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NI4OS-Europe

National Initiatives for Open Science in Europe

Deliverable D2.2
National OSC initiatives models

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Abstract: Deliverable D2.2 – National OSC initiatives models - examines existing Open Science policies and models in Europe, describes the elements an Open Science Cloud model should include, and proposes workflows for setting up National Open Science Cloud Initiatives, whose aim is to become important contributors to the EOSC governance.

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List of Acronyms

AAI	Authentication and Authorization Infrastructure
BiH	Bosnia and Herzegovina
CRIS	Current Research Information System
DEFF	Denmark's Electronic Research Library
DeIC	Danish Rectors' Conference, Danish e-Infrastructure Co-operation
DORA	San Francisco Declaration on Research Assessment
DMP	Data Management Plan
DPO	Data Protection Officer
DSM	Digital Single Market
ECI	European Cloud Initiative
EC	European Commission
EOSC	European Open Science Cloud
ERA	European Research Area
ERAC	European Research Area and Innovation Committee
ESFRI	European Strategy Forum on Research Infrastructures
EU	European Union
EuroHPC JU	European High-Performance Computing Joint Undertaking
FAIR	Findable, Accessible, Interoperable and Reusable
FOSS	Free and Open Source Software
FWF	Austrian Science Fund
GB	Governance Board
GDP	Gross Domestic Product
HEI	Higher Educational Institutes
HPC	High-Performance Computers
HTC	High Throughput Computing
ICT	Information and Communications Technology
IPR	Intellectual Property Rights
IT	Information Technology
JRU	Joint Research Unit
MCST	Malta Council for Science & Technology
MoU	Memorandum of Understanding
MSE	Ministry of Science and Education
MVE	Minimum Viable EOSC

NGI	National Grid Initiative
NGO	Non-Governmental Organization
NOAD	National Open Access Desk
NORF	National Open Research Forum
NOSC	National Open Science Cloud
NOSCI	National Open Science Cloud Initiative
NREN	National Research and Education Networks
OA	Open Access
OANA	Open Access Network Austria
OS	Open Science
OSC	Open Science Cloud
OSPP	Open Science Policy Platform
PPP	Public Private Partnership
RDA	Research Data Alliance
RDM	Research Data Management
RI	Research Infrastructure
PID	Persistent Identifier
RoP	Rules of Participation
R&D	Research and Development
R&I	Research and Innovation
SCOSS	Global Sustainability Coalition for Open Science Services
SEE or SE Europe	South East Europe
SEE-GRID	South Eastern European Grid
SDGs	Sustainable Development Goals
SRIA	Strategic Research and Innovation Agenda
WG	Working Group
WP2	NI4OS-Europe Work Package 2: EOSC national initiatives and policy support

Executive summary

What is the focus of this Deliverable?

The deliverable D2.2 - National OSC initiatives models - provides a Blueprint for candidate OSC models that can be then further customized by countries.

What is next in the process to deliver the NI4OS-Europe results?

The setting up of National Open Science Cloud Initiatives (NOSCIs) – or their support where these exist – is one of the major aims of the NI4OS-Europe project. D2.2 should be considered as an enabler for this process, as it provides both: a Blueprint that addresses governance issues and suggestions about possible workflows and indicators facilitating the establishment and operation of the national initiatives. The national initiatives can have different formats of organization and levels of maturity – the blueprint given here can be seen as a general "best-case scenario" guideline.

What are the deliverable contents?

The deliverable provides in the introduction an overview of the efforts related to the establishment of the EOSC, which sets the overall scene for the motivation for establishment of the National Open Science Cloud Initiatives (NOSCI) and the related models. It then presents the major building blocks of Open Science (OS) and examples of OS models in Europe, as well as the relation between Open Science Cloud models in national and European (EOSC) settings. A particular focus is given to equivalent models and knowledge deriving from the National Grid Initiatives (NGI), which have been precursors of EOSC in several aspects. Chapter 3 summarises developments and status in the NI4OS-Europe countries. Chapter 4 includes the main contents of the Blueprint for setting up National Open Science Cloud Initiatives, indicative indicators to measure NOSCI progress as well as operational aspects for their day-to-day operation. Chapter 5 concludes with major recommendations and plans for the next steps. Finally, the importance of the Appendices in this deliverable has to be stressed, as they are drafted with the intention to provide useful material for the setting up on National Open Science Cloud Initiatives, ready to use or easily to adapt. Appendix A includes detailed information about the Open Science approaches in all European countries, captured in comprehensive tables. Appendices B and C include metrics and indicators that can be used for the assessment of EOSC readiness in Europe. Appendix D is a table of content for a Memorandum of Understanding, including suggested articles of it. Appendix E outlines the table of contents of the Greek proposal for a national OS plan.

Conclusions and recommendations

EOSC will be the open and trusted virtual environment which will enable the estimated 2 million European researchers to store, share and reuse research data across borders and disciplines. The National Open Science Cloud Initiatives are important pillars of this effort. For ensuring the sustainability of this flagship initiative for Europe, it has to be built upon a solid governance and organisational framework on the national level. The development and deployment of models for the NOSCIs, covering aspects related to research, organization and sustainability, can contribute to the strategic and organizational coherence and complementarity at EU, national and institutional levels and, thus, to the success and sustainability of EOSC. It might not be realistic to expect that all European

Members States and Associated Countries can form a formal NOSCI, however we present this model that can be worked with as "best-case scenario" and adapted to each country as circumstances allow.

1. Introduction

The aim of the deliverable is to provide a comprehensive Blueprint for setting up, operating and monitoring the progress of National Open Science Cloud Initiatives (NOSCIs). The model and the steps that are described in the Blueprint can be further customized by countries and adapted to different types of national initiatives according to the level of complexity and maturity of each country.

> A NOSCI is envisaged as a coalition of national organisations that have a prominent role and interest in the European Open Science Cloud (EOSC). The main aim of NOSCI will be the promotion of synergies at national level, and the optimisation/articulation of their participation to European and global challenges in this field of OSC, including the EOSC. National Initiatives are envisaged to play a prominent role in Member States and Associated Countries and facilitate EOSC governance.

Today's data generation is growing exponentially. The vast increase in data production equally applies to the domain of research, whereby researchers are already unable to read or access all relevant digital knowledge in their field. In particular, the underlying research data remains predominantly unpublished and are thus unfindable and inaccessible.

Europe is the largest producer of scientific data in the world, but insufficient and fragmented infrastructure means this "plethora of data" is not being exploited to its full potential. 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. A European-scale environment for storage, data access, data analysis and computing is thus, needed.

To tackle these crucial issues, Open Science (OS) policy has developed progressively in the EU. It concerns all aspects of the research cycle, from scientific discovery and scientific review to research assessment, publishing and outreach; its cornerstone being open access to publications and research data. Open Science increases the quality and impact of science by fostering reproducibility and interdisciplinarity. It makes science more efficient through better sharing of resources, more reliable through better verification and more responsive to society's needs.

By bolstering and interconnecting existing research infrastructures and e-infrastructures, the Commission launched the European Open Science Cloud (EOSC) that will offer Europe's 1.7 million researchers and 70 million science and technology professionals a virtual environment to store, share and re-use their data across disciplines and borders.

EOSC constitutes a major ambition in the European Open Science policy, being a federated ecosystem of research infrastructures, e-infrastructures and services that allows the scientific community to share and process publicly funded research results and data across borders and scientific domains. EOSC initiative reinforces Open Science, Open Innovation and Open to the world policies. It fosters best practices of global data findability and

accessibility (FAIR data), help researchers get their data skills recognised and rewarded; help address issues of access and copyright (IPR) and data subject privacy; allows easier replicability of results and limit data wastage; contribute to clarification of the funding model for data generation and preservation, reducing rent-seeking and priming the market for innovative research services.

The decision to create a EOSC was taken under the European Union's Digital Agenda (2015)[1], followed by an EOSC implementation roadmap in 2018, by a series of dedicated H2020 calls in 2018-2020 to start prototyping the EOSC and the launch of an interim governance structure under the AT Presidency of the EU at the end of 2018. This governance is at work to help in the transition to the EOSC Post-2020. As the mandate of the current interim EOSC governance will come to an end on 31 December 2020, a new legal entity, the EOSC Association, is expected to be set up later this year to represent European stakeholders in a collective manner.[2]

In June 2020, the draft EOSC partnership proposal has been published. It aims to accelerate the deployment and consolidation of an open, trusted, virtual, federated environment in Europe to store, share and re-use research data across borders and scientific disciplines and provide access to rich array of related services. The Partnership will bring together institutional, national and European initiatives and engage all relevant stakeholders to jointly develop a science commons where data are Findable, Accessible, Interoperable, Reusable (FAIR) and where research-enabling and other services are made available throughout Europe[3]. In July 2020, the consultation for the EOSC Strategic Research and Innovation Agenda (SRIA) has been launched[4]. SRIA provides general guidelines to help develop the work programmes for EOSC in Horizon Europe. The consultation aims on getting feedback on topics such as EOSC's guiding principles, action areas and priorities. This includes information relating to rewarding Open Science practices and skills; standards, tools and services to find, access and reuse results; and shared and federated infrastructures to enable open sharing of scientific results.

Moreover, Open Science and Open innovation 5 are widely recognised as key transformative, enabling elements of the European R&I policy driving a renewed European Research Area (ERA). While the majority of the Member States and Associated Countries have policies in place regarding open access to scholarly publications, less countries have yet defined policies regarding FAIR data and only few mention EOSC in their policies. There is a need to progressively operationalise and open up the EOSC ecosystem to allow not only European academics and researchers but also public authorities, innovators and companies and society at large to contribute and exploit open data, publications, software and associated services in Europe.

EOSC is envisioned by the European Commission as an underlying platform which nurtures open science and open innovation in Europe and beyond. It is seen as an ecosystem of organisations and infrastructures from various countries and communities, supporting the open creation and dissemination of knowledge and scientific data. It is envisaged to be open to the widest range of providers and research communities in common sharing of

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infrastructures, services, data and publications. It is building on a number of established initiatives from the fields of e-Infrastructures, Research Infrastructures, and Open Science.

NI4OS-Europe project supports the operational framework for governance by focusing on coordination between relevant national initiatives, as well as research infrastructures, and e-infrastructures and their federation into the EOSC. The current deliverable provides a model for the establishment of NOSCIs in South East Europe, which have as an ultimate goal to support the EOSC governance.

2. Open Science Cloud models and EOSC

Open Science (OS) has been introduced as a term to cumulatively address the changes which had been taking place for many years in the global scientific production and publishing environment following its transformation to electronic and digital forms. From the open source paradigm which introduces collaborative methods for writing and exchanging code in software development, to open access and FAIR research data that permits end-users (i.e. researchers and citizens) to freely download, print, read, re-use and re-distribute publicly funded scientific information, they all have a common target to normalise procedures that validate and accelerate scientific advancements in a democratic manner while securing sustainability and fostering innovation in a participatory fashion. Thereby, traditional practices are re-examined and enhanced in support of Open Science implementation and compliance.

Open Science is about research outputs availability and reusability, but is also interwoven with the research process itself, pointing to technical and operational means facilitating vital research components that lead to quality outcomes, such as services for data processing and management. Although they started independent of each other and have progressed according to different maturity streams, those paradigms combined realize a novel model for practising, sharing and supporting research and science which urges for a reconstruction of existing research ecosystems. EOSC is a regional effort based on the realisation of the open science ecosystem in the European area.

Below is a brief overview of the different components found in "open" models and in the EOSC.

2.1. The three major building blocks of OS

To understand how Open Science has evolved and what models contribute to its establishment, it is important to view all elements which are necessary for Open Science to be performed and/ or enforced. Current section of this deliverable analyses and presents developments in Open Access, Research Data Management and Open Source Software, yet acknowledging that Open Science is bigger in scope and in practice. We consider these three as major building blocks of Open Science and, thus, important aspects in every Open Science Cloud model. For Open Science to thrive, it is imperative that services and cloud infrastructures are in place and, furthermore, they are integrated with standards and protocols as per the global community best practices. The cloud aspect in Open Science is presented in detail in a separate section in this deliverable.
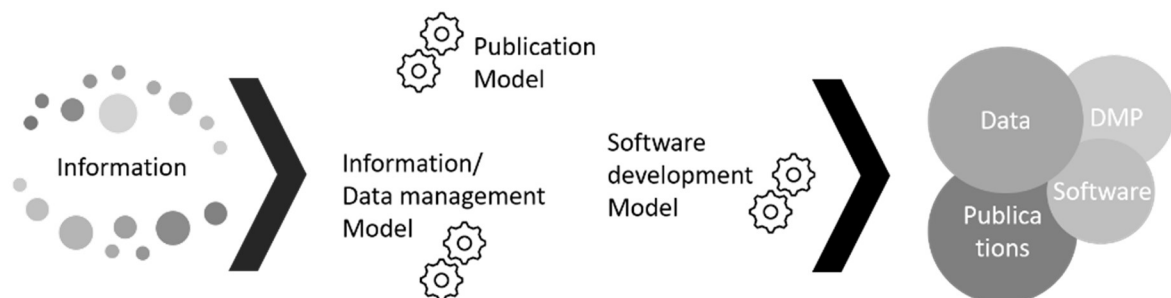

Figure 1: Information flow and Open Science outputs

Open Access

Open Access is the publication model in Open Science as it focuses on the way that research outputs are provided to end-users backed up by the means, i.e. practices and tools, that enable their free access and distribution. Key strategic documents that triggered wider adoption of the Open Access principles are the Budapest Open Access Initiative which was published in 2002 and the Berlin Declaration with signatories starting from 2003. Both documents declare the rights to read and re-use (including Text and Data Mining) scientific information offered via the Internet.

Moreover, Open Access strives for free Internet access to scientific information, primarily targeting peer-reviewed publications. It is highly dependent on intellectual property rights for it secures authors with certain rights that would otherwise fall under scientific publishers' jurisdiction, as is the case when choosing traditional publishing schemes. It is apparent that Open Access affects both authors and scientific publishing venues:

- Authors: the owners of the intellectual work
  - get control of their scientific products by retaining specific rights (including copyright) that allow for re-distribution and re-use of their intellectual work by humans and machines
  - get acknowledged by assigning attribution licenses, such as Creative Commons, to their research outputs
  - increase their citations for openly sharing their work[6]
- Publishing Venues: Open Access repositories and Open Access journals
  - OA repositories (Green OA or self-archiving):
    - Apply standards for interoperability and long-term preservation
    - Guide and support scholars in self-archiving
  - OA journals (Gold OA):
    - Eliminate costs related to the publication process, especially avoiding double dipping, and normalise APCs (Article Processing Charges)
    - Include embargoes concerning availability of scientific outputs in their open access policies

According to the aforementioned, services were built and/or enhanced and policies were developed and enforced by countries, research funding and research performing organisations/ institutions and publishers who conformed to OA principles (check also 2.2 Important OS policies across Europe).

Latest developments have even guided the formulation of funders' coalitions, such as the Coalition S, determined to foster OA on a well-defined timeline by committing to a commonly agreed set of implementation actions succeeding their proposal for a Plan S. Moving things even further, Coalition S now has a new output referring to a "Rights Retention Strategy".

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[6] https://f1000research.com/articles/5-632/v3

Additionally, Open Access principles apply for underlying data of publications, the so-called research data.

Research Data Management

Research data highly depend on the processes taken place throughout a research lifecycle. Hence, research process is complementary delimited with the management and access of research data in an open and FAIR manner.
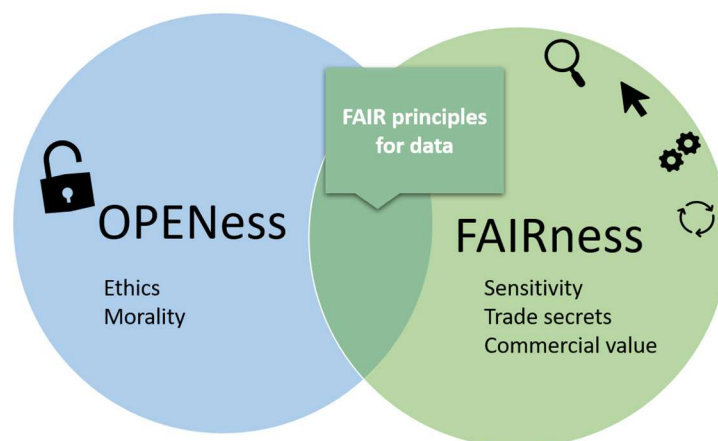
Figure 2: Relation between Open and FAIR data

Research data practices support proper management and documentation and fulfill core components of information/data management models that are tied to Open Science information systems.

