeline is provided below according to section 2.2. However, it should be noted that these phases will be fully developed in the SRIA and the Multiannual Roadmap:

Priorities for 2021-2022: Deploying EOSC Foundations

Based on the work done in the EOSC related H2020 projects this stage focuses on the implementation of the Federating Core and the first components of EOSC-Exchange through Research and Innovation actions that are tightly related through collaboration agreements and interrelated activities.

During the first years of Horizon Europe, timelines and activities will be based upon the results of the existing H2020 projects and the outcomes of the EOSC Working Groups. It is expected that essential components of the Web of FAIR data and the EOSC core will be further developed.

Priorities for 2023-2024: Deploying EOSC Value-added Services for Scientists

The activities of this phase will cover:

- Deployment of services focused on Open and FAIR data (see Box 5);
- Improving the integration of publications, data, software and other digital objects in the EOSC ecosystem (see Box 6);
- Deployment of multidisciplinary thematic services and use cases;
- Development of technologies essential to the widespread deployment of FAIR data and capacity building support for FAIR practices.

Priorities for 2025-2027: Engaging with Industry & Society at large

It is the long-term goal of EOSC to develop and deploy services that will serve the society at large, with significant contributions from the private sector. As of 2024/2025, EOSC should gradually open up to end users beyond the research community. Specific activities and the timeline will be designed based on the results of the previous period. It is expected that EOSC deployment will create market opportunities for new innovative companies to engage in the deployment of Open Science.

All the efforts above will be accompanied by companion efforts on specific projects:

- Projects (RIA, CSA, other) shared with other partnerships,
- Projects (RIA, CSA, other) supporting priorities from the European Commission,
- Projects (RIA, CSA, other) dedicated to key technologies for the deployment of FAIR data.

As Open as possible, as closed as necessary

In conformity with the general principle stating that EOSC shall be ‘as open as possible, as closed as necessary’, the focus of the Partnership will first be on Open Data that are as FAIR as possible. This will allow the deployment of services and applications that will become examples to demonstrate the power of Open Science. These services will be essential in demonstrating the main added value of EOSC and will be at the heart of the communication strategy. They will also allow early adopters to take immediate benefits from those initial services and guide the second generation of content and tooling to further expand EOSC.

As the Partnership matures it will gradually expand towards more complex and specific challenges in areas where FAIR data cannot be by default open. Data protection (i.e. GDPR compliance) will have to be ensured in order to extend the reach of the EOSC to disciplines in which personal data are processed.

As part of the implementation of EOSC action plans will be comprised for incentives and skills, for academics, industry and the public sector to share data, improve data management training, literacy and data stewardship skills.

Box 5: initial focus on services for Open and FAIR data

Publications, Data and Software

Open Science is based on the vision that researchers will share publications, data and software. This vision should be extended by including workflows and all other digital objects along the research life cycle that will facilitate the communication between scientists.

Since this vision is not yet fully instantiated, during the course of the partnership, specific activities will be devoted to improving the consistency between the services that deliver these digital artefacts.

Regarding Open Source software, while much progress has been made, the emphasis has been on the development of environments that facilitate the creation of new software while benefiting from previous developments. The need for sustainable archives has only recently been made clear when the risk of losing important software outcomes has become more evident. Special activities of the Partnership will have to be devoted to preserving software in a sustainable manner.

Box 6: Integration of Publications, Data and Software

3.2 Resources

3.2.1 Stakeholder engagement and commitments

EOSC is a federation of national, pan-European and thematic infrastructures. Its role is to interconnect these infrastructures so that each and every European researcher can

benefit from the publications, data, software, tools, applications and services delivered by and for the research community at large. Therefore, the deployment of FAIR data and related services will fall under the responsibility of the existing infrastructures and e-infrastructures. The role of EOSC is to help develop standards, deploy practices and create the core services which allow the federation of infrastructures and their serving the whole research community

The formal commitments of the partners will need to be made explicit when the methodology for assessing in-kind contributions will have been made available, at the latest by the time the Contractual arrangement / MoU with the European Commission is signed. As an initial guideline, these commitments will be commensurate with the role and level of influence of each category of stakeholders joining the association.

Depending on the category to which a member of the Association belongs (e.g. an organisation mandated by a ministry to represent a country, a Research performing Organisation, a Research Funding Organisation or a service provider), the following types of in-kind commitments will be delivered:

- Promote / incentivise open data sharing;
- Promote the FAIR principles;
- Develop / mainstream standardised FAIRification tools;
- Promote FAIR certified repositories federated to the EOSC;
- Use a FAIR certification mechanism;
- Contribute FAIR research digital objects (data, publications, software, tools, services, etc.) and practices;
- Request, preferably machine actionable Research Objects Management Plans (OMPs);
- Provide services to the EOSC Core;
- Provide resources to the EOSC Exchange (analytical tools, data processing, simulation tools and computing power)
- Insight in the (re-)use of data in order to acknowledge the researchers
- Provide expertise to the Association.

The Contractual arrangement / MoU between the European Commission and the EOSC Association is expected to set out the methodology applicable for assessing these commitments. On that basis, the commitments of the members of the EOSC Association will be set out as an annex to the Contractual arrangement / MoU.

In general, all stakeholders will be asked to be exemplary (within their own capacities) in terms of delivery of open and FAIR data. They will commit to adhere to the EOSC rules of participation, and uptake EOSC standards. The threshold to join EOSC should not be made too high in terms of requirements, so that less advanced research communities can also join forces.

When momentum develops, the main resource will be the researchers themselves depositing their publications, data and software in EOSC and making them available to all.

3.2.2 Synergies within the next Multiannual Financial Framework

It should be kept in mind that the EOSC partnership, by combining commitments made at national level with financing from Horizon Europe, will constitute, by design, a prime example of synergies.

In implementing the SRIA, the partners will further explore synergies between cohesion funds and Horizon Europe.

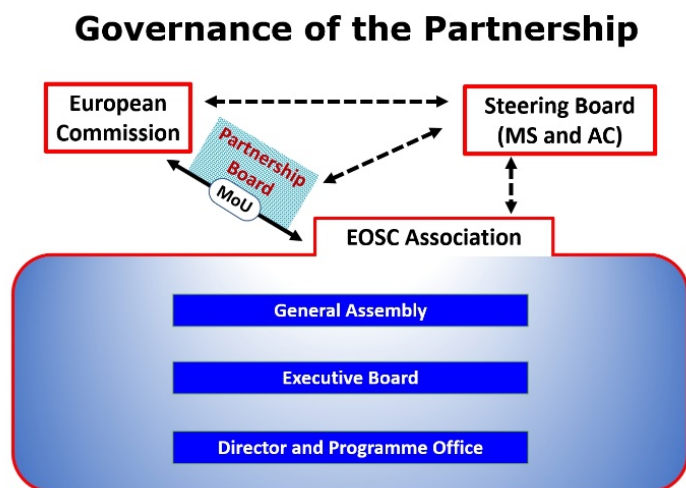
3.3 Governance

3.3.1 Governance of the partnership

In line with Horizon Europe and on the basis of the work of the EOSC Governance Board and the EOSC Executive Board, it is expected that the EOSC partnership will be set up between the **EOSC Association** (currently being set up) and the **EU represented by the Commission**.

A **Steering Board** will be set up outside of the EOSC Association. It will be composed of representatives of Member States and Associated Countries. The Steering Board will provide advice to the EOSC Association at policy and strategy level.

The Commission and the EOSC Association will establish a **Partnership Board** as the main mechanism for dialogue in order to reach the objectives of the Partnership. The Steering Board will be invited to appoint representatives who will attend the meetings of the Partnership Board, in order to ensure that the EOSC partnership is implemented taking due account of the policies decided and the activities implemented at national level. The Commission, in its role of safeguarding public interest, will act as an honest broker among the participants in the Partnership Board and will aim at catalysing consensus.



3.3.2 Governance of the EOSC Association

Note: The EOSC-Association and its governance are being designed at the moment of writing this proposal. This may impact the description below.