Driven from the Open Data and Linked Data paradigm, which set access and re-distribution conditions to contextualise information produced by public sector bodies, especially governmental in nature, research data have been added to the equation for providing extra value and exploitation possibilities and for equally supporting global challenges (such as in the Sustainable Development Goals - SDGs), assisting economies of scale and benefiting the society at large.

There are a number of factors contributing to achieving re-usability and re-producibility of research data and different levels of application/ adaptation subject to the types of data concerned (e.g. sensitive or personal data) and openness pertaining the practices that are followed. Data Management Plans are a useful tool to document the steps followed in order to enhance data understandability and use by others in the future. Introduction of FAIR principles is another pillar in research data management history for they portrait essential elements for producing research data objects which could lead to the Internet of FAIR Data and Services.

By viewing the open and FAIR principles in a data management lifecycle, it is clear that research data management falls equally on researchers, research support staff/ librarians and service providers to realize open and FAIR data.

- Researchers: producing and/ or handling data
  - Follow best practices for collecting, processing and analysing data
  - Self-archive data in data repositories

- o   Write Data Management Plans
- Research support staff/ librarians: curating data
    - o   Curate data in the short and/ or long-term
    - o   Promote data literacy
    - o   Involved in data stewardship
- Data repositories: data archives enabling access, preservation and FAIRness of data
    - o   Integrate complementary services in support of Open and FAIR best practices
    - o   Apply open standards and protocols facilitating information exchange and interoperability across systems

Open Research Software

Following the Free and Open Source Software (FOSS) philosophy, open research software is a software development model which in Open Science could denote both the software produced during and for the needs of a research project, and the software used for implementation of infrastructures for research.

Free software is defined by the "Four Freedoms" allowing developers to run, study, redistribute and improve software, including the source code. FOSS paradigms date back to 1980s, initiated with the GNU Manifesto. Though FOSS has gained momentum for decades, research software has recently come to the forefront in scientific environments. It is recognised as an integral part of the research process enabling the generation, analysis and/or presentation of research outputs.

It becomes evident that a major role in the shift to more open practices in research software development play researchers themselves.

- Researchers
    - o   Produce code that meets data management needs
    - o   Reduce costs by using open source software packages instead of buying licenses for proprietary software

2.2. Important OS policies across Europe

In the recent years Open Science has moved from a merely theoretical construct, to the area of policy development and deployment, being unquestionably a central element of the European policy agenda. This has resulted in the formulation of policies and measures for enforcing Open Science, but, similar to the linguistic landscape, the contemporary policy landscape in Europe is diverse due to the diversification of national science policies, research governance and compliance.

At the level of research institutions, implementing measures and policies may take different forms and have different gravity such as: setting up an enabling environment, providing incentives for open access publishing, establishing a solid reward system, establishing mandatory rules on access to scientific publications or data, or funding for infrastructure. The measures are thus of three kinds: sticks (mandatory rules), carrots (incentives), and enablers (soft and hard infrastructure).

The map in Figure 3 depicts the current policy scenery for Open Data and Open Science for 40 countries. We have grouped the identified policies into five major clusters:

1. National policies and legislation: Laws e.g. Law 2016-1321 in France, Legislative Act e.g. Act 14/2011, on Science, Technology and Innovation of Spain, Governmental decree e.g. the 'Open Access Decree' of the Wallonia-Brussels Federation.
2. Funder policy: Public funders that adopted Open Access policies e.g. Deutsche Forschungsgemeinschaft (DFG), the major research funder in Germany.
3. National plan: Code of Ethics e.g. Belgium, National plan e.g. Netherlands.
4. Declaration and Concordat: Declaration e.g. Greece, Concordat e.g. UK, Memorandum of Understanding (MoU) e.g. Italy.
5. Acknowledgement & Recommendations: Governmental document that mention OA as a future direction e.g. Latvia ("*listing the promotion of Open Access as a top priority*") or ongoing efforts towards the formation of a national strategy e.g. Albania. National guidelines produced or commissioned by public authority e.g. Estonia, principles and guidelines presented by research council e.g. Norway on data, Institutional Recommendations e.g. Luxemburg or White Paper e.g. Switzerland.
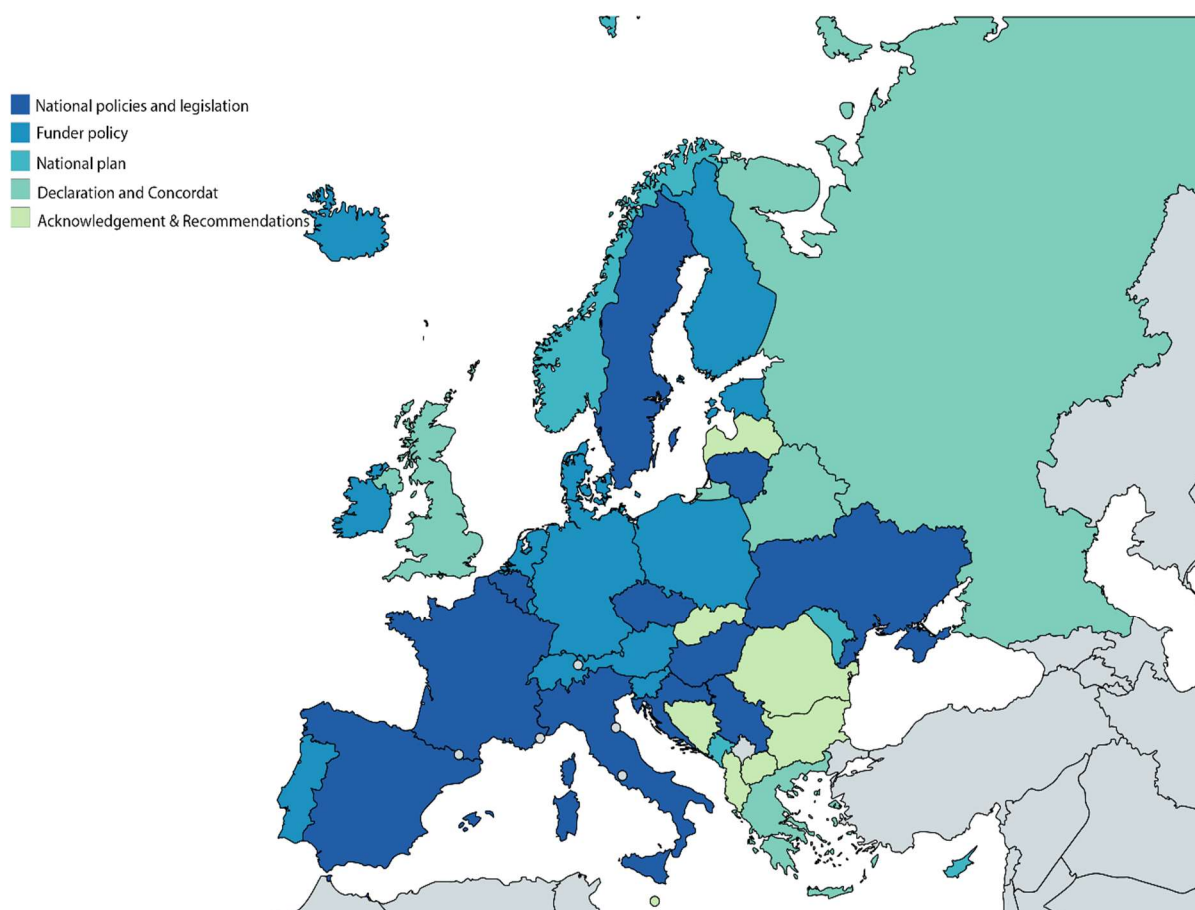
Figure 3: OS models across Europe

Some countries adopt a multilevel approach like Spain, but the map comprises the highest level of policy. A detailed view of Open Science related policies per country is provided in Appendix A.

In the following we examine the status of OS policies in seven European countries. These serve as examples on how approaches and science policy may differ considerably, even at the same "maturity level", as often the same type of policy (e.g. recommendation) may have a different scope (e.g. focused on particular aspects or generic) or gravity (e.g. simple recommendation or recommendation linked to incentives). We analyse the type of policy/ies each country follows, the year that it was adopted, the leading organisation which sponsored and laid the cornerstone of the policy document, the involved parties which contributed to it (if there are any), its focus (research publications, data, software, processes) and its important aspects and key objectives. Each country paradigm is presented in alphabetical order and then, a table (**Error! Reference source not found.**) summarises the different country views.

Funder Policy: Austria

Austria has no national policies, but the Austrian Science Fund (FWF), Austria's central funding organization for basic research, stipulates OA to research data collected and/or analysed using FWF funds for projects approved from 1 January 2019 and OA to publications that result from research funded by FWF. The latest Austrian government programme, Government program 2020–2024 (p. 305), includes a statement regarding actively supporting Plan S for the implementation of Open Access.

Table 1: Example 1, Funder Policy. Summary of OS policy approach in Austria

Country	Austria
Type of policy	Funder Policy
Year	2020
Initiator / Sponsor	Government
Involved parties	N/A
Scope	Publications
Important aspects of the model/ Key objectives	- Statement regarding actively supporting Plan S for the implementation of Open Access

National Plan: Denmark

Denmark does not have an integrated Open Science Policy regarding different types of research results. However, there are two significant distinct actions. In February 2014, the Danish Rectors' Conference, Danish e-Infrastructure Co-operation (DeIC) and Denmark's Electronic Research Library (DEFF) set up the "Steering Group for National Data Management", a steering group which was given the task to prepare the first draft of a national strategy for research data management. Thereinafter, the draft was submitted for consultation with key stakeholders, and finally it was published in January 2015 constituting the "National Strategy for Research Data Management".

Three years later, the Ministry of Higher Education and Science published "Denmark's National Strategy for Open Access" (June 2018) with the vision to open up publications from Danish research institutions financed by public funding and/or private foundations setting the year 2025 as the reference year to establish unimpeded digital access for researchers, industry and society to all research articles. The strategy mainly focuses on Green Open Access with a maximum 12-month embargo.

Table 2: Example 2, National Plans. Summary of OS policy approach in Denmark

Country	Denmark
Type of policy	National Plans
Year	2015
Initiator / Sponsor	Steering group involving university representatives, cooperation organisation for Danish educational and research libraries & national ICT infrastructure provider
Involved parties	Danish Rectors' Conference, universities, and the preservation institutions
Scope	Data
Important aspects of the model/ Key objectives	- Data management policies - Incentivisation - Infrastructure for all stages of the research data life cycle - Support for researchers - Future management structure for the data management - Pilot projects
Year	2018
Initiator / Sponsor	Ministry of Higher Education and Science
Involved parties	N/A
Scope	Publications
Important aspects of the model/ Key objectives	- OA to all publication financed by public funding and/or private foundation - Green OA is preferred over Gold OA

National Plan: Finland

The Finish model is based on the work of the Open Science and Research Initiative (ATT), a cross-administrative initiative managed by the Ministry of Education and Culture, whose goal is to make science and research more open to all by improving the management and use of research results (publications, data, methods and tools). "Open Science and Research Roadmap 2014–2017" has been the result of this effort, and constitutes a guideline for Finnish academia, decision-makers, funders and citizens regarding OS. The Roadmap's main goal has been to make "Finland the leading country for openness in science and research by 2017". Efforts also include the Open Science and Research Handbook, with guidelines and model processes to help researchers, research organisations, decision-makers, financiers, and the general public promote the adoption and use of OS.

Recently, the Finnish research community has jointly created a Declaration for Open Science and Research 2020-2025, which was approved by the National Open Science and Research Steering Group on December 10, 2019. It outlines a vision, where Open Science

and research are seamlessly integrated in researchers' everyday work and support not only the effectiveness of research outputs but also the quality of research.

Table 3: Example 3, National Plan. Summary of OS policy approach in Finland

Country	Finland
Type of policy	National Plan
Year	2014
Initiator / Sponsor	Ministry of Education and Culture
Involved parties	Open Science and Research Initiative (a coalition of ministries, universities, research institutes and research funders)
Scope	Publications, Data, Methods, Tools
Important aspects of the model/ Key objectives	- Reinforcing the intrinsic nature of science & research - Strengthening openness-related expertise - Ensuring a stable foundation for the research process - Increasing the societal impact of research

National Policy and Legislation: France

Scrutinizing the French paradigm, we observe that it includes a twofold effort: the "Law for a Digital Republic" (Loi n2016-1321 pour une République numérique,) passed by the French Senate in 2016 and the National Plan for Open Science, presented in the second quarter of 2018. The Law 2016-1321 sets its focus on the right of publishing in OA and the re-use of research data generated with public funding. The National Plan condenses the ambition to make scientific results "*open to all*"[7] into three commitments, accompanied by the respective Roadmaps:

- 'Generalising Open Access to Publications'
- 'Structuring Research Data and Making it Available through Open Access'
- 'Be part of a sustainable European and international open science dynamic'

Table 4: Example 4, Law. Summary of OS policy approach in France

Country	France
Type of policy	Law
Year	2016
Initiator / Sponsor	Parliament
Involved parties	N/A
Scope	Publications, Data
Important aspects of the model/ Key objectives	- OA to publications & data - Reuse of data financed by public funding

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[7] "France is committed to making scientific research results open to all – researchers, companies, citizens" https://libereurope.eu/wp-content/uploads/2018/07/SO_A4_2018_05-EN_print.pdf

National Plan: Ireland

The [National Framework on the Transition to an Open Research Environment](#) is the Irish national action plan for the free flow of scientific information. It was produced by the National Open Research Forum (NORF), an initiative consisting of policy, research funding and academia representatives, which has been established to deliver an agenda for open research. The National Framework is aligned with developing EC's policy and the principles of 'Plan S'. The principles of the National Framework support OA to research results deriving from public funding and concentrates on the following areas: OA publications, FAIR data, infrastructure, skills and competencies, and incentives and rewards.

Table 5: Example 5, National Plan. Summary of OS policy approach in Ireland

Country	Ireland
Type of policy	National Plan
Year	2018
Initiator / Sponsor	National Open Research Forum (NORF)
Involved parties	N/A
Scope	Publications, Data
Important aspects of the model/ Key objectives	- OA to research publications - FAIR data - Infrastructures for access to and preservation of research - Skills & competencies - Incentives & rewards

Acknowledgement: Malta

Although Malta does not have a national OS/OA policy yet, the work towards this direction cannot be overlooked. The Malta Council for Science & Technology (MCST) has secured the support of the Commission's Policy Support Facility to implement a National Open Science Policy, which is planned to be published in the last quarter of 2020. In addition, in 2014, the Malta Council for Science and Technology launched the [National Research and Innovation Strategy 2020](#), which was endorsed by Malta's cabinet. This document sets out Malta's strategy for a seven-year period proclaiming Research and Innovation as an integral part of Maltese economy. Open access to publications resulting from publicly funded research is linked to innovation and is mentioned as a "*principle which Malta supports as a means to achieve optimal circulation of knowledge*".

Table 6: Example 6, Acknowledgment. Summary of OS policy approach in Malta

Country	Malta
Type of policy	Acknowledgment
Year	2014
Initiator / Sponsor	Malta Council for Science and Technology
Involved parties	Ministries, S3 Platform of the Joint Research Centre, DG REGIO, social partners & industry representatives
Scope	Publications

Important aspects of the model/ Key objectives	- OA to publications resulting from publicly funded research is linked to circulation of knowledge and entrepreneurial innovation - Acknowledgement that an improved framework to support OA publishing is needed

National Plan: Netherlands

Netherlands has drafted its national OS plan, called the "Nationaal Plan Open Science", a 'mild' policy which sets the OS/OA vision in publication, encourages the reuse of data, addresses the need for evaluation and incentives and the necessity of broadly supporting and involving researchers in matters of OS. The National Plan was sponsored by the Ministry of Education, Culture and Science, and it was accompanied by the simultaneous signing of the Dutch Open Science Declaration and the launch of the Open Science National Platform.

Table 7: Example 7, National Plan. Summary of OS policy approach in Netherlands

Country	Netherlands
Type of policy	National Plan
Year	2017
Initiator / Sponsor	Ministry of Education, Culture and Science
Involved parties	Researchers, educational institutions, research institutions, libraries, governmental & funding bodies, supporting organisations & platforms in science
Scope	Publications, Data
Important aspects of the model/ Key objectives	- Full OA to publications in 2020 - Reuse of research data - OS's role in evaluation & reward system - Promoting & supporting OS

2.3. Cloud role in OSC

The EOSC is a federated ecosystem of research infrastructures, e-infrastructures and services that allows the scientific community to share and process publicly funded research results and data across borders and scientific domains. Research infrastructures, e-infrastructures and service providers play a vital role in the EOSC.

This virtual environment to store, share and re-use their data across disciplines and borders will be underpinned by the European Data Infrastructure, deploying the high-bandwidth networks, large scale storage facilities and super-computer capacity necessary to effectively access and process large datasets stored in the cloud. This world-class

infrastructure will ensure Europe participates in the global race for high performance computing in line with its economic and knowledge potential.[8]

2.3.1. The role of research infrastructures, e-Infrastructures and service providers

Research infrastructures include major scientific equipment; knowledge-based resources such as collections, archives or scientific data; e-infrastructures, such as data and computing systems and communication networks; and any other infrastructure of a unique nature essential to achieve excellence in research and innovation. Such infrastructures may be single-sited, virtual, or distributed.

Research infrastructures and e-Infrastructures play an increasing role in the advancement of knowledge and technology and their exploitation. By offering high quality and reliable research services to users from different countries, by attracting young people to science and by networking facilities, research infrastructures help to structure the scientific community and play a key role in the construction of an efficient research and innovation environment. Because of their ability to assemble a critical mass of people, knowledge, and investment, they contribute to national, regional, and European economic development. Research infrastructures, e-Infrastructures and service providers are key in helping Europe to lead a global movement towards open, interconnected, data-driven and computer-intensive science and engineering.

e-Infrastructures address the needs of European researchers for digital services in terms of networking, computing, and data management and provide digital-based services and tools for data- and computing-intensive research in virtual and collaborative environments. e-Infrastructures are key in future development of research infrastructures, as activities go increasingly online and produce vast amounts of data. This support is essential for example to the European Strategy Forum on Research Infrastructures (ESFRI). Furthermore, e-Infrastructures enable and support the circulation of knowledge in Europe online and therefore constitute an essential building block for the European Research Area (ERA). EOSC federates existing and emerging e-Infrastructures to provide European science, industry, and public authorities with world-class data infrastructure to store and manage data, high-speed connectivity to transport data and powerful high-performance computers (HPC) to process data.[9]

While Member States remain central in the development and financing of most research infrastructures and e-infrastructures, the Union plays a catalysing and leveraging role in this field. A European approach helps pooling resources across Europe to properly address the cost and complexity of new world-class research infrastructures. It also ensures wider and more efficient access to and use of the infrastructures existing in the different Member States.[10]

The landscape of research data repositories in Europe is highly fragmented. Most data that are published nowadays are stored in local institutional or disciplinary repositories,

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[8] https://ec.europa.eu/commission/presscorner/detail/en/IP_16_1408

[9] https://ec.europa.eu/digital-single-market/en/policies/einfrastructure

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

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 significantly reduces 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 e-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 and data processing services, as commons, will constitute the core of the federation. The on-going EOSC related e-infrastructures projects, together with initiatives promoted by thematic research infrastructures such as the ESFRIs, 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' 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-infrastructures, 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.

Research infrastructures and e-Infrastructures also contribute to other cross-cutting objectives of Horizon 2020, such as climate action and sustainable development, biodiversity, and social sciences and humanities. Furthermore, production-level e-infrastructures are able to serve the computing and data needs of any project in the framework programme fostering economies of scale in the use of ICT systems by projects supported by Horizon 2020.[11]

EOSC vision is to provide European science, industry and public authorities with world-class data infrastructures, high-speed connectivity and increasingly powerful computers and networks of computers. 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 pan-European e-infrastructures for networking, high-performance computing (HPC) and High Throughput Computing (HTC) are already well established and provide services used by international research and research infrastructures. Also, data and cloud infrastructures are developing fast. It should be noted that the European-level e-infrastructure services are often provided by national e-infrastructures in a collaborative setting and that the pan-European initiatives are dependent on the existence of strong and coherent national e-infrastructure nodes and their cooperation and complementarity

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

to enable cross-border services for scientific communities. The pan-European e-infrastructures participate and play a crucial role for making the EOSC ecosystem a reality.

Regarding Networks, already since a few decades the National Research and Education Networks (NRENs) have been connecting universities, research institutes, and sometimes other public institutions in their country. The GÉANT Association[12] has gradually grown into a pan-European organisation, where the associated NRENs link together research communities and provide trans-national access to research infrastructures and research resources. GÉANT provides interconnectivity between NRENs across 43 European countries, serving an estimated 50 million of users of practically all research disciplines and thematic domains. Most large-scale research infrastructures can connect to the local NREN and thus access GÉANT, enabling worldwide communications.

The High Performance Computing (HPC) national infrastructures are federated at the European level in the Partnership for Advanced Computing in Europe (PRACE)[13]. PRACE offers access to world class high-performance capability computing facilities and services. PRACE systems are available to scientists and researchers from academia and industry from around the world through the process of submitting computing project proposals based on " Excellence of science" and supported by scientific peer-review. A new legal and funding entity, the European High-Performance Computing Joint Undertaking (EuroHPC JU)[14] will pool European and national resources to develop top-of-the-range exascale supercomputers for processing big data, based on competitive European technology. EuroHPC JU develops a pan-European supercomputing infrastructure and supports research and innovation activities during the development and later in the exploitation of the HPC infrastructure.

In the realm of the High Throughput Compute (HTC) infrastructures implemented in the form of institutional clusters and compute grids, cloud compute infrastructures implemented as Infrastructure as a Service, Platform as a Service or Software as a Service. A rich variety of such infrastructures exist within the academic sectors of European countries. On the national level these are often brought together using national infrastructures (NGIs). The NGIs are federated into the EGI pan-European computing infrastructure. The EGI Foundation and its NGI members provide solutions built through a service catalogue[15] that has been evolving during many years. The EGI Federated Cloud Solution offers a standards-based and open infrastructure to deploy on-demand IT services that can host, process and serve datasets of public or commercial relevance and can be flexibly expanded in capacity and capability by integrating new providers. This is complemented by the EGI High Throughput Computing (HTC) Solution that provides a global high-throughput data analysis infrastructure, linking large number of compute clusters from independent organisations and delivering computing resources with high scalability. Access to EGI's resources (cloud or HTC) is provided through various access modes, such as free grant-based allocations, pay per use, and annual membership fees. Moreover, EGI has agreements with resource/service providers from outside Europe to increase the interoperability and availability of compute and data resources from those regions.

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[12] https://www.geant.org
[13] https://prace-ri.eu/
[14] https://eurohpc-ju.europa.eu/
[15] https://www.egi.eu/services/

Data is a key component of research infrastructures, a fundamental scientific product offered for scientific and commercial exploitation. This was stressed in the ESFRI 2018 Roadmap [16] where the ESFRIs "generally understood EOSC as a European Open Science (Data) Commons". The storage, curation, archival and sharing of scientific data for download and for online analytics is a shared challenge of e-infrastructures and Research Infrastructures. This link between RIs and e-infrastructures is in continuous evolution, and EOSC is expected to give a boost to the interactions. For example, with the INFRAEOSC ESFRI Cluster projects where the ESFRIs bring data and services into EOSC. Data infrastructures should be built in an interoperable way and provide all potential users with the capability to store their data and to make this data discoverable and accessible while taking into account European and national data laws (privacy, intellectual property rights (IPR), etc). Initiatives at the European level have been started to offer various services for research data in general such as EUDAT services[17] for publications and a growing range of other research outputs OpenAIRE[18] and its services such as the Zenodo repository[19], and for the caching and staging of research data to compute resources (EGI data services).

Europe needs a robust European-scale environment for storage and data analysis and computing. The digital transformation of the EU economy depends on the availability and uptake of secure, energy-efficient, affordable, and high-quality data processing capacities, such as those offered by cloud infrastructures and services, both in data centres and at the edge. In this perspective, the EU needs to reduce its technological dependencies in these strategic infrastructures, at the centre of the data economy[20].

Shareable research data, open data analysis tools and connected computing facilities need to become available for all researchers and research-support units. Thus, it is of crucial importance to strengthen the European research infrastructures and e-Infrastructures for networking, high-performance computing (HPC) and High Throughput Computing (HTC) to the EOSC and ensure the integration of Grid and Cloud services for all scientific and non-scientific needs.

2.3.2. Previous efforts in SEE: the National Grid Initiatives

In the area of South East Europe (SEE), in the last decade and a half, a number of coordinated and complementary e-infrastructure initiatives were crucial for enabling high-quality research and ICT developments, by providing networking and computational resources, thematic/domain-specific services and application support and training to the users/scientists in this part of Europe. These initiatives have supported the European vision of inclusive and smart growth, based on knowledge and innovation, enriching the European Research Area.

They have helped to reduce the digital gap and brain drain in Europe, by ensuring access to infrastructures and services to the new member states, those on the path to ascension including Western Balkans, and those in the area identified by the Eastern Partnership

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[16] https://www.esfri.eu/esfri-roadmap
[17] https://eudat.eu/european-open-science-cloud
[18] https://www.openaire.eu/
[19] https://zenodo.org/
[20] https://ec.europa.eu/info/sites/info/files/communication-european-strategy-data-19feb2020_en.pdf

grouping. The EOSC-relevant infrastructures and services in the area of SEE have been established through the initiatives described below.

SEE-GRID (South Eastern European Grid) project series[21] established the Grid computing infrastructure (50+ geographically distributed Grid sites) and empowered strategic regional research communities in its common use, while the HP-SEE project[22] established the regional HPC infrastructure, and supported a wide range of scientific communities in its use. Specifically, SEE-GRID project aimed to assist the participation of the SEE European states to the pan-European (EGEE) and worldwide Grid initiatives. It concentrated on the establishment of a seamless and interoperable pilot-Grid infrastructure that expand and support the European Research Area (ERA) in the region. The interconnection of the regional infrastructure to the pan-European and worldwide Grid initiatives translated into benefits for the smaller, less-resourced sites in SE Europe to access computing power that would otherwise be unaffordable. In this perspective, the SEE-GRID initiative reduced the digital gap and released the scientific & productive talents of the region allowing equal participation of the targeted countries in pan-European Grid efforts. The project involved the National Grid Initiatives of Albania, Bosnia-Herzegovina, Bulgaria, Croatia, North Macedonia, Greece, Hungary, Romania, Serbia- Montenegro and Turkey.

The recently finished VI-SEEM[23] unified these infrastructures together with a set of thematic services and open data sets under the umbrella of a common Virtual Research Environment. The overall regional infrastructure services at the end of the VI-SEEM project comprised of 23,694 CPU-cores, 1,166,592 GPU-cores, 20,496 Xeon Phi-cores, 3,112 Grid CPU-cores, 14,152 Cloud VM-cores, and 18 PB of storage space. This SEE integrated e-infrastructure has facilitated high-quality international research in a number of scientific fields - from meteorology, climate change and seismology, to computational physics, chemistry and life sciences - resulting in more than 200 supported applications serving a large number of research teams, and few hundred published scientific papers, most of which open access.

Building on the results of the projects above, NI4OS-Europe articulates a significant contribution of the countries from the SEE to the EOSC vision:

a. it aims to onboard OSC services from the region to the EOSC, including generic services, thematic services and digital open data and publications repositories, to promote further federation of all these types of services within a wider EOSC. NI4OS-Europe articulates a significant contribution of the countries from the SEE to the EOSC vision,
b. it supports both the governance and policy aspects of EOSC through development and inclusion of the NOSCI in the EOSC governance scheme.

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[21] https://cordis.europa.eu/project/id/211338
[22] https://cordis.europa.eu/project/id/261499

[23] https://cordis.europa.eu/project/id/675121

2.4. EOSC Governance

Aforementioned infrastructures and services for research build the environment in which Open Science information, skills and practices thrive. Open Science models mentioned in section 2 utilise those services to perform data activities that enrich content in the OS ecosystem while maximising proper data re-use and exploitation. Below, the models related to operating an OS environment that enables data to seamlessly flow are explained. In doing so, the different stages and evolution of EOSC implementation are highlighted, starting from more conceptual frameworks as expressed by the EU policies and legislation for digitalisation and research leading to actions supporting realization of the EOSC Governance up to establishing the EOSC Association.

First phase: The European Cloud Initiative

EOSC is the implementation of the European Cloud Initiative (ECI) which reflects on priorities set in the Europe 2020, Digital Single Market (DSM) and European Research Area (ERA) policy directions. Hence, EOSC ecology ranges from infrastructures and data to services and skills, that seeks to build a globally competitive data and knowledge economy in Europe. Digital transformation and data exploitation in research are intertwined in EOSC with public sector services and data being also explored in its context, though at a later stage of implementation, for their scientific value and overall contribution to inclusive and growth development.
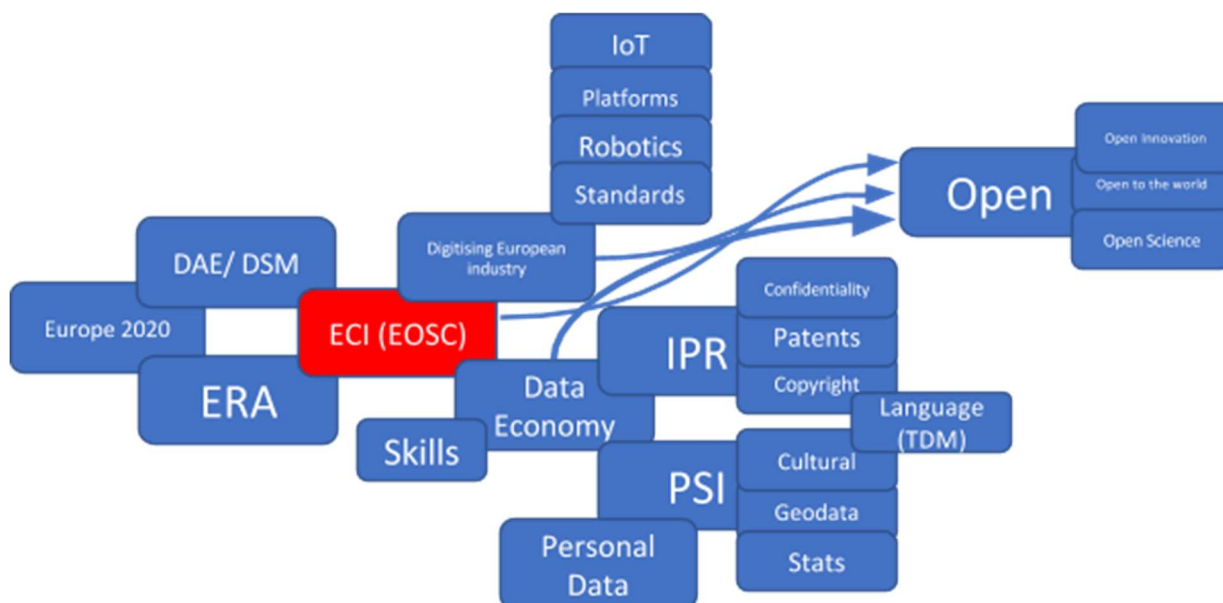
Figure 4: The European e-science and open science policies contributing to EOSC

Second phase: Towards EOSC realisation

Furthermore, it includes all policies, governance mechanisms, standards and principles of engagement for EOSC providers and users necessary for building such an open science ecology. Since previous chapters focused on the core elements pertaining to Open Science Cloud from a strategic and policy view, here models are explained from a governance

perspective, thus manifesting the core components of an open science ecosystem. Both policies and governance components will be further analysed alongside in chapter 5, close to workflows proposed towards the realisation of national OS ecosystems in the Southeastern Europe (SEE) to plug in NI4OS-Europe and the EOSC.
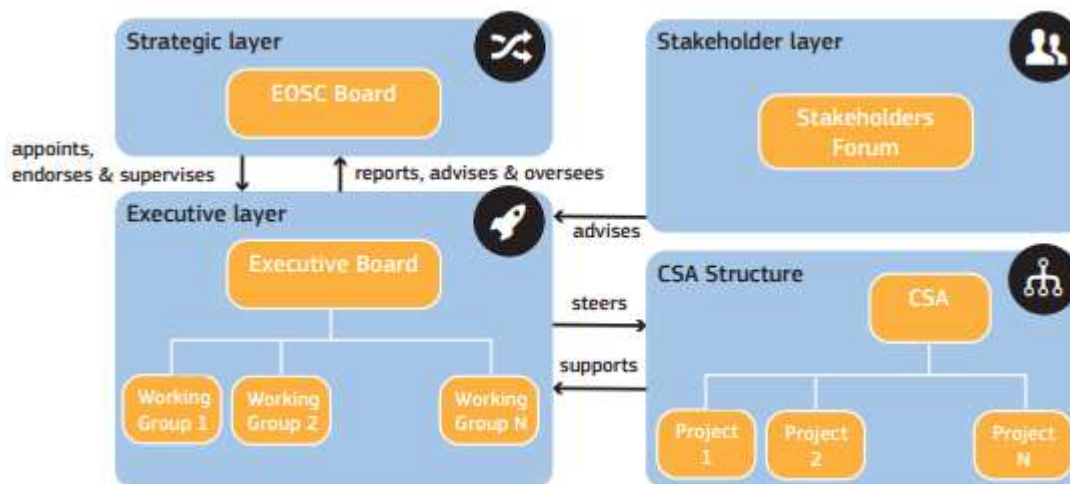
Figure 5: Pre-Association phase of EOSC Governance

Two significant models of the EOSC Governance that require attention in this exercise are Participation Rules and Sustainability, both accruing from activities of the Executive Board (as seen in Figure 5).