The **EOSC Association** will be founded as a not-for-profit organisation and will be open to any interested stakeholder organisation (be it research performing organisations, research funding organisations, or providers of (e-infra) services) that commits to the goals of the Association and to paying a membership fee, contributing to cover the administrative and the operational costs of the Association. The Statutes, the membership

contract and any other relevant document will be made publicly available on the EOSC Association's website. Over the recent years, the EOSC-related activities succeeded in assembling a large number of stakeholders willing to make EOSC a reality. The ultimate success of EOSC will be measured by having a large base of users and contributing organisations.

The EOSC Association will be governed by three bodies:

The **General Assembly** will be the highest decision-making body of the association, composed of representatives of all members. It will elect its **president** as well as the Executive Board for two years (renewable once), adopt the budget prepared by the Executive Board and decide about strategy.

The members of the EOSC Association will be organised in categories of legal entities defined on the basis of objective criteria. Each category of members will have a specific percentage of voting rights, to be set out in the Statutes and bylaws of the EOSC Association.

Each Member State and each Associated Country may mandate a single legal entity established in their territory to represent it in the governance, so that the national EOSC-related policies are taken into account and the broader engagement and specificities of each national research system are represented. These mandated entities should collectively have an appropriate share of the votes.

Observers, as defined in the Statutes of the EOSC Association, may attend the meetings of the General Assembly and take part in the deliberations without voting rights. The **Executive Board** will supervise the operations of the EOSC Association. It will monitor the implementation of the SRIA, manage the evolution of the SRIA over time in close consultation with the members of the EOSC Association, the Commission and the Steering Board and oversee the related EOSC activities. These activities will be implemented:

- either on the basis of the Horizon Europe Work Programmes (1st tier of activities);
- or by the members of the EOSC Association (2nd tier of activities), according to their own rules and procedures.

The Executive Board will prepare the budget of the EOSC Association and will select an Executive Director. The Executive Board will report to the General Assembly.

The **Executive Director** will:

- be the legal representative of the EOSC Association,
- manage the EOSC Association's Programme Office (Secretariat)
- implement the budget of the EOSC Association,
- convene, at regular intervals, a stakeholder forum,
- report to the Executive Board.

The coherence of the programme and the synergies (internal and external) will be ensured by the Programme Office of the EOSC Association. While being as lightweight as possible, the Programme Office will primarily focus on organisational, technical coordination and communication roles:

- The organisational role will consist in organising meetings and events, drafting documents (including the SRIA), assisting the Executive Director to implement the budget and addressing legal issues.
- The technical role will be to contribute to consensus-building regarding the definition, development, maintenance and evolution of standards and best practices; manage any intellectual property that the EOSC Association owns; as well as monitor the implementation of the SRIA.
- The communication role will be multidirectional, listening to and assisting users in all shapes and forms, including operating a “help-desk”, as well as promoting EOSC results, standards and success stories to convince new users of ‘what’s in it for them’. A stakeholder forum will be organised, at regular intervals, in order to take into account the views of the broader EOSC community.

The Programme Office will work on ensuring that the ‘output’ made openly available by researchers using ‘EOSC-approved repositories’ will be clearly attributable to them, so that they can obtain the recognition they deserve. The EOSC Association will develop an internal process to bring consensus in any important operational decision regarding its internal functioning. This process will be described in a document to be made publicly available.

The detailed procedures regarding the functioning of the Association, including further details about the General Assembly, the Executive board, the Executive Director and the Programme office will be set out in the Statutes of the Association and its bylaws.

As an entity with legal capacity, the EOSC Association will be able to launch procurement activities on the basis of its budget, as approved by the General Assembly. This could allow, in particular, the EOSC Association to launch calls for tender in order to procure specific components of the future EOSC, which will then be owned by the Association itself.

If needed, the General Assembly may decide that the EOSC Association will exercise limited operational responsibilities such as managing a common service (developed, or owned by, or entrusted by a third party to the EOSC Association). When the efforts necessary to provide such a service become too significant, the service will be either transferred to and hosted by another existing entity or, as an extreme case, a new operational entity may be created.

The resources needed to support the Programme Office operation will come mainly from the fees paid by the members of the EOSC Association.

3.3.3 Role of Member States and Associated countries

Member States and Associated Countries will exert influence from three positions:

- via their mandated organisations in the EOSC Association
- via membership to the Steering Board
- via the Horizon Europe Programme Committee (in the context of comitology)

Member States and Associated Countries are expected to bring forward and discuss their national plans or policies related to the EOSC so that coherence is achieved and synergies are exploited.

3.4 Openness and transparency

The EOSC vision targeted by the Partnership directly supports the European agenda towards Open Science. It is therefore in the genes of the EOSC Partnership to be open and transparent. The EOSC Partnership will follow-up on the lessons learned from the rules and best practices developed over the last 30 years by IETF and later by ICANN, W3C and RDA in terms of openness and transparency and will be grounded on European values and the rule of law.

3.4.1 Process for the establishment of an open and transparent Partnership

A clear and transparent governance of the Partnership (as described in section 3.3) will be set-up from the beginning, allowing the participation from a broad range of stakeholders. By April 2020 eleven countries expressed interest in mandating an organisation to the EOSC Association. In addition, thirteen stakeholder organisations, including international organisations, have already expressed interest in becoming founding members of the Association. The partnership will remain open to new members during its whole lifetime, and specific efforts will be developed to ensure a good geographic coverage within the Partnership (in priority for countries in Europe not sufficiently represented).

The Statutes of the Association will foresee the possibility of allowing Observers to attend the meetings of the General Assembly and to take part in deliberations without voting rights. By inviting participants to the observer category through an open and transparent process and by letting the observers participate without fees or voting rights in the General Assembly, the Partnership will create favourable conditions to engage all relevant sectors from the society. The observer status can be seen as an interim solution to become full member at a later stage.

3.4.2 Policy for enlargement of the Partnership and inclusiveness

The Partnership will strive to widen its membership. As the EOSC cuts across all scientific disciplines and targets all researchers, a pro-active and continuously improved engagement strategy will be set-up to stimulate participation, uptake and commitment both horizontally across geographical borders, and vertically in society.

- Horizontal expansion of the Partnership will notably target the participation of non-European countries starting with countries associated to the Horizon Europe programme.
- Vertical expansion of the Partnership will follow a staged approach: focussing on the research community foremost at the start and thereafter gradually expanding to the broader user community, including SMEs, public authorities and the society at large.

A Landscape dashboard will be maintained, as part of the Partnership monitoring which will present successful collaborations and the progress towards the objectives of the Partnership. Use cases, data access statistics and information on EOSC-connected services will be visualized as well to provide regular snapshots on the state-of-progress by the partnership towards its objectives and to inform all interested parties.

3.4.3 A transparent process for the development of the Partnership agenda

Maintaining a high level of trust in the Partnership operations will imply clear and transparent processes governing the five “core-tasks” performed by the Association (section 2.3.4). In particular, developing and updating the SRIA (section 2.2.5) will be performed through open consultations of the wide community of EOSC stakeholders.

3.4.4 Open access to the Partnership outputs and dissemination and exploitation policy

The EOSC Partnership will be built and operate along the principles of decentralised federation, transparency and openness (see section 2.3.2). Minutes, decisions and recommendations produced by the Partnership will be stored in an EOSC-compliant repository and follow the EOSC principles of being FAIR by design and as open as possible. Access rate to these documents will be monitored to inform the outreach strategy conducted by the Partnership. These principles shall increase transparency, engagement, and quality of the work of the Partnership.

Annex 1: The concept of DCC's

Data infrastructures differ according to scientific and economic domains, by participating countries, and by governance models. This was clearly illustrated in 2020 by the Working Group Landscape of the EOSC Executive Board. Access policies for networking, data storage, and computing also vary across these dimensions. Disconnected data and computing infrastructures hinder scientific discovery, create silos, and slow down the circulation of knowledge.⁶⁶ To overcome this fragmentation, the EOSC Partnership proposes a common European approach for access, use, and reuse of the data and related services, that will enable the federation of existing and emerging research infrastructures, thematic services and user-centric initiatives.