- Participation Rules

define the rights, obligations and accountability of prospective EOSC participants. Majority of the rules are services heavy as they concern providers' onboarding and integration practices or EOSC administration operations. The proposed Rules of Participation (RoP) is a minimal set of rules, in alignment with the policies encompassing EOSC, that govern offering of services (including expertise) and all transactions taking place within its context. Application of RoPs differs according to specific characteristics of stakeholders such as disciplinary orientation, role in the ecosystem, location in the international landscape etc. Below is a break-down of the model:

   o Ground rules refer to EOSC resources and are driven by the principles of openness and a clarification of the onboarding process.
   o Rules about data, including metadata, draw on how resources are accessed, on producers' obligations regarding the research conduct, providers' obligations with respect to FAIR resources and use, and on data utility by users.
   o Rules about services guide provision and consumption and specificities regarding inclusion in the service architecture.
   o Rules for EOSC Operators concern processes regarding the EOSC federating core such as about resources findability, sharing and security.

- Sustainability

takes into account the EOSC business model, governance structure and legal entity to set strategic and financing orientations for its second phase of implementation and beyond. The "Tinman report", being the latest output that suggests specific sustainability measures

to be applied, establishes a Minimum Viable EOSC (MVE) with clear access policies and focuses on services and data exploitation by researchers, the public sector and the industry.

The MVE is comprised of the EOSC-Core and the EOSC-Exchange. The prior concerns vital services that build up the EOSC and contribute to its successful operation; it is assembled by EOSC-related projects and provides the means to discover, share, access and re-use services and data in EOSC. The latter offers services for data exploitation mainly for storage, preservation and sharing of data.
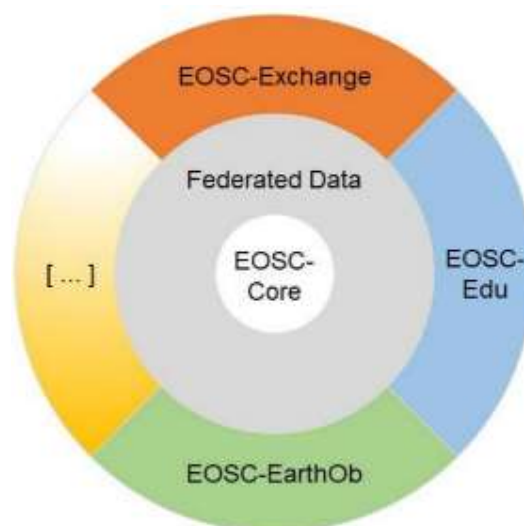
Figure 6: EOSC elements and their relationships (from the consultation phase of the Tinman report)

The Tinman report describes costs associated to the MVE for its sustainable operation, but also proposes a plan for funding services, projects and researchers to provide and use the EOSC services.

Third phase: The EOSC Association

Aforementioned actions led to the establishment of EOSC as an International Non-Profit Association under the Belgian law (AISBL) in July 2020[24]. Latest developments include open calls for members and publication of the reviewed by notary statutes[25] according to which there are mandated and independent organisations acting as EOSC members or EOSC observers. All Member States and Associated Countries can apply to become EOSC members, but only one can serve as the mandated organisation of a country. The mandated organization is nominated by the government of the respective country. On the other hand, EOSC Observers are outside the EU Framework Programme for Research and Innovation.

Eligible organisations to join EOSC Association fall into one or more of the following categories:

- research funding organisations,

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[24] https://www.eoscsecretariat.eu/news-opinion/major-milestone-eosc-association-born
[25] https://www.eoscsecretariat.eu/sites/default/files/eosc_statutes.pdf

- research performing organisations,
- service providing organisations,
- other organisations such as libraries, National Open Science Cloud Initiatives and other national initiatives, European Agencies and Standardization Bodies.

All organisations, should be established as legal entities, confirm in writing that they embrace and endorse the vision of the Association, adhere to its values and have a substantial and significant interest in, and potential contribution to or impact on EOSC.

The General Assembly is the supreme authority of EOSC Association responsible among other things for bylaws, membership and fees, followed by the Board of Directors, "who are appointed in their individual capacity, from amongst the Delegates of the General Assembly". The Secretariat advises and supports both governance bodies, whilst there may be additional operational and/ or advisory bodies or individuals facilitating the fulfilment of the Association's mission, including auditing activities.

As described above, there are many different categories of organisations that are eligible for becoming members of EOSC Association. Among several different models of national initiatives, NOSCIs can serve as the best-case scenario for the participation into the EOSC Association and facilitate its governance. Nevertheless, the described model of NOSCIs can be adapted and support different types of national initiatives and different types of membership.

Moreover, NOSCIs can be proven exceptionally useful in preparing all national stakeholders for this next phase of EOSC, among other things by spreading awareness and communicating EOSC developments to and from national for a and by coordinating national activities that enable interconnection with the EOSC at technical, policy and governance levels. Moreover, NOSCIs contribute to EOSC Governance and facilitate its operation both internally and externally. Internally, with being the legal representatives of the EOSC Association and contributing to its activities spanning from advisory to auditorial. Externally, with organising the community under a collaborative schema and undertaking preparatory activities for harmonising EOSC practices.

3. Current status and approaches in SEE

During the past year there have been several landscaping efforts initiated from various sides aiming at creating a consolidated picture of the current status in OS and OSC initiatives in Europe. Many of these landscaping activities are ongoing trying to follow up the continuously changing landscape in OSC as progress occurs through the numerous WG, TF and related projects activities in both trans-European and national efforts. All these landscaping activities have made efforts in capturing all the complementary aspects arising in this fast-moving environment, trying to provide current standing, trends and different approached in member states.

This report is an attempt to gather and consolidate all findings from other efforts (including initiatives), the Landscape WG report, OpenAIRE findings and most recent internal survey results and discussions with most partners from NI4OS-Europe as they are considered key [26]. In an effort to merge and categorise all this information in a manner to address and reflect collected data to key aspects of EOSC establishment, relevant information is presented in four areas. Specifically, status is presented with regards to

- related existing (or not) policy or legislation attempts including involved consulting parties,
- training considered essential for the development or progress of national OSC initiatives in each member state,
- services available on national levels, being considered for EOSC onboarding and promoted to pan-European coverage, and
- collaboration with EOSC details including GB delegates, EB representatives, mandated organisations and selected EOSC pillars.

Training related information is considered important for capacity building in the area, therefore condensed information is provided including the most important training needs in each MS, EOSC related training requested via NI4OS-Europe and training and support offered by various institutions/organisations in each MS. Regarding services, information is provided about the kind/focus of services offered by organisations, targeted user groups, service support availability, status for EOSC integration level, existence of associated IPR policies and access restrictions to these services. It has to be mentioned that most of organisations that responded to NI4OS-Europe survey indicated that they do not provide any services to the research community. Finally, regarding the EOSC pillars, we provide information about the ones that are relevant for the majority of the NI4OS-Europe countries, as representation to some of them is rather marginal.

The main sources used to extract the information presented in the following tables are:

i.   The EOSC Governance Board Country delegates paper[27].
ii.   OpenAIRE NOADs from website pages[28].

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[26] They have acquired LoS from their respective Ministries in each Member State.

[27] Version 15.0 (2020-06-11):
https://docs.google.com/viewer?url=https%3A%2F%2Fec.europa.eu%2Fresearch%2Fopenscience%2Fpdf%2Fec_rtd_eosc-governance-board-delegates.pdf
[28] OpenAIRE NOADs: https://www.openaire.eu/contact-noads

iii.   The EOSC Landscape Working Group[29] collected country-sheets.
iv.   NI4OS-Europe landscaping study: D2.1 Stakeholder map, inventory and policy matrix[31].
v.   NI4OS-Europe plan of training events and training modules: D6.2 Training plan[9].
vi.   NI4OS-Europe May-June 2020 survey among consortium partners outcomes.

The chapter below presents the NI4OS-Europe country-profiles in alphabetical order.

3.1. Albania

Policy

Currently there is no OA/OS policy and there are not any institutional OA/OS policies widely used yet but according to the "The Open Government Partnership Third Open Government National Action Plan for Albania 2016-2018", the Albanian government will be committed to maximize access to research information resulting from public and private funds. Thus, the development, adoption and promotion of Open Science standards are in the Albanian agenda. A National OS/OSC initiative does not exist yet. Albania is making progress towards OS policy and OSC by requiring an approved Open Access Policy Regulation document when submitting applications to receive research grants from public funds. They are creating e-infrastructure trying to move towards OSC like the "Database for Archiving and Publication of Research Funds and Programs in Albania (AL0049)"[30], "Opendata.tirana.al" the first open data portal in Albania and the RASH e-infrastructure is interconnected with GÉANT Network. Albanian response to NI4OS-Europe survey[31] indicated a little familiarity with EOSC and minimum familiarity with FAIR. A discussion has recently been initiated with the Ministry of Education (vice Minister for HE), assessing the possibility for an OS framework in Albania. This initial discussion was between the Ministry of Education and RASH, but part of the proposed working group will also be experts from NASRI[32] and universities.

Training

Albania indicated[33] several maximum valued topics for FAIR related training including: training others, including PhD students, Data analytics and statistical techniques, Finding and reusing data, documenting data or code to make it FAIR, Using or developing tools/services. EOSC related trainings will include topics on how to use the onboarded services, including thematic services. Regarding training and support provided by organisations in the areas of Repositories, research data, publishing platforms, PIDs, licenses, IPR, article/book processing charges, Open-source software, open education resources and open practices the majority of organisations that responded to the NI4OS-Europe survey answered either negatively or that they plan to do so in the future.

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[29] EOSC landscape WG: https://www.eoscsecretariat.eu/working-groups/landscape-working-group
[30] Creating a Database for Archiving and Publication of Research Funds and Programs in Albania (AL0049): https://www.opengovpartnership.org/members/albania/commitments/AL0049/
[31] NI4OS-Europe deliverable D2.1: https://zenodo.org/record/3736129#.XoYNoIgzY2w
[32] National Agency for Scientific Research and Innovation
[33] NI4OS-Europe deliverable D6.2: https://zenodo.org/record/3736155#.XoYM1YgzY2w

Services

There were no user groups defined nor policies about user access to such services. In addition there is no service support implemented nor IPR policy. There is currently no support for integration of services in EOSC.

EOSC collaboration

The organisations responded to NI4OS-Europe survey showed interest in contributing to EOSC. Current picture of EOSC collaboration includes:

- GB delegate: Geron Kamberi from Ministry of Education & Sport
- Mandated organisation: No, but RASH[34] will apply to be the mandate organization.
- Participation in EOSC pillars: **OpenAIRE:** Arjan Xhelaj from RASH (NOAD), **NGI:** - **RDA:** -, **GEANT**: Arjan Xhelaj and Andi Malaj both from RASH

3.2. Armenia

Policy

Byurakan Astrophysical Observatory, Institute of Geological Sciences, National Academy of Sciences; Fundamental Scientific Library of the National Academy of Sciences; and Yerevan State University mentioned in the NI4OS survey that they defined clear policies for the dissemination of and open access to scientific publications resulting from publicly-funded research. And Fundamental Scientific Library of the National Academy of Sciences and National Polytechnic University of Armenia mandated software sharing under open licenses.
Armenian State University of Economics, Yerevan Brusov State University of Languages and Social Sciences, Yerevan State Medical University, Yerevan State University and the Ministry of Education, Science, Culture & Sport of Republic of Armenia are drafting institutional and national policies as a part of Erasmus+ project "Strengthening Research Management and Open Science Capacities of HEIs in Moldova and Armenia" (MINERVA).

Training

Armenia indicated "Raising awareness about FAIR principles" as the most important topic for FAIR related training in the country. EOSC related trainings will include topics on how to use the onboarded services, including thematic services. Regarding training and support provided by organisations in the areas of Repositories, research data, publishing platforms, PIDs, licenses, IPR, article/book processing charges, Open-source software, open education resources and open practices less than half of organisations that responded to the NI4OS-Europe survey indicated that they provide some form of training/support while a few more answered that they plan to do so in the future. MINERVA project[35] trained 20 Open Science train-the-trainers.

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[34] The Academic Network of ALBANIA

[35] http://www.minerva-project.space/index.php/en/

Services

One organization responded to NI4OS-Europe survey indicated that provides data infrastructures for research data. This service provider provides services for user groups on all scientific disciplines without any access restrictions on user groups or geographic area. In addition, service support is provided in the form of a helpdesk, during normal working hours. The services provided (data related) do not currently have any associated IPR policies. Currently the service provider reported no support for integration of services in EOSC.

EOSC collaboration

IIAP NAS RA drives EOSC developments in the country. The organisations responded to NI4OS-Europe survey showed interest in contributing to EOSC. Current picture of EOSC collaboration includes:
GB delegate: -
Mandated organisation: To be appointed
Participation in EOSC pillars: **OpenAIRE:** IIAP NAS RA, **NGI:** Hrachya Astsatryan, IIAP NAS RA, **RDA:** -, **GEANT**: Vladimir Sahakyan and Hrachya Astsatryan both from ASNET-AM

3.3. Bosnia and Herzegovina

Policy

Currently there is no OA/OS policy and there are not any institutional OA/OS policies widely used. There are no plans/roadmap for establishing a policy yet. Bosnia-Herzegovina is joining the open government partnership with a 2019-2021 plan in order to cover several challenges[36]. An official document was drafted to set the points of action "ACTION PLAN OF THE COUNCIL OF MINISTERS OF BOSNIA AND HERZEGOVINA FOR THE IMPLEMENTATION OF THE INITIATIVE "OPEN GOVERNMENT PARTNERSHIP " FOR THE PERIOD 2019 – 2020". Point n°4 of the document mentioned above addresses the problem of open data in the country and sets a plan in order to increase availability, openness and use of official statistical data. There is lately an attempt to create momentum for discussions about a national OSC initiative that involves the members of the academic community, policy makers, namely the Ministry of Civil Affairs and Ministries of Science and Education of Entities. In addition, in the Republic of Srpska, the "Law on scientific research and technological development" recognizes open science as one of the key principles of scientific research. Bosnia and Herzegovina representatives are members of Working Group on Open Science and Research and Innovation in the Western Balkans and participate in meeting of the Commission expert group on National Points of Reference on Access to and Preservation of Scientific Information. In addition, representatives of Bosnia and Herzegovina participated at the Brussels Meeting in January 2020 where a draft version of the Protocol on Open Access to Research Infrastructure in the Western Balkans was presented. Recognizing the importance of Research Infrastructures, including e-infrastructures, as the core of the

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[36] Strengthening institutional integrity, more efficient public resource management, improving public services through the application of open data, increasing transparency of institutions, and improving co-operation and greater involvement of civil society in policymaking.

knowledge triangle of research, education and innovation and their crucial role towards open, inter-connected, data driven and computer intensive research, as well as education and training, Regional Cooperation Council has identified B&H stakeholders that would be included in the process of adoption of the aforementioned Protocol.

Training

Bosnia – Herzegovina indicated "Sharing data" as the most important topic for FAIR related training in the country. EOSC related trainings will include topics on how to use the onboarded services, including thematic services. Regarding training and support provided by organisations in the areas of Repositories, research data, publishing platforms, PIDs, licenses, IPR, article/book processing charges, Open-source software, open education resources and open practices about half of organisations that responded to the NI4OS-Europe survey indicated that they provide some form of training/support while most of the rest answered that they plan to do so in the future.

Services

Three organisations responded to NI4OS-Europe survey indicated they provide data infrastructures for research data, two that they provide high-bandwidth networks for research data and one that offers project planning and management services, as well as knowledge/technology transfer. Most of these service providers provide services for user groups on all scientific disciplines and do not enforce policies about user access to their services. In addition there is no service support implemented by the majority of service providers nor IPR policy. There is currently no support for integration of services in EOSC.