Coordination at institutional and national levels

Several research infrastructures and research performing organisations across Europe have started creating Data Competence Centres (DCCs) and the hiring of data stewards⁶⁷ to support their researchers. These DCCs combine the expertise on data management and curation of the organisation to which they belong. They have both generic data skills and specific disciplinary skills that can serve the researchers' data needs. The partnership can help upscaling these efforts at the institutional and national level. This concept of DCCs can serve to empower and potentially revitalise the role that libraries could play in the EOSC ecosystem. Librarians, laboratory technicians, newly formed professionals, via new roles such as data stewards and EOSC enablers, will support researchers with training, certification, and generally overseeing the "process" required to meet open research policy. This may prove a strong EOSC adoption factor in the years ahead. Some data stewards (with slightly different skills from the embedded ones) could form a 'hub' at the institutional level. This 'hub' can deal with generic aspects effectively and support the embedded data stewards in a structured and organised way. The 'hub' is also where typically interactions will take place with 'higher levels of data stewards' and 'ICT knowledge and infrastructure providers', locally and beyond.

However, many aspects of data stewardship are also generic, such as communication protocols relating to digital objects, AAI aspects, etc. Therefore, it would be good if DCCs would join forces. In some countries we can see collaboration developing between areas with overlapping interest. This is based on another vital assumption, namely that data steward challenges and solutions (even at the discipline or domain level) will overlap for most institutions. The choices and challenges for instance as posed in the community driven environment range from selection of a basic digital object protocol to metadata formats, ontologies and identifier schemes to responsible choices of repositories and very

⁶⁶ Cloud initiative: <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52016DC0178&from=EN>

⁶⁷ Data steward is used in this text as a generic term for all those that work with research data, be it a dedicated full-time or part-time person actually working with the data (handling), or data-management, coordination of data activities in an organization, etc. The Data Steward is responsible for defining the conditions and restrictions that govern the use of data, as well as negotiating data management decisions with stakeholders. <https://www.ausy.com/en/technical-news/where-are-all-data-stewards>

domain or even semantic type level decisions. We anticipate that the national decisions for the Research Data Infrastructures in the countries will also be based on the needs expressed by the DCCs as well as on the collective expertise of the DCCs (institutional and inter-institutional).

Coordination at European level

At European level (and potentially larger), the Partnership could accelerate the ongoing development of a network of collaborating and cross-learning DCCs. The choices and challenges that the research performing organisations are confronted with are so overlapping, that one can expect that the DCCs will be important ‘drivers’ of the convergence of the national research data infrastructures into an ecosystem across nations. Data stewards will become ‘users’ helping to drive the development of EOSC. In this way they support the researchers using EOSC and translate their needs. In some countries, there are also national centres with a domain-oriented expertise that serve the individual institutions.

The Partnership should closely collaborate with and promote coordination and sustainability of existing (e-)infrastructures. Examples of such pan-European infrastructures include: GÉANT for connectivity, EGI for computing infrastructures, the ESFRI Landmark PRACE in the area of High-Performance Computing, EUDAT on data and OpenAIRE on scholarly communication. Many of the e-infrastructures at the national level are interconnected to these at the European level. In some countries there is one organisation with e.g. strong ties to GÉANT, PRACE, EGI and other international e-infrastructures. They form the ‘national e-infra expert and provider’ across all academic research institutes. As many of the issues they deal with are supra-disciplinary, it makes perfect sense to organise this strongly at the European level.

As the Web of FAIR data evolves, the contribution of e-infrastructures for managing, processing, storing and re-using the data will also evolve to address emerging needs and challenges of researchers. However, this situation is in flux, as e-infrastructure is rapidly increasing in the individual institutions and the enormous emerging cloud market brings large (mostly USA based) organisations into this space. Thus, the role of the e-infra providers will have to evolve to address the needs of the EOSC users.

The Partnership could also stimulate the creation of ‘National Coordinators for Open Science’ in countries, as recommended by the OSPP⁶⁸ (Open Science Policy Platform) in their OSPP-REC⁶⁹. Such a coordinator can be an organisation or person with a national mandate to deal with issues of Open Science (including EOSC-relations) and the related infrastructure as well as to represent the country’s interest in these areas at an international level. These representatives could come from the supporting ministry in the country or a representing organisation. The recently established CoNOSC (Council of National Open Science Coordination)⁷⁰ has taken these initiatives a step further and created a network for the coordination to share experiences and policies on Open Science

⁶⁸ <https://ec.europa.eu/research/openscience/index.cfm?pg=open-science-policy-platform>

⁶⁹ https://ec.europa.eu/research/openscience/pdf/integrated_advice_opssp_recommendations.pdf

⁷⁰ <https://conosc.org/>

at a European level. Other relevant networks are formed by the National Points of Reference, launched in 2013 by the EC, for monitoring national policies on open access, research data and e-infrastructures⁷¹, the ERAC Standing Working Group on Open Science and Innovation⁷², or the OpenAIRE National Open Access Desks⁷³.

The established international (wider than Europe) organisations with a domain-agnostic focus on key data aspects (notably RDA, CODATA, WDS and GO FAIR) have recently reached an agreement⁷⁴ on their joint mission, their specific focus and their modus operandi to be optimally synergistic. CODATA has just been mandated by its parent organisation, the International Science Council to work closely with the National Academies of Sciences, the Scientific Unions and major international initiatives to develop a decadal plan to sustain the international policy and interoperability aspects of data and related services.

The Partnership can benefit from and help RDA, CODATA, WDS and GO-FAIR to realise their data-oriented missions and to ensure the connection with the international developments in non-EU regions. Several of these regions have (in many shapes and forms) EOSC-similar initiatives running or are developing these. Thus, there is a strong need to connect at a support and coordination level tightly with the developments in the EOSC initiative. The USA, with their new Convergence Accelerator in NSF⁷⁵, running the Open Knowledge Network (the closest sibling to EOSC in USA) has already shown keen interest to collaborate on convergence of core protocols for interoperability. These issues cannot be developed and consented by Europe in isolation and therefore need to be part and parcel of a strategic plan for EOSC.

Conclusion: With all the players involved in many countries around the world, we can jointly bring the critical mass to federate and bring more coherency in the existing data infrastructures and relevant services, developing a “Web of FAIR Data and Related Services for Science”. This will ultimately offer a virtual environment within which to store, share and re-use research data across borders and disciplines, without top-heavy and bureaucratic governance and standards bodies, in an agile fashion, learning from how the current World-Wide-Web emerged based on the technology and interoperability of the internet. If Europe is able to continue being the first in properly sharing and combining data it can influence the digital marketplace based on data in virtually all sectors of society.

⁷¹ <https://ec.europa.eu/transparency/regexpert/index.cfm?do=groupDetail.groupMeeting&meetingId=12655>

⁷² <https://www.consilium.europa.eu/en/council-eu/preparatory-bodies/european-research-area-innovation-committee/>

⁷³ <https://www.openaire.eu/noad-activities>, <https://www.openaire.eu/contact-noads>

⁷⁴ <https://www.icsu-wds.org/news/files/DataTogetherFinalVersionMarch2020FINAL.pdf>

⁷⁵ <https://www.nsf.gov/od/oia/convergence-accelerator/index.jsp>

Annex 2: List of EOSC related EU-projects

AENEAS – Grant agreement No 731016 – 01.01.2017 to 31.12.2019

The AENEAS (*Advanced European Network of E-infrastructures for Astronomy with the SKA*) aims to develop a science-driven, functional design for a distributed, federated European Science Data Centre (ESDC). The ESDC will be part of a network of science data centres that will help the astronomical community make fundamental new discoveries with the largest radio telescope in the world - the Square Kilometre Array (SKA)⁷⁶ in Australia and South Africa. The European share of the global SKA regional centre network will be considerable in terms of volume of open scientific data, processing and networking. Integration or alignment with EOSC is therefore foreseen.

ARCHIVER – Grant agreement No 824516 – 01.01.2019 to 31.12.2021

The ARCHIVER Project - *Archiving and Preservation for Research Environments* - aims to introduce significant improvements in the area of archiving and digital preservation services for publicly funded research outputs, thus closing critical gaps between what is increasingly required by research funding agencies, requested by data creators and eventual users and what is currently available. ARCHIVER will combine multiple ICT technologies, including extreme data- scaling, network connectivity, service interoperability and business models, in a hybrid cloud environment to deliver end-to-end archival and preservation services that cover the full research lifecycle. It will create an eco-system for specialist ICT companies active in archiving and digital preservation, who would like to introduce new

AGINFRA+ - Grant agreement No 731001 – 01.01.2017 to 31.12.2019

AGINFRA+ supported agriculture and food scientists by enhancing more than 60 innovative data- and computing-intensive applications with open e-infrastructure resources and services from D4Science and EGI. It continued and evolved the data infrastructure of agINFRA⁷⁷. It continued the user engagement of CIP PSP VOA3R⁷⁸, FP7 SemaGrow⁷⁹, H2020 OpenMinTeD⁸⁰, H2020 e-ROSA⁸¹ and projects that facilitated the wider open science engagement and alignment of stakeholders in the food and agriculture sector⁸². With almost 350 people participating in its user trials, the pilot demonstration work of AGINFRA+ has been pivotal in showcasing the potential of EOSC for this domain. Its SME-oriented activities for data science companies⁸³ in the agtech and foodtech sectors have also been unique⁸⁴.

BE OPEN – Grant agreement No 824323 – 01.01.2019 to 30.06.2021

BE OPEN has brought on board key transport and open science related communities in an attempt to promote, regulate and standardize Open Science in transport research⁸⁶. The main outputs are to develop a framework of common understanding for realizing Open Science services, create the TOPOS⁸⁷ forum and observatory for different stakeholders, provide a roadmap and concrete guidelines for operationalizing Open Science services and design the European Code of Conduct on Open Science in transport to support research organizations.⁸⁸

⁷⁶ (n.d.). Square Kilometre Array. Consulté le novembre 6, 2019 à l'adresse <https://www.skatelescope.org/>

⁷⁷ <https://cordis.europa.eu/project/id/283770>

⁷⁸ <https://cordis.europa.eu/project/id/250525>

⁷⁹ <http://www.semagrow.eu>

⁸⁰ <http://openminted.eu>

⁸¹ <http://erosa.aginfra.eu>

⁸² <http://aims.fao.org/activity/blog/open-harvest-2016-release-chania-declaration>

⁸³ <https://medium.com/@AgroKnow/call-to-european-data-science-startups-who-is-going-to-win-the-10-000-prize-c90be1899f4b>

⁸⁴ AGINFRA+ AgTech Innovators Meetup (<https://youtu.be/bNOMBnV3KNk>

⁸⁶ (2017, octobre 27). Funding & tenders - European Commission. Consulté le novembre 6, 2019 à l'adresse <https://ec.europa.eu/info/funding-tenders/opportunities/portal/screen/opportunities/topic-details/mg-4-2-2018>

⁸⁷ (n.d.). TOPOS – BE OPEN project Open Science in transport. Consulté le novembre 6, 2019 à l'adresse <https://beopen-project.eu/topos>

⁸⁸ (n.d.). The project – BE OPEN project Open Science in transport. Consulté le novembre 6, 2019 à l'adresse <https://beopen-project.eu/the-project>

services capable of supporting the expanding needs of research communities but are currently prevented from doing so because there is no common procurement activity for the advanced stewardship of publicly funded research data in Europe. ARCHIVER's final goal is to allow research groups to retain responsibility and stewardship of their data whilst leveraging best practices, standards and economies of scale.⁸⁵

Blue Cloud – Grant agreement No 862409 – 01.10.2019 – 31.09.2022

Blue-Cloud - Piloting innovative services for Marine Research & the Blue Economy - aims i) to build and demonstrate a Pilot Blue Cloud by combining distributed marine data resources, computing platforms, and analytical services; ii) to develop services for supporting research to better understand & manage the many aspects of ocean sustainability; iii) To develop and validate a number of demonstrators of relevance for marine societal challenges; iv) To formulate a roadmap for expansion and sustainability of the Blue Cloud infrastructure and services. The project will federate leading European marine data management infrastructures (SeaDataNet, EurOBIS, Euro-Argo, Argo GDAC, EMODnet, ELIXIR-ENA, EuroBioImaging, CMEMS, C3S, and ICOS-Marine), and horizontal e-infrastructure (EUDAT, DIAS, D4Science) to capitalise on what exists already and to develop and deploy the Blue Cloud. The federation will be at the levels of data resources, computing resources and analytical service resources.

CINECA – Grant agreement No 825775 – 01.01.2019 to 31.12.2022

To maximise the impact of large cohorts of data for researchers, healthcare, industry, patients and funders, the project has assembled a set of expert partners in resource delivery who are embedded in the communities which generate, analyse, standardise and share genomic data. The project also received funding from the Canadian Institute of Health Research under CIHR grant No 404896.⁸⁹

CatRIS – Grant agreement No 824173 – 01.01.2019 – 31.06.2021

The CatRIS (Catalogue of Research Infrastructure Services) project is building an open, trusted and user-friendly portal to a harmonised and aggregated catalogue of services and resources provided by Research Infrastructures (RI), CoreFacilities (CF) and Shared Scientific Resources (SSR) across Europe focusing on services provided by physical infrastructures and facilities. It is a bottom-up initiative that is populated and run by RI, CF and SSR service providers at European, national, regional and institutional levels. CatRIS will be complementary to and interoperable with the EOSC catalogue.

COS4CLOUD – Grant agreement 863463 – 01.11.2019 – 28.02.2023

Cos4Cloud (*Co-designed Citizen Observatories Services for the EOS-Cloud*), aims to facilitate citizen science initiatives by designing and implementing services for citizen observatories in the EOSC framework. The innovative digital services will be based on deep machine learning, automatic video recognition, and other cutting-edge technologies. Cos4Cloud will use the experiences of platforms like: Artportalen, Natusfera, iSpot, as well as other environmental quality monitoring platforms like FreshWater Watch, KdUINO, OdourCollect, iSpex and CanAir.io. The final goal is to improve the implementation of existing and future citizen observatories, addressing the technological critical challenges facing them, and to contribute to ensuring their sustainability. Regarding EOSC landscape WG activities, COS4CLOUD main value may be as an example of how EOSC can interact with other types of knowledge infrastructures

⁸⁵ (n.d.). About | Archiver-project. Consulté le novembre 6, 2019 à l'adresse <https://www.archiver-project.eu/about>

⁸⁹ (n.d.). History — CINECA - Common Infrastructure for National Consulté le novembre 6, 2019 à l'adresse <https://www.cineca-project.eu/history>

such as those being currently developed by citizen science observatories

CS3MESH4EOSC – Grant agreement No 863353 – 01.01.2020 – 31.12.2022

The objective of CS3-MESH-4-EOSC is to create an interoperable federation of data and higher-level services to enable friction-free collaboration between European researchers. This will be achieved by capturing the momentum of recent cloud service provisioning and uptake in National Research & Education Networks (NRENs) and public research sector providers across Europe. CS3MESH4EOSC wants to integrate these local existing sites and services into a seamless infrastructure which is fully interconnected with the EOSC-Hub, as proposed in the European Commission's Implementation Roadmap for EOSC.

DARE – Grant agreement No 777413 – 01.01.2018 to 31.12.2020

DARE aims to deliver a new working environment for researchers wrestling with the challenge of extreme data, computing and complexity. The project aims at presenting a platform and a set of tools that visualise the runs of scientific work flows in summary form still without distracting technical detail. DARE works with two RIs: EPOS (European Plate Observing System)⁹⁰ and IS-ENES (Infrastructure for the European Network of Earth System Modelling)⁹¹, engaging in the co-design and production use of extreme methods that address these challenges.⁹² DARE accelerates innovation in e-science while provides the technical framework to virtualize existing research infrastructures.