EOSC collaboration

The organisations responded to NI4OS-Europe survey showed interest in contributing to EOSC. Current picture of EOSC collaboration includes:

- GB delegate: -
- Mandated organisation: To be appointed
- Participation in EOSC pillars: **OpenAIRE**: 2 institutions are joining OpenAIRE - University of Banja Luka with Dragana Radulović (NOAD) and CREDI (small NGO) - The Centre for Development Evaluation and Social Science Research. CREDI hosts and manages the DASS-BiH – a national data repository that preserves & disseminates social science research data, **NGI**: -, **RDA**: -, **GEANT**: -

3.4. Bulgaria

Policy

Currently there is no OA/OS policy and there are not any institutional OA/OS policies widely used, in general research organizations try to follow European related polices. The National strategy for the development of scientific research 2017 – 2030 includes an Implementation plan – phase I (act. point 6) which indicates open access to scientific information as a strategic action point. Also, national concept for open access to scientific information (draft), outlines the essence and framework of open science. There are plans for detailed national policies on open science, consolidating strategic commitments and milestones in a single paper. Universities and organizations are

already being encouraged to adopt open science policies. A document called "Concept for the application of the principle of open access to scientific information" has been developed and is currently being proposed for discussions. The Bulgarian Portal for Open Science - BPOS[37] provides quick and easy access to scientific information and publicly funded research outputs, including resources from institutional open access repositories in Bulgaria and aims to provide coordination and connectivity with other European infrastructures and initiatives, such as OpenAIRE and the European Open Science Cloud. No policy regarding FAIR data yet, but the efforts are towards setting national standards for the description and dissemination of scientific data (at first in the context of the national repository). There are ongoing discussions on OSC initiative and policies. Involved parties include MES[38] and the research organizations partnering in the National Science Program "ICT for Unified Digital Market in Science, Education and Security" (which includes three main areas: the e-infrastructure for open science, the application of digital technologies in education and information security). IICT and IMI are also involved.

Training

Bulgaria indicated "Training others (including PhD students)" as the most important topic for FAIR related training in the country. EOSC related trainings will include topics on how to use the onboarded services, including thematic services. Regarding training and support provided by organisations in the areas of Repositories, research data, publishing platforms, PIDs, licenses, IPR, article/book processing charges, Open-source software, open education resources and open practices more than half of organisations responded to the NI4OS-Europe survey indicated that they provide some form of training/support or are planning to do so in the near future.

Services

Three organisations responded to NI4OS-Europe survey indicated they provide data infrastructures for research data. These service providers provide services for user groups on all scientific disciplines and do not enforce policies about user access to their services or are mainly targeting a national user base. In addition, service support is provided by these service providers in the forms of a helpdesk, a hotline and dedicated service teams. The services provided (data related) are protected by established IPR policies on all providers. Currently almost all service providers indicated some level of support for integration of services in EOSC through local/national/international funded projects.

EOSC collaboration

The organisations responded to NI4OS-Europe survey showed interest in contributing to EOSC. Current picture of EOSC collaboration includes:

- GB delegates: Yanita Zherkova, Yumer Kodzhayumer, Hristiyania Ancheva all from MES.
- Mandated organisation: NACID39 is the mandated organisation in Bulgaria.

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[37] BPOS (https://www.bpos.bg/) is managed by NACID[39]
[38] Ministry of Education and Science
[39] National Center for Information and Documentation

- Participation in EOSC pillars: **OpenAIRE**: IMI-BAS, Peter Stanchev from NACID and the institute of Mathematics and Georgi Simeonov, also from the institute of Mathematics, **NGI**: Todor Gurov and Aneta Karaivanova both from IICT-BAS, IICT-BAS , **RDA**: Maria Nisheva-Pavlova and Ana Proykova both from Sofia University St. Kliment Ohridski, **GEANT**: Roumen Trifonov and Radoslav Yoshinov both from BREN

3.5. Croatia

Policy

The [Croatian Act on Scientific Activity and Higher Education](#) mandates archiving digital versions of all higher education theses in a corresponding academic library repository. The new version of the Croatian Act on Scientific Activity and Higher Education, issued by the Ministry of Science and Education (MSE), supports more broadly and mandates Open Science at national level. Since it is not yet adopted, and from July 2020 there is a new government in place, it is unknown if this will undergo parliament procedure or not. Regarding institutional OA/OS policies widely used, in 2012 a group of representatives consisting of university faculty and research staff, librarians and students presented the "Croatian Open Access Declaration" which has been supported by ministries, HE and research institutions, and many individuals from Croatia and abroad since then.

Training

Croatia indicated "Training others (including PhD students)" and "Raising awareness about FAIR principles" as the most important topics for FAIR related training in the country. EOSC related trainings will include topics on how to use the onboarded services, including thematic services. Regarding training and support provided by organisations in the areas of Repositories, research data, publishing platforms, PIDs, licenses, IPR, article/book processing charges, Open-source software, open education resources and open practices about half of organisations that responded to the NI4OS-Europe survey indicated that they provide some form of training/support and there are a lot more planning to do so in the future.

Services

Four organisations responded to NI4OS-Europe survey indicated they provide data infrastructures for research data, for storing, managing and transporting research data. All of these service providers provide services for user groups on all scientific disciplines and do not enforce policies about user access to their services. In addition, service support is provided by these service providers in the forms of a helpdesk, a hotline and/or dedicated service teams. The services provided (data related) are protected by established IPR policies on all providers. Currently half of the service providers indicated some level of support for integration of services in EOSC through local/national/international funded projects.

EOSC collaboration

The organisations responded to NI4OS-Europe survey showed interest in contributing to EOSC. Current picture of EOSC collaboration includes:

- GB delegate: Ivan Marić from SRCE
- Mandated organisation: No, but SRCE and Rudjer Boskovic Institute could form the EOSC Mandated Organization since they have letters of interest for project proposal NI4OS-Europe signed by the Ministry.
- Participation in EOSC pillars: **OpenAIRE**: Rudjer Boskovic Institute. The national contact point for the open access to the scientific information is Jadranka Stojanovski, appointed by the Croatian Ministry of Science and Education, **NGI**: Representatives in EGI.eu Council are Ivan Marić and Dobriša Dobrenić both from SRCE, **RDA**: Draženko Celjak and Ljiljana Jertec Musap both from SRCE, **GEANT**: Goran Kezunović from CARNET and Ivan Marić from SRCE

3.6. Cyprus

Policy

Cyprus has established an OA/OS policy since 2016. In 2019 a revised draft document of the National policy has been created and is on discussion. The Policy for Open Access to Scientific Information[40] was prepared by the Directorate General for European Programmes, Coordination and Development, in collaboration with the National Documentation Centre (NDC) of Greece, the University of Cyprus and the Research Promotion Foundation. The document's approval was the outcome of collaboration between the different stakeholders involved in the Working Group for Open Access (consisting of the NPR for OA, local Academic institutions and national funders), coordinated by the OpenAIRE Cyprus NOAD[41] and highly supported by the coordinators of the project PASTEUR4OA[42]. The National policy encourages researchers to have their outputs in OA and provides guidelines and support for the implementation of Open Access to research outputs that are funded locally, aligned with the European policies and based on the already established infrastructure in European level (e.g. OpenAIRE). The formation of Institutional Policies is also in progress in Cyprus involving the biggest universities of the country.

Training

Cyprus indicated "Training others (including PhD students)" as the most important topic for FAIR related training in the country. EOSC related trainings will include topics on how to use the onboarded services, including thematic services. Regarding training and support provided by organisations in the areas of Repositories, research data, publishing platforms, PIDs, licenses, IPR, article/book processing charges, Open-source software, open education resources and open practices more than half of organisations that responded to the NI4OS-Europe survey indicated that they provide some form of training/support and a few more planning to do so in the future, while some have no plans yet.

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[40] The policy can be found at: http://opensciencecy.ucy.ac.cy/wp-content/uploads/2019/09/FINAL-EN-National-Policy-for-Open-Access-to-Scientific-Information.pdf

[41] University of Cyprus Library

[42] Open Access Policy Alignment Strategies for European Union Research: https://cordis.europa.eu/project/id/611742

Services

Two organisations responded to NI4OS-Europe survey indicated they provide data infrastructures for research data, for storing, managing and transporting research data. These service providers provide services for user groups on all scientific disciplines and one does not enforce policies about user access to their services, while the other restricts access to communities approved by the funding body. In addition, service support is provided by these service providers in the forms of a helpdesk, a hotline and/or dedicated service teams. The services provided (data related) are protected by established IPR policies on all providers. Currently both of the service providers indicated some level of support for integration of services in EOSC through local/national/international funded projects.

EOSC collaboration

The organisations responded to NI4OS-Europe survey showed interest in contributing to EOSC. Current picture of EOSC collaboration includes:

- GB delegate: Evgenios Epaminondou, Maria Poeti both from Directorate General for European Programmes
- Mandated organisation: To be appointed
- Participation in EOSC pillars: **OpenAIRE**: Sylvia Koukounidou, Natasa Ioannou, Zafeiro Marti all from the University of Cyprus, **NGI**: Marios Dikaiakos and Maria Poveda both from UCY, **RDA**: -, **GEANT**: Dr George Konnis and Vasos Vassiliou, Ph.D. both from CYNET

3.7. Georgia

Policy

Shota Rustaveli National Science Foundation expressed commitment to coordinate national Open Science policy development and the drafting work is ongoing.
Georgian Technical University, National Environmental Agency, Akaki Tsereteli State University and Ilia State University mentioned in the NI4OS survey that they defined clear policies for the dissemination of and open access to scientific publications resulting from publicly-funded research. National Environmental Agency, Ilia State University, Georgian Technical University, Akaki Tsereteli State University and Tbilisi State Medical University defined clear policies for the dissemination of and open access to research data resulting from publicly-funded research. And The University of Georgia, National Environmental Agency and Akaki Tsereteli State University mentioned that they mandated software sharing under open licenses.

Training

Georgian Integrated Library & Information System Consortium (GILISC) organize open science training events for researchers, research administrators and librarians. And Tbilisi State University expressed interest in launching online training for PhD students on Open Science, Research Data Management, data protection and ethics and open licensing.
Georgia indicated "Raising awareness about FAIR principles" as the most important topic for FAIR related training in the country. EOSC related trainings will include topics on how to use the onboarded services, including thematic services. Regarding training and

support provided by organisations in the areas of Repositories, research data, publishing platforms, PIDs, licenses, IPR, article/book processing charges, Open-source software, open education resources and open practices more than half of organisations that responded to the NI4OS-Europe survey indicated that they provide some form of training/support and a few more planning to do so in the future, while some have no plans yet.

Services

Four organisations responded to NI4OS-Europe survey indicated they provide data infrastructures for research data, for storing, managing and transporting research data. These service providers provide services for user groups on all scientific disciplines and one does not enforce policies about user access to their services, while the others restricts access to members of certain communities or organisations or according to established contracts. In addition, service support is provided by these service providers in the forms of a helpdesk, a hotline and/or dedicated service teams. The services provided (data related) are protected by established IPR policies on half of the providers. Currently one of the service providers indicated some level of support for integration of services in EOSC through dedicated staff.

EOSC collaboration

The organisations responded to NI4OS-Europe survey showed interest in contributing to EOSC. Current picture of EOSC collaboration includes:

- GB delegate: Zviad Gabisonia Shota Rustaveli National Science Foundation
- Mandated organisation: To be appointed
- Participation in EOSC pillars: **OpenAIRE**: GILISC, **NGI**: Temur Maisuradze and Ramaz Kvatadze both from GRENA, **RDA**: -, **GEANT**: Ramaz Kvatadze and Nino Tsulaia both from GRENA

3.8. Greece

Policy

The authority for Research and Innovation falls under three Ministries (Ministry of Development and Investments, Ministry of Digital Governance, Ministry of Education and Religious Affairs) which complicates the establishment of a common legal framework. Since July 2019 an informal working group on Open Science has been formed, which includes representatives of academic and research institutions, research infrastructures, national nodes and Open Science initiatives. The working group published in June 2020 the National Open Science Plan which will serve as the basis for setting up the National Open Science Strategy. Greece's National Digital Strategy will be shortly replaced (in the course of 2020) by the Digital Transformation Bible which will cover the period 2020-2024. The Digital Transformation Bible of the Ministry of Digital Governance includes several actions regarding Open Science policies and contains as a key target the adoption of the National Open Science Strategy.

Training

Greece indicated "Training others (including PhD students)" and "Finding and reusing data" as the most important topics for FAIR related training in the country. EOSC related

trainings will include topics on how to use the onboarded services, including thematic services. Regarding training and support provided by organisations in the areas of Repositories, research data, publishing platforms, PIDs, licenses, IPR, article/book processing charges, Open-source software, open education resources and open practices most of organisations that responded to the NI4OS-Europe survey indicated that they provide some form of training/support and a few more planning to do so in the future, while some have no plans yet but are encouraging staff towards training and support in some or all of the above areas.

Services

Four organisations responded to NI4OS-Europe survey indicated they provide data infrastructures for research data, for storing, managing and transporting research data. These service providers provide services for user groups on all or several scientific disciplines and half do not enforce policies about user access to their services, while the other half restricts access to national users or communities approved by the funding body. In addition, service support is provided by these service providers in the forms of a helpdesk, a hotline and/or dedicated service teams, mainly available during working hours. The services provided (data related) are protected by established IPR policies on half of the providers. Currently half of these service providers indicated some level of support for integration of services in EOSC through local/national/international funded projects.

EOSC collaboration

The organisations responded to NI4OS-Europe survey showed interest in contributing to EOSC. Current picture of EOSC collaboration includes:

- GB delegate: Vassiliki Karavangeli from GSRT, Stelios Sartzetakis from Athena Research & Innovation Center (ATHENA RC)
- Mandated organisation: To be appointed
- Participation in EOSC pillars: **OpenAIRE**: Elli Papadopoulou from ATHENA RC, Iliana Araka from HEAL-Link, **NGI**: Kostas Koumantaros from GRNET, **RDA**: Fotis Karagiannis independent consultant and Elli Papadopoulou from ATHENA RC, **GEANT**: Aristeidis Sotiropoulos and Chrysostomos Tziouvaras both from GRNET

3.9. Hungary

Policy

Currently there is an integrated open science /FAIR data policy in Hungary. However, a working group at National Research, Development and Innovation Office (NKFIH/NRDIO) was established to formulate the policy regarding OS. Responsible for this policy making in the Ministry of Innovation and Technology (ITM/MIT). Also involved are NKFIH/NRDIO and the Governmental Agency for IT Development (KIFÜ) which is responsible for e-infrastructure. OA policies are slowly adopted in Higher Educational Institutes (HEI). The policy in most HEI encourages researchers to deposit all research outputs at the institutional repository and to provide open access upon publication or as soon as possible (respecting publishers' policies). The deposit of PhD and master theses is mandatory (Act CCIV of 2011 on national higher education; about doctoral schools,

the order of doctoral procedures and habilitation). The Open Access policy has been mandatory for all NRDIO funded research since 2014.

The Act LXIII/2012 on Reuse of Public Data regulates the access and reuse of the public sector information (PSI) according to directive 2013/37/EC. The last modification of the directive has not yet been implemented in national law.

Ministerial decree 2/2010 (I. 14) on operating licences was replaced by governmental decree 376/2017 (XII. 11) stipulating requirement to makes mandatory for museums to set up data repositories. The new regulation provides an exact definition for its content and function. Institutional Open Access policies are quite common, both in the non-university research institutes and HEIs, without a high-level policy though. In 2019 the Hungarian node of Research Data Alliance (HRDA) was set up for supporting and developing the research data management in Hungary.

National Electronic Information Service (EISZ) Program operated at Library and Information Centre of Hungarian Academy of Sciences provides access to electronic scientific content for domestic higher education, public collections, and non-profit research by purchasing a national license. EISZ also contributing to the Open Access publishing and discussion in Hungary.

Training

Hungary indicated "Training others (including PhD students)" as the most important topic for FAIR related training in the country. EOSC related trainings will include topics on how to use the onboarded services, including thematic services. Regarding training and support provided by organisations in the areas of Repositories, research data, publishing platforms, PIDs, licenses, IPR, article/book processing charges, Open-source software, open education resources and open practices almost all of organisations that responded to the NI4OS-Europe survey indicated that they provide some form of training/support and a few more planning to do so in the future.

Services

Six organisations responded to NI4OS-Europe survey indicated they provide data infrastructures for research data, for storing, managing and/or transporting research data. These service providers provide services for user groups on all scientific disciplines and most restrict access to national users and communities approved by the funding body. In addition, service support is provided by these service providers in the forms of a helpdesk, a hotline and/or dedicated service teams. The services provided (data related) are protected by established IPR policies on most providers. Currently most of the service providers reported some level of support for integration of services in EOSC through local/national/international funded projects or with dedicated staff.