DEEP-Hybrid-DataCloud – Grant agreement No 777435 – 01.11.2017 to 30.04.2020

DEEP aims to support machine learning, artificial intelligence, and deep learning over distributed e-Infrastructures in the European Open Science Cloud (EOSC), satisfying the needs of research, education communities and citizen science.⁹³ The project seeks to evolve to technology readiness level (TRL) 8 existing services and technologies at TRL6+, including relevant contributions to the EOSC by the INDIGO-DataCloud⁹⁴, that the project will enrich with new functionalities already available as prototypes.⁹⁵

DigitalHealthEurope – Grant agreement No. 826353 – 01.01.2019 -31.12.2020

DigitalHealthEurope (DHE) supports the Digital Transformation of Health and Care (DTHC) in the Digital Single Market⁹⁶. Besides providing direct funding and support for digital solutions for health and care, DHE facilitates the creation of multi-stakeholder communities, one for each of three priorities of the DTHC. Key outputs generated are recommendations for EU coordination and support for DTHC beyond 2020. The activities on priority 2 „Better data to advance research, disease prevention and personalised health and care“ crucially align with the EOSC, particularly when dealing with health data. Hence, exchange of information between DHE and EOSC is fundamental and mutually profitable.

e-InfraCentral – Grant agreement No 731049 – 01.01.2017 to 30.06.2019

e-IRGSP6 – Grant agreement No 823761 – 01.01.2019 to 30.06.2021

⁹⁰ (n.d.). European Plate Observing System. Consulté le novembre 6, 2019 à l'adresse <https://www.epos-ip.org/>

⁹¹ (2019, avril 1). Welcome to the ENES Portal — vERC. Consulté le novembre 6, 2019 à l'adresse <https://portal.enes.org/>

⁹² (n.d.). Da.Re. project. Consulté le novembre 6, 2019 à l'adresse <http://dare-project.eu/>

⁹³ (n.d.). DEEP – Hybrid DataCloud. Consulté le novembre 6, 2019 à l'adresse <https://deep-hybrid-datacloud.eu/>

⁹⁴ (n.d.). INDIGO DataCloud: Home. Consulté le novembre 6, 2019 à l'adresse <https://www.indigo-datacloud.eu/>

⁹⁵ (n.d.). The project – DEEP – Hybrid DataCloud. Consulté le novembre 6, 2019 à l'adresse <https://deep-hybrid-datacloud.eu/the-project/>

⁹⁶ COM/2018/233 on enabling the digital transformation of health and care in the Digital Single Market; empowering citizens and building a healthier society <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=COM:2018:233:FIN>

eInfraCentral aimed to address the challenge of researchers in navigating a fragmented e-infrastructure landscape. The goal was to develop a portal as the main entry point to European e-infrastructures services to enhance accessibility, discoverability, and comparability of services/ resources. Key results of the project include:

The Scientific Resources Description Template (SDT) for EOSC⁹⁷

An all-inclusive catalogue of e-services/resources - the First Catalogue for EOSC⁹⁸

APIs for enabling EOSC interoperability

Online Services and Assets Representations

A Set of Portal Cataloguing Functionality

Registration services for onboarding in EOSC and analytics and visualisations

A platform for providers to build their own EOSC-compliant catalogue

e-IRGSP6 aims to support e-IRG in its activities producing high-level policy recommendations towards the implementation of EOSC, Electronic Data Interchange (EDI) and the e-Infrastructure Commons overall. Through these supporting activities by e-IRGSP6 e-IRG will contribute to the implementation of EOSC and promote the cultural change towards Open Science principles⁹⁹. The most recently published policy document “National Nodes - Getting organised; how far are we?” provides a representative picture of the European e-Infrastructure landscape at its current state¹⁰⁰. e-IRGSP6 also constructed a Knowledge Base for e-Infrastructures in Europe¹⁰¹.

ENVRI-FAIR – Grant agreement No 824068 – 01.01.2019 to 31.12.2022

ENVRI-FAIR is the connection of the Cluster of Environmental Research Infrastructures (ENVRI) to the EOSC. It develops tools and resources for easy and seamless access to environmental data and research services provided by ENVRI research infrastructures, according to the FAIR principles. The highest priority is on the provision of high-quality data using open licenses, standard mechanisms and protocols. Its high-impact ambition is to prepare the foundations for a federated machine-to-machine interface – the ENVRI-hub. The hub forms the interface to the EOSC and will be realized as the services across ENVRI and even between environmental subdomains become progressively more integrated.¹⁰²

EOSC Enhance – Grant agreement No 871160 – 01.12.2019 – 30.11.2021

EOSC Enhance will consolidate the EOSC Portal as the universal access point for researchers through the facilitation and improvement of findability and discoverability of EOSC services and resources. It will enrich the EOSC offering for services and data by connecting the thematic clusters and clouds currently in development. EOSC Enhance pursues 4 objectives:

Enhance the service provider interface and incorporate new services and resources into the EOSC catalogue

Accelerate the deployment and uptake of EOSC services and resources

Increase user demand for EOSC services and resources via portal improvements and development

Enabling easier access to thematic clouds services and data¹⁰³

EOSC-hub – Grant agreement No 777536 – 01.01.2018 to 31.12.2020

EOSC-hub¹⁰⁴ brings together 100 partners including major e-Infrastructures and ESFRI research infrastructures, to create the Hub: a single contact point for European researchers and

EOSC-Life – Grant agreement No 824087 – 01.03.2019 to 28.02.2023

⁹⁷ Search for “eInfraCentral+github” or <https://github.com/eInfraCentral>

⁹⁸ (n.d.). eInfraCentral Platform. Consulté le novembre 6, 2019 à l'adresse <https://www.einfracentral.eu/>

⁹⁹ (n.d.). Introduction - e-Infrastructures Reflection Group - e-IRGSP6. Consulté le novembre 7, 2019 à l'adresse <http://e-irgsp6.e-irg.eu/introduction>

¹⁰⁰ <http://e-irg.eu/catalogue/eirg-1006>

¹⁰¹ <http://knowledgebase.e-irg.eu/>

¹⁰² (n.d.). ENVRI-FAIR homepage. Consulté le novembre 7, 2019 à l'adresse <https://envri.eu/home-envri-fair/>

¹⁰³ <https://www.eosc-portal.eu/>

¹⁰⁴ <https://www.eosc-hub.eu/>

innovators to discover, access, use and reuse a broad spectrum of EOSC resources. This will favour broader access to services supporting discovery and collaboration across disciplinary and geographical boundaries. The list of project key exploitable results includes components contributing to the implementation of the EOSC roadmap: the EOSC Marketplace and the EOSC Portal AAI, services for the realization of EOSC as federated system (the “Hub Portfolio”), the first prototype of the EOSC Service Management System for the delivery of services of the EOSC federating core, the EOSC Digital Innovation Hub for industrial collaborations, business and sustainability models, input to the EOSC Rules of Participation and Integration and Interoperability guidelines, and training resources and events complemented by the EOSC Early Adopter Programme.

In EOSC-Life the 13 European life science RIs (ELIXIR¹⁰⁵; BBMRI-ERIC¹⁰⁶; EATRIS-ERIC¹⁰⁷; ECRIN-ERIC¹⁰⁸; EMBRC¹⁰⁹; EMPHASIS¹¹⁰; ERINHA¹¹¹; EU-OPENSREEN¹¹²; EuroBioImaging¹¹³; INFRAFRONTIER¹¹⁴; Instruc-ERIC¹¹⁵; ISBE¹¹⁶; MIRRI¹¹⁷) publish their FAIR data in EOSC and establish the policies (e.g. GDPR) needed for researchers to access and combine resources from multiple RIs in new projects. The project works with the developer community to create an ecosystem of life-science tools in EOSC compatible clouds and connect these to users via a shared Life Science Login (compatible with EOSC AAI). Through open calls for projects researchers will be enabled to get support for novel data driven research in EOSC.¹¹⁸

EOSC-Nordic – Grant agreement No 857652 – 01.09.2019 to 31.08.2022

EOSC-Nordic aims to foster and advance the take-up of the EOSC at the Nordic level by coordinating the EOSC-relevant initiatives taking place in Finland, Sweden, Norway, Denmark, Iceland, Estonia, Latvia, Lithuania, Netherlands and Germany as well as exploit synergies to achieve greater harmonisation at policy and service provisioning across these countries, in compliance with EOSC agreed standards and practices.¹¹⁹

EOSC-Pillar – Grant agreement No 857650 – 01.07.2019 to 30.06.2022

EOSC-Pillar is one of the projects funded in INFRAEOSC-05 call, dedicated to thematic and regional initiatives. This project aims to support the coordination and harmonization of national initiatives relevant to EOSC in Italy, France, Germany, Austria and Belgium. The project intends to integrate a bottom-up approach (by voicing the requirements and needs expressed by the different scientific communities operating at the national level) and a top-down one (by harmonising the national strategies and translating them in a viable work plan).¹²⁰