EOSC collaboration

The organisations responded to NI4OS-Europe survey showed interest in contributing to EOSC. Current picture of EOSC collaboration includes:
- GB delegate: János Mohácsi Governmental Agency for IT Development (KIFÜ), Ágota Dávid Permanent Representation of Hungary to the EU
- Mandated organisation: To be appointed by the Ministry
- Participation in EOSC pillars: **OpenAIRE**: Gyöngyi Karácsony (Hungarian CoNOSC - Council of National Open Science Coordination) and Judit Fazekas-Paragh (Hungarian EOSC Skills and Training WG delegate) both from University

of Debrecen, **NGI**: Robert Lovas from MTA SZTAKI, **RDA**: Judit Fazekas-Paragh and Gyöngyi Karácsony from University of Debrecen, András Holl from Library and Information Centre, Hungarian Academy of Sciences, Robert Lovas, Peter Kacsuk and László Kovács from MTA SZTAKI and János Mohácsi from KIFÜ, **GEANT**: János Mohácsi from KIFU

3.10.   Moldova

Policy

Code on Science and Innovation of the Republic of Moldova, approved in 2004, with amendments in 2018 (No. 259 of 15.07.2004) ensures free and non-discriminatory access to scientific and technological information resources (Articles 54, 57, 79 and 85).

The R&D strategy of the Republic of Moldova (until 2024) includes the development of human, institutional and infrastructure capacities – national R&D infrastructure by 2020, connecting the infrastructure of research local innovation in European networks. It also promotes transparent engagement of citizens and civil society in the development of research topics by facilitating access to scientific knowledge (General Objective 4 - Continuous Dialogue between science and society, the dissemination of knowledge and the implementation in practice of research results). All specific programmes of the national funding framework should include a dissemination component, including free access to research results of end-users, citizens, business, civil society organizations and policy makers.

Moldova is a member of ERAC Standing Working Group on Open Science and Innovation and in 2016 the Council of Europe asked the Working Group to evaluate the actions proposed in the Amsterdam Call for Actions on Open Science in terms of feasibility, effectiveness and prioritization. Moldova contributed to the report with the national perspective and identified the following priorities for Open Science, Open Innovation and cross-cutting issues: covering Open Science costs, open access to research data, stimulating the creation of innovative research-business networks /platforms, assessing the impact of Open Innovation, assessing the social relevance of research, harmonizing national e-infrastructures, protecting personal data vs. Open Access, and Intellectual Property Rights vs. Open Access.

The National Strategy for the Development of the Digital Moldova Information Society 2020 includes the Programme on the creation, development and capitalization of digital content: digital data centers / repositories for local content), development of open data portal, digitization of cultural and scientific heritage and providing access to it.

The Declaration on Open Science in the Republic of Moldova was approved in 2018.

There are 11 institutional Open Access policies and all of them include Creative Commons Attribution (CC BY) license.

Improving access to research data requires institutional policies, but also commitment of researchers. A culture of research data sharing still needs to be developed as well as infrastructure for storing and sharing research data.

Training

Electronic Resources for Moldova (REM) trained researchers, journal editors and publishers, research administrations and librarians on open science.

Moldova indicated "Training others (including PhD students)" as the most important topic for FAIR related training in the country. EOSC related trainings will include topics on how to use the onboarded services, including thematic services. Regarding training and support provided by organisations in the areas of Repositories, research data, publishing platforms, PIDs, licenses, IPR, article/book processing charges, Open-source software, open education resources and open practices most of organisations that responded to the NI4OS-Europe survey indicated that they provide some form of training/support and a few more planning to do so in the future.

Services

15% of organisations responded to NI4OS-Europe survey indicated they provide data infrastructures for research data, for storing, managing and/or transporting research data. These service providers provide services for user groups on all or several scientific disciplines and most do not restrict access to their services. In addition, service support is provided by many of these service providers in the forms of a helpdesk, a hotline and/or dedicated service teams, but also through the user communities. The services provided (data related) are protected by established IPR policies on most providers. Currently most of the service providers reported some level of support for integration of services in EOSC through local/national/international funded projects.

EOSC collaboration

The organisations responded to NI4OS-Europe survey showed interest in contributing to EOSC. Current picture of EOSC collaboration includes:

- GB delegate: Viorica Boaghi from the National Agency for Research and Development
- Mandated organisation: RENAM
- Participation in EOSC pillars: **OpenAIRE:** -, **NGI**: Petru Bogatencov and Nicolai Iliuha both from RENAM, **RDA:** -, **GEANT**: Petru Bogatencov and Grigore Secrieru both from RENAM

3.11.   Montenegro

Policy

Currently there is no OA/OS policy. Ministry of Science is planning to start the process of creating a policy by the end of 2020, with a horizon of development until 2022. A national OSC exists and has been initiated by the Ministry of Science involving the University of Montenegro and other Ministries with the scope of creating a strategy for OS. Additionally, the Ministry of Science has appointed an external advisor, Mojca Kotar from Slovenia, as an official contact to support the process. The joint efforts resulted in the release of the first strategic document related to Open Science in Montenegro, the "Programme of Implementation of Open Science Principles in Montenegro with the Action Plan (2020–2022)". The document was adopted by the Government of Montenegro on June 25, 2020 and it is currently available only in Montenegrin. Other Ministries and national stakeholders in research and academia are expected to be involved in the open consultation. Most mature area of OS is considered to be OA, but it is still lacking a national repository and services to support its FAIRness and EOSC compatibility.

Training

Montenegro indicated "Finding and reusing data" and "Raising awareness about FAIR principles" as the most important topic for FAIR related training in the country. EOSC related trainings will include topics on how to use the onboarded services, including thematic services. Regarding training and support provided by organisations in the areas of Repositories, research data, publishing platforms, PIDs, licenses, IPR, article/book processing charges, Open-source software, open education resources and open practices almost all of organisations that responded to the NI4OS-Europe survey answered either negatively or that they plan to do so in the future.

Services

Three organisations responded to NI4OS-Europe survey indicated they provide data infrastructures for research data, for storing, managing and/or transporting research data. These service providers provide services for user groups on all scientific disciplines and most restrict access to national users and communities approved by the funding body. In addition, service support is provided by these service providers in the forms of a helpdesk, during work hours. The services provided (data related) are protected by established IPR policies on some providers. Currently all of the service providers reported no support for integration of services in EOSC.

EOSC collaboration

The organisations responded to NI4OS-Europe survey showed interest in contributing to EOSC. Current picture of EOSC collaboration includes:

- GB delegate: Sasa Ivanovic from Ministry of Science
- Mandated organisation: To be appointed
- Participation in EOSC pillars: **OpenAIRE**: University of Montenegro became an OpenAIRE member recently, **NGI**: -, **RDA**: -, **GEANT**: Miodrag Zarubica and Vladimir Gazivoda both from MREN

3.12.   North Macedonia

Policy

Currently there is no OA/OS policy, but there are plans for creating one. These will be part of the upcoming ESFRI and other related roadmaps. Open Data policy is not institutionally recognized yet, and the awareness and interest by Macedonian academics and relevant institutions towards OA is still limited[43]. Despite the lack of Open Access policies (indeed, there are currently no OA policies registered in ROARMAP (The Registry of Open Access Repository Mandates and Policies), many initiatives have taken place in the recent years. There are currently ongoing/open discussions about a national OSC initiative between Ministry of Education and Science, responsible for research and Ministry of Information Society which is responsible for e-Infrastructures. Other parties

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[43]http://www.unesco.org/new/en/communication-and-information/portals-and-platforms/goap/access-by-region/europe-and-north-america/republic-of-macedonia/

involved in the discussions include Representatives from the government and academia and representatives from UKIM.

Training

Republic of North Macedonia indicated "Training others (including PhD students)" as the most important topic for FAIR related training in the country. EOSC related trainings will include topics on how to use the onboarded services, including thematic services. Regarding training and support provided by organisations in the areas of Repositories, research data, publishing platforms, PIDs, licenses, IPR, article/book processing charges, Open-source software, open education resources and open practices almost all of organisations that responded to the NI4OS-Europe survey indicated that they provide some form of training/support and a few more planning to do so in the future.

Services

Twelve organisations responded to NI4OS-Europe survey indicated they provide data infrastructures for research data, for storing, managing and/or transporting research data. These service providers provide services for user groups on several or all scientific disciplines and most restrict access to national users and communities approved by the funding body. In addition, service support is provided by these service providers in the forms of a helpdesk, a hotline and/or dedicated service teams. The services provided (data related) are protected by established IPR policies on most providers. Currently almost all of the service providers reported some level of support for integration of services in EOSC through local/national/international funded projects or with dedicated staff.

EOSC collaboration

The organisations responded to NI4OS-Europe survey showed interest in contributing to EOSC. Current picture of EOSC collaboration includes:

- GB delegate: Svetlana Pineva, Ministry of Education and Science and Anastas Mishev, UKIM
- Mandated organisation: To be appointed
- Participation in EOSC pillars: **OpenAIRE**: UKIM has signed the statutes for joining OpenAIRE recently, **NGI**: Boro Jakimovski from UKIM, **RDA**: -, **GEANT**: Sasko Mukaetov from MARnet and Anastas Mishev from UKIM

3.13.   Romania

Policy

Currently there is no OA/OS policy, but there are plans for creating one. UEFISCDI through the Open Science Hub Romania (OSHRO) and in collaboration with the Ministry of Education and Research (MEC) is developing the national strategic framework for Open Science. On November 2018 The Romanian government approved the National Action Plan 2018-2020 for Open Government Partnership (NAP 2018-2020). Between the main topics of the document there are "Open access to research results, open education, measuring the impact of re-use open data and publication of open data". Before the NI4OS project start, MEC mandated the two partner organizations

participating in the project – UEFISCDI, coordinated by MEC and ICI Bucharest, coordinated now by the General Secretariat of the Government (GSG) – to implement actions related with the national OSC setup, according with the overall action framework adopted at the SEE region level.

Training

Romania indicated "Raising awareness about FAIR principles" as the most important topic for FAIR related training in the country. In addition, the majority of respondents to the Country landscape survey declared that they are not familiar / not very familiar with the current EOSC implementation. EOSC related trainings will include topics on how to use the onboarded generic and thematic services. Regarding training and support provided by organisations in the areas of repositories, research data, publishing platforms, PIDs, licenses, IPR, article/book processing charges, open-source software, open education resources and open practices almost half of organisations that responded to the NI4OS-Europe survey indicated that they provide some form of training/support and a few more planning to do so in the future.

Services

Four organisations responded to NI4OS-Europe survey indicated they provide data infrastructures for research data, for storing, managing and/or transporting research data. These service providers provide services for user groups on several or all scientific disciplines and most do not restrict access to the use of their services. In addition, service support is provided by some of these service providers in the forms of a helpdesk, a hotline and/or dedicated service teams. The services provided (data related) are protected by established IPR policies on most providers. Currently all of the service providers reported no support for integration of services in EOSC.

EOSC collaboration

The organisations responded to NI4OS-Europe survey showed interest in contributing to EOSC. Current picture of EOSC collaboration includes:

- GB delegate: Dragos Barbu, Sorin Constantinescu from Ministry of Communications and Information Society and Iulia Mihail from Ministry of Research and Innovation
- Mandated organisation: To be appointed
- Participation in EOSC pillars: **OpenAIRE**: Alina Irimia, Mihaela Cucu both from UEFISCDI, **NGI**: Mihnea Dulea from Horia Hulubei National Institute for Physics and Nuclear Engineering, **RDA**: Marius Dorian Nicolaescu and Alina Irimia both from UEFISCDI, **GEANT:** Mihai Bărbulescu **from** National Authority for Scientific Research and Octavian Rusu, Valeriu Vraciu from RoEduNet

3.14.   Serbia

Policy

Currently there is an OA/OS policy in place, adopted in 2018. The policy was drafted by a dedicated working group appointed by the Ministry of Education, Science and Technological Development (MESTD) based on a community-driven initiative. On 8 July 2019, the Serbian government passed a new law on science and research that

recognizes open science as a fundamental principle of science and research (Article 4). The law regards open access to research publications and data. A national fund for science has recently been established and it may be expected that its policies will conform to the national Open Science Platform adopted by MESTD, just like the institutional policies are (or will be) aligned with it. The research funding and organization system is now in a phase of transition. The policy covers publications and data and is planned to be updated with links to EOSC. The Team for Open Science in Serbia (TONuS), was established in 2020 in order to identify and define all improvements, measures and regulations related to OS, and to ensure the implementation. Along with the national policy, about 15 institutions have their own institutional OS policies[44].

Training

Serbia indicated "Training others (including PhD students)" as the most important topic for FAIR related training in the country. EOSC related trainings will include topics on how to use the onboarded services, including thematic services. Regarding training and support provided by organisations in the areas of Repositories, research data, publishing platforms, PIDs, licenses, IPR, article/book processing charges, Open-source software, open education resources and open practices almost half of organisations that responded to the NI4OS-Europe survey indicated that they provide some form of training/support and a few more planning to do so in the future.

Services

Three organisations responded to NI4OS-Europe survey indicated they provide data infrastructures for research data, for storing, managing and/or transporting research data. These service providers provide services for user groups on several or all scientific disciplines and do not restrict access to the use of their services. In addition, service support is provided by some of these service providers in the forms of a helpdesk and/or dedicated service teams. The services provided (data related) are protected by established IPR policies on most providers. Currently all of the service providers reported some level of support for integration of services in EOSC through local/national/international funded projects or with dedicated staff.

EOSC collaboration

The organisations responded to NI4OS-Europe survey showed interest in contributing to EOSC. Current picture of EOSC collaboration includes:

- GB delegate: Prof. Dr. Vladimir Crnojević from Institute BioSense and Prof. Dr. Vladimir Popović
- Mandated organisation: To be appointed
- Participation in EOSC pillars: **OpenAIRE**: Biljana Kosanovic from University of Belgrade, **NGI**: Antun Balaz and Dusan Vudragovic both from IPB, **RDA**: -, **GEANT:** Bojan Jakovljevic and Slavko Gajin both from AMRES

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[44] The information is available on ROARMAP: http://roarmap.eprints.org/view/country/688.html

3.15.   Slovenia

Policy

Currently there is an OA/OS policy in place, adopted in 2015. The Government of the Republic of Slovenia has on September 3rd 2015 adopted the National Strategy of Open Access to Scientific Publications and Research Data in Slovenia for the period to 2020 together with National strategy of open access to scientific publications and research data in Slovenia 2015-2020[45]. Two years later, the government strategy was followed by the publication of the Action plan in May 2017, which sets its focus on open data. At the national level, the Ministry of Education, Science and Sport is responsible for developing open science policies. In 2020, the current strategy papers will be complemented by access and preservation of research data, which will also include FAIR data provisions and links to EOSC. In order to support the further development of open science in 2021, we plan to fund: a) transition to the FAIR data principle, b) establishing a national long-term repository for research data, c) co-financing the work of the national open science community. Slovenia has a national OSC initiative led by the University of Maribor Library appointed by the Ministry of Education, Science and Sport. In the near future, relevant Slovenian open science stakeholders will be invited to join the OS community in Slovenia on the basis of voluntary membership. There is also a relevant website is in preparation[46]. University of Maribor Library together with Arnes are preparing the concept of the website portal, our Library is also preparing the rules of participation and other stakeholders cooperate with us in promoting the EOSC services. The main goal is to connect most OS stakeholders, the most important are OpenAIRE and RDA Node, to establish national helpdesk and to offer the end users Slovenian services like EOSC Marketplace.

Training

Slovenia indicated "Raising awareness about FAIR principles" as the most important topic for FAIR related training in the country. EOSC related trainings will include topics on how to use the onboarded services, including thematic services. Regarding training and support provided by organisations in the areas of Repositories, research data, publishing platforms, PIDs, licenses, IPR, article/book processing charges, Open-source software, open education resources and open practices almost half of organisations that responded to the NI4OS-Europe survey indicated that they provide some form of training/support and a few more planning to do so in the future.

Services

Five organisations responded to NI4OS-Europe survey indicated they provide data infrastructures for research data, for storing, managing and/or transporting research data. These service providers provide services for user groups on several or all scientific disciplines and in their majority do not restrict access to the use of their services. In addition, service support is provided by some of these service providers in the forms of

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[45] http://mizs.arhiv-spletisc.gov.si/fileadmin/mizs.gov.si/pageuploads/Znanost/doc/Zakonodaja/Strategije/National_strategy_for_open_access_21._9._2015.pdf

[46] in cooperation with Arnes, NI4OS-Europe partner.

a helpdesk, a hotline and/or dedicated service teams. The services provided (data related) are protected by established IPR policies on most providers. Currently most of the service providers reported some level of support for integration of services in EOSC through local/national/international funded projects or with dedicated staff.

EOSC collaboration

The organisations responded to NI4OS-Europe survey showed interest in contributing to EOSC. Current picture of EOSC collaboration includes:

- GB delegate: Jan Jona Javorsek from Jožef Stefan Institute and Peter Sterle from Ministry of Education, Science and Sport
- Mandated organisation: To be appointed
- Participation in EOSC pillars: **OpenAIRE**: Mojca Kotar from University of Ljubljana, **NGI**: Jan Jona Javorsek from JSI, **RDA**: Janez Štebe from University of Ljubljana, Social science data archives, Irena Vipavc Brvar from Slovene Social Science Data Archive (UL-FDV), Maja Dolinar from Social Science Data Archives (ADP), **GEANT:** Marko Bonač and Avgust Jauk both from ARNES

4. Blueprint

This chapter describes the main contents of the Blueprint for the establishment of the National Open Science Cloud Initiatives (NOSCIs). Specifically, it presents indicative indicators to measure the progress of the NOSCIs establishment, the workflow for setting-up the initiatives, as well as their operational aspects.

The blueprint takes stock of the models explained in chapter 2 to present the building blocks of an Open Science ecosystem whilst ensuring its connection to the EOSC. The building blocks set a framework for policies, governance mechanisms, standards and principles of engagement for providers and users.

The advantage of the proposed model is that the Blueprint can be further customized by any Member State and Associated Country and can be used as a valuable tool to advance national OSC, support the establishment of different types of national initiatives at different levels of maturity, monitor their progress and facilitate the governance of EOSC.

4.1.Indicators

The various landscaping activities (e.g. the ones by the Landscape WG and the INFRAEOSC-5b projects) have revealed the different levels of Open Science and EOSC readiness across the European Countries. This sparked a discussion among EOSC stakeholders and EOSC supporting projects about the necessity of having an accurate understanding of the status of EOSC readiness in each country, but also about the methodology and steps that are needed to measure it. This is important not only to understand the starting point for setting up national initiatives supporting EOSC, but also to monitor the progress of EOSC within each Member State.

The definition of the areas the indicators and metrics should cover as well as the elements they should include, are in the core of the related discussion.

Previous efforts in the SEE region have also proposed a set of metrics in relation to the setting up of national grid initiatives. Considering the close relation (thematic but also formative) to the current endeavours for setting up National Open Science Cloud Initiatives, the outcomes of these efforts can provide useful insights and recommendations.

For the SEE-GRID project series key factors for the project success were the set-up of the National Grid Initiatives (NGI) metrics specification and the proposed steps to set-up an NGI. The full list can be found in Appendix B.

The document "A working proposal for living indicators to monitor MS progresses towards EOSC Readiness"[47] reflects the current status of discussions and recommendations coming from the INFRAEOSC-5b projects. This working document is the result of the discussions

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[47]

https://www.eoscsecretariat.eu/sites/default/files/working_proposal_for_living_indicators_to_monitor_ms_progresses_towards_eosc_readiness.pdf

within the Landscaping Task Force[48] and the input received during a workshop, organized within the EOSChub Week in May 2020, on the topic "National Policy Development Supporting the EOSC Implementation".

The workshop was an opportunity to validate the idea of EOSC maturity assessment, present the set of metrics collected and receive input by the community through online voting. A remarkable 96% of the participants agreed on the necessity and usefulness of readiness indicators to monitor the progress of EOSC at the level of member states. In terms of focus of indicators, the apparent option is to categorise them by referring to the EOSC Working Groups topics. This is an open and ongoing discussion among the INFRAEOSC-5b projects, which results will be, hopefully, reflected in the updated version of the rules of participation that are underway. The full list of proposed indicators can be found in Appendix C.

The Blueprint proposes an indicative set of metrics that may be used for the assessment of the status and progress of the NOSCI in the region. The proposed indicators are in line with the EOSC Readiness Indicators and may be used as a guide to complement the establishment and operation of a NOSCI. Current work should be rather seen as the starting point for establishing an assessment framework, and not as a ready to adopt solution. The framework should be both, agile and expandable to successfully address any countries-specific needs.

The metrics are categorized in four distinct categories.:

- The first category: NOSCI organization is focused on organizational, administrative and legal aspects of the NOSCI.
- The second category: Infrastructure is focused on the core infrastructure aspects: the infrastructure itself and its operations.
- The third category: Training and Skills assesses the nature and spread of the training activities within the NOSCI community.
- The fourth category: Sustainability and international collaboration is focused on financial issues related to long-term sustainability of the NOSCI, as well as its relationship with international organizations, specifically in terms of sustainability at European level.

All four main categories have been accompanied by sub-categories of indicators that provided a higher granularity.

A. NOSCI organization
    1.a. Set-up metrics
        1.a.1. NOSCI established [Yes [Date]/No]
        1.a.2. NOSCI initiating body [Name, Type]
        1.a.3. NOSCI set-up document [Description, URL]
        1.a.4. NOSCI mandate duration [Period/Date]
        1.a.5. NOSCI set-up event carried out [Date, Type of event]
    1.b. Organizational metrics

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[48] With representatives of EOSCPillar, EOSC-Nordic, NI4OS-Europe, EOSC Synergy, ExPaNDS and FAIRsFAIR

1.b.1. Form of organization: [task force / consortium / national programme /professional association / standalone organization / legal entity / other]

1.b.2. Nomination of the representative [Description / Name, Date]

1.b.3. Establishment of the Coordination body / decision making mechanism [Name, Description]

1.b.4. NOSCI recognition at the national level [Document, Date]

1.c. Membership

1.c.1 Membership: number of organizations [number]

1.c.2 Membership: type of organizations [Number of: Academic / Research / Non-profit/ Commercial/ Other Organizations]

1.d. NOSCI Documents

1.d.1. National OSC Strategy document existence (Yes [(URL, Date of Establishment]/No)

1.d.2. Strategic roadmap (Yes [(URL, Date of Establishment]/No)

1.d.3. National / Institutional policies around Open Science (Yes [Content, URL, Date of latest update]/No)

B.   Infrastructure & Services

2.a. Infrastructure metrics

2.a.1.Number and Type of infrastructures (Number and Type [National Roadmap infrastructures (ESFRIs), Other national e-infrastructures, Other Research Infrastructures])

2.a.2.Access policies in place (Yes (URL, Date of establishment/latest update]/No)

2.a.3.Number of CPU cores [number]

2.a.4.Storage size [number in TB]

2.b. Services metrics

2.b.1.Number of services offered [number/type of services (generic, thematic, operational)]

2.b.2.Enrolled services [number/position in MVE (EOSC-Exchange/EOSC-Core)]

2.b.3.National SLAs in place [number]

2.b.4.Integration with national AAI federation [number]

2.b.5.Services following the FITSM [number/type of services (generic, thematic, operational)]

2.b.6.FAIR-enabling services [number/type of services (generic, thematic, operational)]

2.c. Operational metrics

2.c.1.National (regional) registry or other federation mechanisms for data in place/planned (Yes [URL, Date of Establishment]/No)

2.c.2.National SLA monitoring [Yes/No]

2.c.3.National Open Science portal [Yes/No]

2.c.4.National Open Science helpdesk [Yes/No]

2.c.5.National Open Science monitoring [Yes/No]

2.c.6.National AAI federation availability [Yes/No]

2.c.7. Security and privacy policies in place (Yes [URL, Date of establishment/ latest update]/No)

2.c.8. Preservation policies in place (Yes [URL, Date of establishment/ latest update]/No)

C. Training & Skills

3.a. Community Metrics

3.a.1 National/regional curricula in place/planned (Yes [Description]/No)

3.a.2. Basic training available for researchers & research support staff (eg. National Competence centers) (Yes [(Description]/No)

3.a.3. Number of trained people per year [Number, Thematic coverage]

3.a.4. Number of training material [Number, Thematic coverage]

D. Sustainability and international collaboration

4.a. Funding Metrics

4.a.1. National Fund for OS/OSC in place/ planned [Yes/ No]

4.a.2. Funding: national OSC project [type: infrastructure/software/services/data/skills; total funds; total FTEs; Duration].

4.a.3. Funding: International and European OSC Projects (type: infrastructure/software/services/data/skills; total funds; total FTEs: number; Duration).

4.a.4. Sustainability plan in place / planned [Yes/ No]

4.b. Metrics concerning membership in international bodies / fora:

4.b.1. EOSC Association participation (Yes/No)

4.b.2. EOSC pillars participation (Yes [Description, Date of Admission] /No)

4.b.3. Other (Yes [Description, Date of Admission]/No)

4.2. Workflows for setting up National OSC Initiatives

The setting up of National Open Science Cloud Initiatives cannot be a linear process. Country- or community-specific considerations must be taken into account. The landscaping exercise performed for our region by NI4OS-Europe project and the Landscape Working Group (presented in chapter 3) contributed to a better understanding of existing initiatives and approaches and made clear that there is no "one solution fits all" with regard the regional support of EOSC.

Nascent efforts have already chosen different pathways for their formulation, some of them being more bottom up driven, some others being the result of official administrative decisions (top-down). The character of the initiatives is somehow reflected on the strategic approaches that have been established.

These might operate as task forces, consortia, national projects, professional associations or legal entities, each one falling under the following setups:

A. Top down (objective-driven)

Initiated by higher authority stakeholders, such as Ministries and relevant Public Bodies, who set goals and utilise macro variables so as to identify the bigger picture and all of its components. Example: Montenegro

B. Bottom up (data-driven)

Involves all stakeholders in decision-making processes and focuses on specific characteristics and micro attributes more fundamental in nature. Example: Italy[49]

C. Hybrid

A mixture between Top down and Bottom up. A hybrid approach[50] breaks down activities and provides a multi-dimensional and transparent scoring system. Example: Ireland[51]

Top down	**Bottom up**	**Hybrid**
Central decision of the related ministry or national research funding organisation	Initiative by researchers, OS stakeholders and actors in the country	Combination of previous two, independently of who initiated it

Figure 7: Options for setting up NOSCI

Moreover, the process for setting up the National Grid initiatives is very enlightening in this respect. The SEE-GRID project series had also identified multiple factors that play a crucial role for coordinating and formalising efforts, as presented above. NI4OS-Europe project proposes a modular workflow for the setup of the initiatives. This will give to countries or national initiatives maximum flexibility, while making sure that all important for them aspects are addressed.

There are, however, activities that have been identified as important steps towards building national EOSC-related infrastructures and policies. To start with, an essential first step is to identify relevant stakeholders and in turn design and establish the proper communication workflows between them. A landscape review on policies, (e-)infrastructures and training should follow to create a deep understanding of the current status and bring all stakeholders up to date and on the same path. In the presence of existing policies this step may also require digging deeper into the readiness for policies (using for example OpenAIRE's checklists[52]), including collecting the national legal framework supporting and enforcing these policies (e.g. French law on Copyright). In addition to policies readiness, (e-)infrastructures readiness should also be assessed and recorded as part of the same activity, preferably following the EOSC readiness indicators, once they are formulated (current working proposal has been presented above and in Appendix C).

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[49] https://sites.google.com/view/iossg/home
[50] https://www.designsociety.org/publication/39507/Hybrid+top-down+and+bottom-up+framework+to+measure+products%27+circularity+performance
[51] http://norf-ireland.net/
[52] https://www.openaire.eu/openaire-releases-model-templates-and-checklists-for-policy-makers

Following matching activity should be the categorisation of available services between EOSC-Core and EOSC-Exchange services, providing a clear distinction between the two categories. Having completed these previous activities will allow establishing a liaison with the EOSC Association and defining a national representation. Next step will be drafting OSC strategy(ies) and associated implementation actions. Having finalised OSC strategy drafts, all documentation and relevant information should be communicated to associated Ministry(ies). Communication among parties is essential therefore regular meetings should be planned. A separate activity should also be linking to Innovation Platforms. As a key activity supporting the initiatives should be a proper setup of a monitoring system to enable progress evaluation and reporting as well as adapting to changes and keeping in alignment with EOSC.

The purely top down approach, meaning the setting up of a national Open Science Working Group under the government/ministry/research funder umbrella, has proven to be an efficient way to start, tasked with defining an Open Science implementation roadmap with a vision, mission, principles, strategic goals and objectives and required actions. Nevertheless, this requires political willingness. As this is not always present, or results in delays and bureaucracy, the bottom-up approach is the other alternative a choice.

Below, the workflow and concrete steps for a bottom-up approach in setting up a NOSCI are presented in detail. These steps can also support the setting up of different types of national initiatives and can be adapted to different models.

A. Stakeholders identification and engagement

1.a. Identify national organisations that have a prominent role in EOSC, either in the EOSC Secretariat or in consecutive EOSC-related projects.

1.b. Make contact with diverse research scientific communities, institutes and organizations interested and active in the European Open Science Cloud (EOSC), including the research infrastructures, e-infrastructures, large computing centers, research service providers and manage to get consensus towards a common strategy for Open Science Cloud development in the country.

1.c. Reach out to national stakeholders - a first attempt has already been made in the context of the NI4OS-Europe project to collect contact details from all relevant to Open Science national stakeholders.

1.d. Collaborate with NGIs, NRENs, and national HPC initiatives of respective countries who are knowledgeable of the current status in data transfer, processing and management services and could provide links with other research and e-infrastructures, nationally.

1.e. Collaborate with OpenAIRE NOADs of respective counties who have been making links between communities for the past years and are experienced in Open Science endeavours.

1.f. Approach relevant Ministries (e.g. Digital Governance, Science, Research and Technology, Development, Education) with the proposed NOSCI MoU agreement, and try to get the support of Ministries. This can have the form of an official letter of support to the NOSCI.

B. Designing of workflows and communication between stakeholders

2.a. Hold an inaugural meeting of the consortium / initiative to establish collaboration between identified stakeholders and create common ground of understanding.

2.b. Hold working meetings and divide work in Task Forces / Working Groups that will perform landscape reviews on policies, infrastructures and training, e.g. Learned Societies to work on open access and Plan S, RIs and e-infrastructures to work on categorising the services etc.

2.c. Involve right from the beginning the Ministries (e.g. Science and Technology, Development, Education, Information Technology), as they might have already established Working Groups or Task Forces for Open Science. Check whether merging of efforts is feasible under their umbrella and/or how the initiative could act complementary or be left totally independent of their activities.

C. Communication to wider public

3.a. Communicate current Open Science Cloud status in the country and goals as well as inform about the EOSC, its advancements, national representation already in place and what the future holds for national research ecosystems. Example: Greek Open Science Task Force[53]

3.b. Hold an official inauguration event of the NOSCI targeted at wider public, with the support from the Ministries. The inauguration event will introduce the NOSCI (even if still under formation) to all Open Science Cloud related national communities (users, developers, infrastructure providers, funding agencies, related public bodies, industry etc.).

D. Drafting of National Roadmap

4.a. Agree on a common roadmap that includes contribution to producing a national strategy for Open Science and implementation actions. Main things to be considered for the strategy are:

   4.a.1 Research outputs management, sharing and publication

   4.a.2 Research/e-Infrastructures and services access and enhancement

   4.a.3 Training and skills for digital research, data management and scholarly communication

   4.a.4 Connection with existing R&D ecosystem focusing on information exploitation and innovation

   4.a.5 Connection with the EOSC

4.b Define and adopt in the strategy any national and institutional level policies, if they can be replicable.

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[53] https://www.openaire.eu/blogs/2020-the-year-of-open-science-in-greece

4.c Reflect in the strategy the value of the European Open Science Cloud and build on the resources available and the dynamic of national stakeholders involved in/ supporting the initiative.

4.d Examine the possibility to use this document also to define the structure of the initiative and its decision mechanisms and internal organisation.