EOSCPilot – Grant agreement No 739563 – 01.01.2017 to 31.05.2019

EOSC-Secretariat.eu – Grant agreement No 831644 – 01.01.2019 to 30.06.2021

¹⁰⁵ (n.d.). ELIXIR Europe. Consulté le novembre 7, 2019 à l'adresse <https://elixir-europe.org/>

¹⁰⁶ (n.d.). BBMRI-ERIC. Consulté le novembre 7, 2019 à l'adresse <http://www.bbmri-eric.eu/>

¹⁰⁷ (n.d.). EATRIS. Consulté le novembre 7, 2019 à l'adresse <https://eatris.eu/>

¹⁰⁸ (n.d.). ECRIN: Facilitating European Clinical Research. Consulté le novembre 7, 2019 à l'adresse <https://www.ecrin.org/>

¹⁰⁹ (n.d.). EMBRC. Consulté le novembre 7, 2019 à l'adresse <http://www.embrc.eu/>

¹¹⁰ (n.d.). Emphasis. Consulté le novembre 7, 2019 à l'adresse <https://emphasis.plant-phenotyping.eu/>

¹¹¹ (n.d.). ERINHA. Consulté le novembre 7, 2019 à l'adresse <https://www.erinha.eu/>

¹¹² (n.d.). EU OPENSREEN - European high-capacity screening Consulté le novembre 7, 2019 à l'adresse <https://www.eu-openscreen.eu/>

¹¹³ (n.d.). Euro Bioimaging. Consulté le novembre 7, 2019 à l'adresse <https://www.eurobioimaging.eu/>

¹¹⁴ (n.d.). INFRAFRONTIER - The European infrastructure for Consulté le novembre 7, 2019 à l'adresse <https://www.infrafrontier.eu/>

¹¹⁵ (n.d.). Instruc-ERIC. Consulté le novembre 7, 2019 à l'adresse <https://instruct-eric.eu/>

¹¹⁶ (n.d.). ISBE Project Website. Consulté le novembre 7, 2019 à l'adresse <http://project.isbe.eu/>

¹¹⁷ (n.d.). Home | MIRRI - Microbial Resource Research Infrastructure Consulté le novembre 7, 2019 à l'adresse <https://www.mirri.org/>

¹¹⁸ (n.d.). EOSC Life: Home. Consulté le novembre 7, 2019 à l'adresse <http://www.eosc-life.eu/>

¹¹⁹ (n.d.). EOSC-Nordic. Consulté le novembre 7, 2019 à l'adresse www.eosc-nordic.eu and <https://neic.no/eosc-nordic/>

¹²⁰ (n.d.). EOSC-Pillar. Consulté le novembre 7, 2019 à l'adresse <https://www.eosc-pillar.eu/>

EOSCpilot supported the first phase of development of the EOSC. The project delivered contributions to the EOSC in the areas of governance, policies, interoperability, architecture, and services, and provided the first "EOSC in practice" science demonstrators. Having delivered these, EOSCpilot has established its legacy and its outputs are used by several other projects funded to establish the EOSC.¹²¹ A mapping of which EOSCpilot deliverables are most relevant to each EOSC Working Group has been provided.¹²²

EOSC-synergy – Grant agreement No 857647 – 01.09.2019 to 28.02.2022

EOSC-synergy delivers services and supports selected scientific use cases that span several countries by pushing the state-of-the-art in software and services life-cycle through a quality-driven approach to services integration. It focuses on the identification of obstacles and barriers to close international collaboration and followed by steps for their minimization by harmonizing policies and federating relevant national research e-Infrastructures, scientific data and thematic services. All this bridges the gap between national initiatives and EOSC and expands adoption by developing new capabilities by opening national thematic services to European access, based on a robust human network and advanced training tools.

ExPaNDS – Grant agreement No 857641 – 01.09.2019 to 31.08.2022

ExPaNDS (*EOSC Photon and Neutron Data Services*) aims to deliver standardised, interoperable and integrated data sources and data analysis services for national Photon and Neutron facilities to the EOSC. It complements the PaNOSC project who has similar objectives for the ESFRI PaN RIs. For the EOSC Landscape WG, ExPaNDS established a baseline on the current state of FAIR data policies and data management practices among the project's RIs and the e-infrastructure EGI.

EOSCsecretariat.eu addresses the need for the set-up of an operational framework supporting the overall Governance of the EOSC. It supports the EOSC Governance in channelling messages to the stakeholders and following up on implementation and maintains a practical approach to address all the specific needs of the coordinated structure expected by the EOSC.¹²³

ESCAPE – Grant agreement No 824064 – 01.02.2019 to 31.07.2022

ESCAPE is a single collaborative cluster of 7 ESFRI & Landmark projects (CTA, SKA, KM3NeT, ELT, EST,FAIR, HL-LHC) and 2 pan-european organizations (ESO, CERN) in the area of astronomy- and accelerator-based particle physics in order to implement a functional link between the concerned ESFRI projects and EOSC. These ESFRI projects have aligned challenges of data-driven research, with demonstrated capabilities in addressing various stages of data workflow and concerned with fundamental research through complementary approaches. The networks of ASTRONET, APPEC and HEP (CERN), NuPECC are involved in ESCAPE. ESCAPE participants are involved in EOSC WGs - Architecture and FAIR.¹²⁴

FAIRsFAIR – Grant agreement No 831558 – 01.03.2019 to 28.02.2022

FAIRsFAIR (Fostering Fair Data Practices in Europe) aims to supply practical solutions for the use of the FAIR data principles throughout the research data life cycle with an emphasis on fostering FAIR data culture and the uptake of good practices in making data FAIR, in particular in the context of the European Open Science Cloud (EOSC). FAIRsFAIR will deliver and support recommendations on data policy and practice, provide solutions and support for semantic interoperability, support certification of trustworthy data repositories and data assessment, as well as develop a FAIR competence centre and framework for higher education.¹²⁵

FAIRsFAIR's three landscaping activities on *Semantics and Interoperability*, *FAIR Data Policies and Practices*, and *Research Data and FAIR Data Principles (in higher education)* are relevant inputs for the information gathering exercise of

¹²¹ (n.d.). eoscpilot.eu. Consulté le January 7, 2020 à l'adresse: <https://eoscpilot.eu/news/eoscpilot-rounds-key-contributions-eosc>

¹²² <https://eoscpilot.eu/news/eoscpilot-maps-key-deliverables-use-eosc-executive-board-working-groups> (Consulté le January 7, 2020)

¹²³ (n.d.). About Us | EOSCsecretariat. Consulté le novembre 7, 2019 à l'adresse <https://www.eoscsecretariat.eu/about-us>

¹²⁴ <https://projectescape.eu/about-us>

¹²⁵ (n.d.). The Project | FAIRsFAIR. Consulté le novembre 7, 2019 à l'adresse <https://www.fairsfair.eu/the-project>

the EOSC Landscaping WG regarding national data policies, available infrastructure, and training and skills.¹²⁶

Fair4Fusion – Grant agreement No 847612 – 01.09.2019 to 31.08.2021

The overall objective of Fair4Fusion is to make European funded data more widely available to the fusion community, other science communities, funding bodies, and the public at large in order to maximise the impact of the data and demonstrate the importance of the work done at relevant sites. Fair4Fusion aims to provide a reference architecture for an open data platform. Where possible, Fair4Fusion will make use of existing services and tools, adapting them where necessary to meet the needs of the fusion community.¹²⁷

FAIR4Health – Grant agreement No 824666 – 01.12.2018 to 30.11.2021

The overall objective of FAIR4Health is to facilitate and encourage the EU health research community to FAIRify, share and reuse their datasets derived from publicly funded research initiatives, and from real-world data (Electronic Health Records).¹²⁸ FAIR4Health will apply privacy-preserving distributed data mining techniques over the shared and FAIRify datasets to develop 2 pathfinder case studies: supporting the discovery of disease onset triggers and disease association patterns in comorbid patients, and a prediction service for 30-days readmission risk in complex chronic patients. FAIR4Health develops activities of interest to the EOSC strategy, especially in the field of FAIR data and specific infrastructures.

FAIRplus – Grant agreement No 802750 – 01.01.2019 to 30.06.2022

The FAIRplus project aims to develop tools and guidelines for making life science data FAIR. The project has 22 partners from academia and industry. FAIRplus aims to increase the discovery, accessibility and reusability of data from selected projects funded by the EU Innovative Medicine Initiative (IMI), and internal data from pharmaceutical industry partners. The increased FAIRness of data will lead to a wider sharing of knowledge, greater opportunities for innovation, and more insights that benefit society.¹²⁹

FNS-Cloud – Grant agreement No 863059 – 01.10.2019 – 30.09.2021

Health related RIs focus on clinical, molecular and biological sciences whilst existing food, nutrition and security (FNS) resources (data, knowledge rules) are fragmented, lack critical mass, and access by user communities is unevenly distributed. FNS-Cloud aims to develop an on-demand, federated network (cloud infrastructure), supporting access and exploitation of FNS resources, integrated with the European Open Science Cloud (EOSC). Also, because FNS domains lack tools for data management and predictive modelling, FNS-Cloud will develop advanced methods and Services for user communities, making FNS data FAIRer (findable, accessible, interoperable and reusable) and adding-value to publicly funded research for citizens.

FREYA – Grant agreement No 777523 – 01.12.2019 to 30.11.2020

FREYA is extending a robust environment for Persistent Identifiers (PIDs) into a core component of European and global research e-infrastructures, motivated by the vision of a rich 'PID Graph' of interconnected entities. The resulting FREYA services will cover a wide range of resources in the research and innovation landscape and enhance the links between them so that they can be exploited in many disciplines and research processes. This will provide an

GN4-3 (GEANT) – Grant agreement No 856728 – 01.01.2019 to 31.12.2022

The project is proposed to last 48 months to implement, as the call requests, a very ambitious restructuring of the backbone network operated by GÉANT in order to provide equal access to clouds and other e-infrastructure services in the European research area and beyond. It will improve the overall resilience and reliability of the GÉANT network significantly and offer a base for future improvements in

¹²⁶ FAIRsFAIR deliverables: <https://www.fairsfair.eu/reports-deliverables>

¹²⁷ (n.d.). CORDIS. Consulté le novembre 7, 2019 à l'adresse <https://cordis.europa.eu/>

¹²⁸ (n.d.). Project - FAIR4Health. Consulté le novembre 7, 2019 à l'adresse <https://www.fair4health.eu/en/project>

¹²⁹ (n.d.). About the FAIRplus project| FAIRplus. Consulté le novembre 7, 2019 à l'adresse <https://fairplus-project.eu/about/>

essential building block of the European Open Science Cloud (EOSC). Moreover, the FREYA project will establish an open, sustainable, and trusted framework for collaborative self-governance of PIDs and services built on them—the ‘PID Commons’.

ICEDIG – Grant agreement No 777483 – 01.01.2018 – 31.03.2020

ICEDIG – *Innovation and consolidation for large scale digitisation of natural heritage* - is an EU-funded project that aims at supporting the implementation phase of the new Research Infrastructure DiSSCo (“Distributed System of Scientific Collections”) by designing and addressing the technical, financial, policy and governance aspects necessary to operate such a large distributed initiative for natural sciences collections across Europe.¹³¹

NEANIAS – Grant agreement No 863448 – 01.11.2019 - 31.10.2022

NEANIAS - NEANIAS - Novel EOSC Services for Emerging Atmosphere, Underwater & Space Challenges - aims to promote Open Science practices and actively contribute to the materialization of the EOSC ecosystem by engaging large scientific and professional communities, extending its offerings and supporting its technological, regulatory, procedural, strategic and business development. NEANIAS will drive the co-design and delivery of innovative thematic services, derived from state-of-the-art research assets and practices in three major sectors – Underwater, Atmospheric and Space Research – and will seek business innovation cases by exemplifying reuse in Energy, Smart Cities and other domains, engaging multitudinous academic, research and business actors.¹³³

MERIL – Grant agreement No 262159 – 01.10.2010 to 31.12.2012 and **MERIL-2** – Grant agreement No 262159 – 01.03.2016 to 31.08.2019

The MERIL (*Mapping of the European Research Infrastructure Landscape*) portal provides access to a

access, transmission speeds and capacity wherever needed.¹³⁰

INODE – Grant agreement No 863410 – 01.11.2019 – 31.10.2022

INODE – Intelligent Open Data Exploration – aims at advancing open data exploration and democratization in the EOSC ecosystem by providing a suite of fit-for-purpose and sustainable services for intuitive linking and exploration of open data. These services will allow users to search data using natural language and examples, and optimize answers and queries by a combination of service functions that provide recommendations, explanations, analytics, and interactive visualizations. INODE’s service offering is shaped by the needs of three communities in the areas of biomedical research, astrophysics as well as research and innovation policy making¹³².

InRoad – Grant agreement No 730928 – 01.01.2017 to 31.12.2018

InRoad looked at ways to foster a higher degree of coordination of priority setting, evaluation and funding mechanisms, as well as to ensure sustainable planning for RIs in Europe. The analysis of the extensive data collected during the project activities allowed the project partners to identify common trends and good practices that are summed up in InRoad final Report.¹³⁴

NI4OS-Europe – Grant agreement No 857645 – 01.09.2019 to 31.08.2022

NI4OS aims to support the development and inclusion of the national Open Science Cloud initiatives in 15 EU MS and AC in the overall scheme of EOSC governance. The overall

¹³⁰ (2019, octobre 31). GN4-3N Project | H2020 - Cordis. Consulté le février 14, 2020 à l'adresse <https://cordis.europa.eu/project/id/856728>

¹³¹ (n.d.). icedig: Front. Consulté le février 14, 2020 à l'adresse <https://www.icedig.eu/>

¹³² (n.d.). The INODE project — INODE. Consulté le Janvier 7, 2020 à l'adresse <http://www.inode-project.eu/>

¹³³ The NEANIAS project - <https://www.neanias.eu/>

¹³⁴ (n.d.). InRoad Project. Consulté le novembre 7, 2019 à l'adresse <https://www.inroad.eu/>

database that stores information about openly accessible RIs in Europe, across all scientific domains, including Social Sciences and Humanities (SSH). The MERIL database is a dynamic resource that was being continuously updated. MERIL database consists of lists of identified, eligible RIs, and a set of data for each individual RI, collected and displayed in a standardised format. The MERIL-2 project built on the previous phases of MERIL and provided the means for making informed assessments and decisions about the RI landscape in Europe, and encouraged accessibility, new partnerships and collaborations within the scientific community. The MERIL-2 project further expanded the coverage of RIs included in the database, and improved the depth and accuracy of the information held on them.¹³⁵

OCRE – Grant agreement No 824079 – 01.01.2019 to 31.12.2021

The OCRE (*Open Clouds for Research Environments*) project aims to accelerate cloud adoption in the European research community, by bringing together cloud providers, Earth Observation organisations and the research and education community, through ready-to-use service agreements with cloud service providers that meet the specific requirements of the research community, saving institutions the time-consuming and complex process of doing this themselves.¹³⁷

OpenRiskNet – Grant agreement No 731075 – 01.12.2016 to 30.11.2019

OpenRiskNet aims to develop an open e-Infrastructure providing resources and services to a variety of communities requiring risk assessment of chemicals, cosmetic ingredients, therapeutic agents or nanomaterials. Virtual environments are provided, which can run on different types of computer hardware ranging from single computers to cloud infrastructure, onto which a multitude of data, modelling and simulation services can be deployed and combined to answer complex risk assessment questions. Case studies

approach is that national Open Science landscape in all countries will be mapped, analysed and systematized so as to facilitate both the creation of national Open Science Cloud initiatives to support the overall EOSC governance, and to engage all stakeholders.¹³⁶ NI4OS will federate the existing EOSC-relevant services in the target countries by making them compatible with, and visible in core building blocks of EOSC. NI4OS will collaborate directly with the other EOSC-related initiatives to contribute to the common EOSC platform including a set of policies, rules and principles for managing services and research data across EOSC ecosystem.biki

OpenAIRE-Advance – Grant agreement No 777541 – 01.01.2018 to 31.12.2020

OpenAIRE-Advance continues the mission of OpenAIRE¹³⁸ to establish a European/global scholarly communication commons by 1) providing services to: researchers for making their research open (Zenodo, Amnesia, Argos); content providers for linking their content to the European infrastructure (Metadata Guidelines for literature, data, software repositories, ScholExplorer); policy makers for monitoring research outcomes and impact; research communities for managing open research, 2) establishing national nodes, National Open Access Desks (NOADs), as a pivotal part within national infrastructure environments, 3) consolidating Europe's global role, extending collaborations with Latin America, US, Japan, Canada, and Africa.¹³⁹

PaNOSC – Grant agreement No 823852 – 01.12.2018 to 30.11.2022

PaNOSC (*Photon and Neutron Open Science Cloud*) aims to make FAIR data a reality in six European RIs, developing and providing services for scientific data and connecting these to the EOSC.¹⁴¹

¹³⁵ (n.d.). MERIL portal. Consulté le novembre 7, 2019 à l'adresse <https://portal.meril.eu/meril/>

¹³⁶ (n.d.). NI4OS-Europe Project - CORDIS. Consulté le novembre 7, 2019 à l'adresse https://cordis.europa.eu/project/rcn/224431/en?WT.mc_id=RSS-Feed&WT.rss_f=project&WT.rss_a=224431&WT.rss_ev=a <https://ni4os.eu/>

¹³⁷ (n.d.). About | OCRE. Consulté le novembre 7, 2019 à l'adresse <https://www.ocre-project.eu/about>

¹³⁸ (n.d.). OpenAIRE. Consulté le novembre 7, 2019 à l'adresse <https://www.openaire.eu/>

¹³⁹ (2019, mai 2). OpenAIRE Advance project | Projects. Consulté le novembre 7, 2019 à l'adresse <https://www.openaire.eu/openaire-advance-project>

¹⁴¹ (n.d.). The Photon and Neutron Open Science Cloud (PaNOSC Consulté le novembre 7, 2019 à l'adresse <https://www.panosc.eu/>

demonstrate the applicability of the infrastructure in productive settings supporting research and innovation.¹⁴⁰

PRIMAGE – Grant agreement No 826494 – 01.12.2018 to 30.11.2022

PRIMAGE proposes an open cloud-based platform to support decision-making in the clinical management of two paediatric cancers. PRIMAGE is based on the use of computational imaging, which allows the extraction of multiparametric data, multiscale models, visual analytics and artificial intelligence, leading to a new era in radiomics, characterized by high-throughput extraction, storage, and analysis of a large number of quantitative imaging features and parameters (Imaging Biomarkers). Imaging biomarkers linked to clinical, molecular and genetic data, will be part of a high-quality repository with anonymized data, which will be used, as an observational in silico study, to finally have a Clinical Decision Support (CDS) tool. As a result, PRIMAGE platform will be able to provide quantitative relevant information (Virtual Biopsies) for the early disease diagnosis, disease phenotyping, disease grading, targeting therapies and evaluation of disease response to treatment in children with neuroblastoma and DIPG.

RDA Europe 4.0 – Grant agreement No 777388 – 01.03.2018 to 31.05.2020

The Research Data Alliance (rd-alliance.org) is an international community driven initiative building the social and technical bridges to enable the open sharing and re-use of research data. The RDA Europe 4.0 project is mandated to ensure that European political, research, industrial and digital infrastructure stakeholders are aware of, engaged with and actively involved in the global RDA activities. RDA provides an international neutral forum for discussing and agreeing relevant technical standards for the implementation of the EOSC. In addition, RDA supports the communication and dissemination of EOSC developments across the globe.¹⁴³

SSHOC – Grant agreement No 823782 – 01.01.2019 to 30.04.2022

SSHOC (*Social Sciences and Humanities Open Cloud*) aims to realise the Social Sciences and Humanities' part of European Open Science Cloud (EOSC) where data, tools, and training are available and accessible for users of SSH data. All aspects

PROCESS – Grant agreement No 777533 – 01.11.2017 to 31.10.2020

PROCESS aims to deliver a comprehensive set of mature services prototypes and tools specially developed to enable extreme scale data processing in both scientific research and advanced industry settings. PROCESS demonstrators seek to pave the way towards data services that aim to accelerate innovation and maximise the benefits of the emerging “very large data” solutions. PROCESS provides an ecosystem of distributed services based on virtualization principles, which necessitates containerization of applications, refactoring software stacks using a micro-service approach, and supporting orchestration on the infrastructures.¹⁴²

RISCAPE – Grant agreement No 730974 – 01.01.2017 to 31.12.2019

The goal for the RISCAPE project is to provide a systematic, focused, high-quality, comprehensive, consistent and peer-reviewed international landscape analysis report on the position and complementarities of the major European research infrastructures in the international research infrastructure landscape.¹⁴⁴

TRIPLE – Grant agreement No 863420 – 01.10.2019 – 31.03.2023

TRIPLE (*Transforming research through Innovative Practices for Linked interdisciplinary Exploration*) aims at developing an innovative multilingual and multicultural discovery solution for Social Science and Humanities. Based on the

¹⁴⁰ (n.d.). About • OpenRiskNet. Consulté le novembre 7, 2019 à l'adresse <https://openrisknet.org/about/>

¹⁴² (n.d.). Project Objectives – PROCESS. Consulté le novembre 7, 2019 à l'adresse <https://www.process-project.eu/project-objectives/>

¹⁴³ (n.d.). About RDA EU 4.0 - RDA Europe - Research Data Alliance. Consulté le novembre 7, 2019 à l'adresse <https://www.rd-alliance.org/rda-europe>

¹⁴⁴ (n.d.). RISCAPE in a nutshell - RISCAPE. Consulté le novembre 12, 2019 à l'adresse <https://riscape.eu/riscape-project/>

of the full research data cycle and human-centric approach are engaged in creating links between people, data, services and training. SSHOC will advance secure environments for sharing and using sensitive and confidential data and will contribute to innovations stemming from the coupling of heterogeneous data types, as well as work on the Interoperability principle of FAIR. The consortium aims to align with necessary technical and other EOSC requirements for making the SSHOC services sustainable beyond the duration of the project¹⁴⁵.

VirtualBrainCloud – Grant agreement No 826421 – 01.12.2018 to 30.11.2022

The central goal of this project is the development of a cloud-based platform for biomedical research and clinical decision-making that helps to improve early patient-specific diagnosis and treatment of neurodegenerative diseases (NDD) like Alzheimer's disease (AD) and Parkinson's disease (PD) and has substantial potential for significant positive socioeconomic impact. The objective is to develop and validate VirtualBrainCloud, a dedicated cloud-based environment that leverages the potential of big data and high-performance computing (HPC) for personalized prevention and treatment of NDD.¹⁴⁷

Isidore search engine, the TRIPLE platform will provide a single access point for users to discover and reuse open scholarly SSH resources, i.e. research data and publications, which are currently scattered across local repositories; to find and connect with other researchers and projects across disciplinary and language boundaries; to make use of innovative tools to support research; to discover new ways of funding research. The project's final goal is to integrate the discovery solution into the EOSC marketplace¹⁴⁶.

XDC – Grant agreement No 777367 – 01.01.2017 to 31.01.2020

XDC (*eXtreme DataCloud*) aims to develop scalable technologies for federating storage resources and managing data in highly distributed computing environments. The services provided seek to operate at the unprecedented scale required by the most demanding, data intensive, research experiments in Europe and Worldwide. XDC aims to be based on existing tools, whose technical maturity is proved and that the project seeks to be enriched with new functionalities and plugins already available as prototypes (TRL6+) that will be brought at the production level (TRL8+) at end of XDC. The XDC software will be released as Open Source platforms available for general exploitation.¹⁴⁸

¹⁴⁵ The SSHOC project - <https://www.sshopencloud.eu/about-sshoc>

¹⁴⁶ (n.d.). About TRIPLE | GOTRIPLE. Consulté le Janvier 8, 2020 à l'adresse <https://www.gotriple.eu/about/>

¹⁴⁷ (n.d.). VBC Project - VirtualBrainCloud. Consulté le novembre 7, 2019 à l'adresse <https://virtualbraincloud-2020.eu/vbc-project.html>

¹⁴⁸ (n.d.). The project | XDC - eXtreme DataCloud. Consulté le novembre 7, 2019 à l'adresse <http://www.extreme-datacloud.eu/the-project/>