E. Establishment and Sustainability

5.a. Consider and define the form that NOSCI can have. Possible formats are:

> 5.a.1. Legal base - establishing a legal entity for promoting OS in the country with roles and responsibilities for EOSC
>
> 5.a.2. Public private partnership - cooperation based on good practices and well-defined roles and responsibilities for the public and private sector
>
> 5.a.3. Appointed by the government / ministry - experts (individuals or organisations) working under the authorship of Ministries; tied to national policies.
>
> 5.a.4. Collaboration through an MoU- scope, duration, responsibilities and overall framework under which members build a consortium and collaborate are defined

In case of signing a **Memorandum of Understanding (MoU)** within the consortium, this should define the common goals in setting up a National Open Science Cloud Initiative (NOSCI) and developing Open Science activities in the country. The MoU may include:

> 5.a.4.1. the description of appropriate tools and methods to establish the NOSC initiative;
>
> 5.a.4.2. the collaboration with the relevant European and international initiatives such as: EOSC Association, EuroHPC, OpenAIRE, PRACE, RDA, EUDAT and EGI;
>
> 5.a.4.3. the decision mechanisms and internal organization;
>
> 5.a.4.4. the initial activities and guiding actions of the agreement, such as the mapping of the national digital capacity in terms of available computing resources and services related to the Open Science Cloud;
>
> 5.a.4.5. the development and implementation of the National Open Science Strategy, with reference to the national roadmap, and the possibility of creating common working groups, or forming a Joint Research Unit (JRU), or inclusive association entities open to all national research infrastructures and e-infrastructures.

5.b. Perform a cost-benefit analysis, complementary to the strategy, to showcase recurring and non-recurring costs and benefits from integrating Open Science in current national scientific sceneries.

5.c. Seek national funding programme by proposing a national-level project. With support from a Ministries and with proof of EU funding there are more chances with the national funding bodies to get funding for National OSC activities.

F. EOSC liaison and communication

6.a. Communicate progress to Ministries and EOSC representatives ensuring that the country is represented at its fullest and in a coordinated fashion among all stakeholders, from higher to lower in the organizational model and vice versa.

6.b. Define national representation and liaison with the EOSC Association, make sure that the initiative is formally represented on behalf of the consortium (with whatever format has been selected: legal entity, PPP or MoU)

6.c. Link to national monitoring mechanisms / bodies for assessment and adaptation that will result in better alignment with the EOSC.

As mentioned above, the proposed steps are considered as important elements that can be combined, adapted and adjusted, as part of the modular workflow for the setup. This will be particularly the case where a combination of methods (hybrid model: bottom up and top down) will be used.

The up to date experience showed that a simple and efficient way of creating a national initiative is the drafting of a MoU. This is the option the Italian research community has chosen for the creation of their NOSCI. Appendix D contains articles that can be included in the MoU. In any case, the use of monitoring indicators already at early stages will help the assessment of status, the monitoring of the progress and will assist to adapt the workflow of the NOSCI implementation to the region.

4.3. Operational aspects

The Blueprint itself is a cumulative and comprehensive approach that has a twofold scope: to establish an effective, secure and cost-effective OSC ecosystem, but also to enrich it with resources, such as data and educational material, and expertise necessary to ensure its adoption and successful use by all stakeholders, specifically targeting researchers.

This section presents practical aspects for establishing and operating a NOSCI and is to be consulted complementary to indicators measuring a country's readiness to set up a NOSCI and to workflows for performing collaborative activities explained in Chapter 4. Also, the NI4OS-Europe deliverable "D4.3 Mapping of legal, technical and procedural tools" provides a solid insight and the means (resources) necessary to start work on deliverables and implementation actions within NOSCIs.

Furthermore, work is equally driven by the successful paths followed to realising the Grid as a new infrastructure in the past and by the efforts of OpenAIRE and predecessor projects that contributed to the development and implementation of concrete policies for Open Science at institutional and/ or national levels. It also takes stock of FAIR data policies currently being explored in the context of EOSC by EOSC-related projects such as FAIRsFAIR, PaNOSC, etc as well as national developments expressed through EOSC fora.

Based on the descriptions in the previous section, we consider a number of elements as inevitable for any NOSCI model, but also for the operation of the initiative itself. These are any aspects related to governance, to the infrastructure and services the initiative will provide or support, the processes to be followed encompassed in policy documents and the sustainability of the whole endeavour. In the following we analyse these aspects.

A. Governance and organization

Independently of the form and the character that national initiatives may have in each country, i.e. whether they will pursue a bottom-up or a top-down or hybrid approach, as described in the previous section, there is a clear need for a governance structure and

organizational model to guide internal and external activities. Internal being the workflows, actions and deliverables that determine communication and cooperation of existing and prospective stakeholders and interested parties of the national initiative, while external activities involve formal representation to European and global fora and liaising with the EOSC. The prior set the terms and conditions under which a national cooperation for Open Science is established. It includes a clear definition of roles and responsibilities of stakeholders involved in the national setting, highlights commitments and agrees on a common roadmap that guides performance and collaborative activities. Each stakeholder serves a certain purpose according to their capacity, supplies and area of influence based on which they have a certain place in the national R&D setting. It is important that the initiative is well represented by all types of Open Science stakeholders[54] so that dialogue is maximised and decisions are inclusive and fair-minded to the benefit of democracy in research and society at large.

Besides a predefined role in the Open Science ecosystem, there should be a clear set of responsibilities that guide participation in the initiative's activities. Complementary, there should be in place a framework of representation regarding negotiations, new collaborations and overall communication between the members of the initiative and external parties, particularly with respect to the EOSC and liaising activities with European and International fora. Especially for the EOSC Association, a representative organisation is required to be responsible for communicating advancements and needs from and to the international not-for-profit association of EOSC once it's established[55].

The activities to be worked on by the initiative include integration of Open Science Cloud at the national level and are relative to setting up and management of infrastructures, services, policies and skills necessary for all technical, procedural and legal operations. All of them are characterized by three main stages in its lifetime: Planning - Establishment - Support and maintenance.

B. Definition of Strategy

The role of the strategic document is pivotal for the setting up and the success of a NOSCI. This is especially important if the bottom-up approach is selected. The strong recommendation in this case, is the collective production of the national strategy by members of the initiative. This can ensure that the document is centered around the strengths and potentials of the country's stakeholders and depicts a clear position and vision for Open Science nationally. The document should contain rules and recommendations in the form of commitments at the macro level, comprising a national plan for Open Science. At the same time, these commitments could be adopted by participating (and non) stakeholders at the micro level, i.e. by implementing policies in their institutions/ organisations.

The national strategy should cover four main aspects related to national research policies: the approach to the various research outputs, the way infrastructures and services are offered, the framework on research assessment and the capacity building through skills

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[54] For a detailed analysis of OS stakeholder profiles check NI4OS-Europe deliverable D2.1 Stakeholder map, inventory, policy matrix

[55] Current list of interested organisations: https://www.eoscsecretariat.eu/expressions-of-interest

and training. A recent example of how a national strategy could be structured comes from the Greek Open Science Initiative[56].

2.a. Research Outputs

It is important that policies highlighted in the document support overall access via the Internet, a free flow of knowledge and data, starting from the three main outputs of research, literature, data and software:

2.a.1. Literature

This refers to any issues related to the access to and preservation of scientific information recommendation[57]. Emphasis is on the access to peer-reviewed scientific articles, books and publications. Most of the times, access to non-peer-reviewed publications is encouraged. Equally encouraged is copyright retention by authors with countries such as France to have incorporated it in their Copyright Law. The following two models-routes of Open Access (OA) could be adopted separately or combined. Other approaches, such as the Diamond[58], could also be considered.

- Green OA: focusing on preservation of scientific information and access through literature repositories. As part of this, maturity and readiness of literature repositories should be explored. Pre-print servers available at national level should also be included.
- Gold OA: focusing on OA journals and fees (Article Processing Charges - APCs) for ensuring that access is immediately available. As part of this the eligibility and source of funding regarding reimbursement of Article Processing Costs (APCs) should be thought. Moreover, transformative agreements should be explored and Plan S should be communicated to national funders and gain their interest in participating to CoalitionS.

There are many documents enforcing Open Access policies which could be consulted by the members of the initiative. Some use both routes, such as the Horizon2020 programme by the European Commission, explaining the reasoning behind each route and how compliance of stakeholders can be met. Others choose one route, mostly the one that is more mature at the given time and can be more easily adopted and implemented. An overview of national OA policies can be viewed in Section 2.

2.a.2. Research Data

In the data deluge era pertaining research nowadays, research data but most importantly their management and sharing, is essential as it provides the bridge to re-usability and reproducibility, which are essential to enhance research integrity and create new products and innovation. RDM policies concern not only access to

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[56] Please see A.1.1.1.1.1Appendix A.1Appendix E for more details.

[57] https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32018H0790&from=EN

[58] Open Access Routes https://en.wikipedia.org/wiki/Open_access

data but also standardised practices that are applied to data and their documentation throughout all stages of a data management lifecycle[59].

Open and FAIR RDM is built around the motto "as open as possible as closed as necessary" and the FAIR principles, infused with ethical and legal considerations for ownership that show how data should be handled in order to be findable, accessible, interoperable and reusable. This includes, among others, assigning PIDs and licenses to datasets as well as depositing datasets and metadata (including raw and auxiliary data) in trustworthy repositories or applying copyright clearance methods[60]. National law and regulation should be consulted to identify and report any exemptions pertaining data access. Data repositories certification of trustworthiness and readiness to store and preserve FAIR data should be explored.

Aforementioned processes should be documented in Data Management Plans (DMPs). Funder and institutions should either integrate customised DMP tools or use existing online services of such as a way to implement their RDM policies. Argos[61] is a dynamic, machine-actionable tool for writing DMPs which is used in the NI4OS-Europe project for it links to and utilises OpenAIRE underlying services such as Zenodo or APIs and the Research Graph[62]. For DMP templates, a good source of information are Science Europe's reports and documents facilitating the development of a set of minimum requirements[63].

2.a.3. Software

Another essential element of Open Science is research software, particularly characterised by openness and collaborativeness in its development and management stages. Free and open source software follows FOSS principles[64] that provide insight of how a program can be run and re-purposed. FAIR principles for research software[65] allow for extra possibilities such as those related to interoperability to boost possibilities in open source code. Suggestions for software management plans gradually appear in the bibliography and will be even enforced by communities such as the ELIXIR[66]. Additionally, repositories for capturing and preserving snapshots of code in a FAIR manner are taken into account.

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[59] A great example of a data management lifecycle showing curation processes is the DCC Curation Lifecycle Model https://www.dcc.ac.uk/guidance/curation-lifecycle-model.

[60] NI4OS-Europe is developing a tool facilitating copyright clearance of data, software and other outputs. It's called License Clearance Tool and current version can be found at http://ni4os-dev.madgik.di.uoa.gr/lct
Wiki page: https://wiki.ni4os.eu/index.php/Dataset_License_Clearance_Tool_-_Description_and_Documentation

[61] https://argos.openaire.eu/splash/

[62] The OpenAIRE Research Graph Data Model https://zenodo.org/record/2643199#.X0jCKsgzY2w

[63] Practical Guide To The International Alignment Of Research Data Management https://www.scienceeurope.org/media/jezkhnoo/se_rdm_practical_guide_final.pdf and Presenting a Framework for Discipline-specific Research Data Management http://www.scienceeurope.org/media/nsxdyvqn/se_guidance_document_rdmps.pdf

[64] The four essential freedoms by the Free Software Foundation https://www.gnu.org/philosophy/free-sw.en.html

[65] Towards FAIR principles for research software https://content.iospress.com/articles/data-science/ds190026

[66] https://elixir-europe.org/events/webinar-software-management-plans

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2.b. Access, preservation and RDM

To enable open and FAIR outputs to be produced and flow, services should equally adapt to the new practices by integrating standards and protocols more open in nature to enable interoperability in information exchange and machine actionability of digitalised information for evaluation and monitoring activities. Enhancement of services to accommodate new demands should also be considered. The strategy paper should address following aspects related to infrastructures and services:

Access policies

One of the primary issues that infrastructures and services are called to untie are policies and methods for accessing services and their underlying data. The NOSCI should consult the European Charter for RIs[67] providing valuable information about possible ways to follow, such as:

- *Excellence-driven access* that applies peer review for testing excellence, originality, quality, technical and ethical feasibility of an application.
- *Market driven access* through agreements between users and RIs, usually under a fee.
- *Wide access* for maximised availability and visibility of data and services.

Preservation policies

Mainly concern repositories and other storage facilities particularly offering long-term services. They address issues about retention of electronic information such as what will be preserved, including exceptions, what services are involved, how backup of information takes place, security matters etc.

RDM policies, including FAIR

Infrastructures' policies on RDM and FAIR refer to embedding Open Science best practices and enhancement with tools and services for PIDs, standards, metrics etc. FAIRsFAIR project has identified the elements where services contribute to achieving FAIRness of data which have been used by others as guidance to produce policies, such as the example of EOSC cluster PaNOSC[68].

2.c. Research Assessment

A national Open Science strategy aiming to lift traditional practices should support this shift in procedures for research and researchers assessment. Criteria should follow Open Science principles in the successful paradigms of the San Francisco Declaration on Research Assessment - DORA[69] or the Open Science Policy Platform (OSPP)[70], in order for research and researchers to be rewarded for their efforts to comply with them not only on the occasion of calls for funding but also in promotion and tenure. Understanding existing

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[67] European Charter for Access to Research Infrastructures: Principles and Guidelines for Access and Related Services https://ec.europa.eu/research/infrastructures/pdf/2016_charterforaccessto-ris.pdf

[68] PaNOSC FAIR Research Data Policy framework https://zenodo.org/record/3862701#.X0i61cgzY2x

[69] https://sfdora.org/

[70] Evaluation of Research Careers fully acknowledging Open Science Practices https://ec.europa.eu/research/openscience/pdf/os_rewards_wgreport_final.pdf#view=fit&pagemode=none

criteria at the national level is key to moving on with next generation metrics need to be sought and embedded following the paths of the Leiden Manifesto[71].

2.d. Skills and Training

To foster Open Science, the R&D community is empowered with the necessary qualifications, digital skills and incentives in accordance with the good practices of Responsible Research and Innovation. The EOSC Skills and Training Framework which is underway highlights the various skills and professions needed for Open Science and beyond[72].

NOSCIs should pay attention and explore current status in their countries to those two streams:

> 2.d.1. Capacity building, which concerns the skills required in courses and curricula that are open science and digital data oriented.

> 2.d.2 Training, which is the means to exchange knowledge and educate everyone, from novice to experts. It involves design and implementation of training, including supporting material, and may be tied to Higher Education degrees if embedded in curricula or be independently provided in the form of vocational training certifications.

C. Infrastructures & services

Infrastructures and services are key components of a NOSCI as they are the primary materials building the Open Science ecosystem. National services that are equivalent to EOSC-Core services are covered by the EOSC regional projects and EOSC clusters for the onboarding of services and data to the EOSC. In the SEE region and the Balkans, EOSC Core providers are NI4OS-Europe partners. Participation is feasible to anyone through membership to some of the infrastructures serving as pillars for EOSC, i.e. major e-/research infrastructures, such as but not limited to OpenAIRE (for open science), ESFRI (for RIs), GEANT (for network), EGI (for computing), PRACE/ EuroHPC (for high performance and high throughput computing), EUDAT (for research data services).

EOSC-Exchange builds on the services provided by EOSC-Core. It includes services such as storage, preservation and data exchange. As such, it focusses on FAIR-related aspects. It offers a common technical basis for all services, but it varies with respect legal, access and policy requirements.

Both EOSC-Core and EOSC-Exchange services should follow the EOSC Rules of Participation (RoPs)[73]. For services to be included in the EOSC, it is required that they follow a minimum set of rules that showcase how services are developed and described in an organisational model, but also how they can be used by others. In preparations for maximum compliance with the latest release of the EOSC RoPs, the following are examples of what could be achieved at a national level:

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[71] http://www.leidenmanifesto.org/

[72] Digital Skill sets for EOSC: https://drive.google.com/file/d/1AMvbC1ZIJXddUXatIPgnZlphbrppSSda/view

[73] For more information you may consult
https://repository.eoscsecretariat.eu/index.php/s/QWd7tZ7xSWJsesn#pdfviewer

3.a. National Service Catalogue

Creation of a National Service Catalogue with a dual-purpose of having all services indexed according to the EOSC service standardised templates which can then more easily fit into EOSC and of having available and query able information from all services in one place.

3.b. Information Technology Service Management Framework

Adapting to the Information Technology Service Management Framework followed by EOSC, which is the FIT SM[74]. FIT SM provides certifications for all levels (Foundation, Advanced and Expert) and can be pursued by national service providers to become familiar and knowledgeable in applying the standard. Infrastructures such as EGI[75] provide reduction in price or even some foundational courses for free to its members.

3.c. Monitor

Developing a national monitoring mechanism for Open Science practices following specifications for open and alternative metrics.

3.d. Access policies

Developing access policies for all infrastructures for research, guided by access methods (or a combination of them) as included in the European Charter for Access to RIs.

D. Sustainability

Sustainability should be explored early in the process of setting up, to ensure that advancements are not prohibited either in the short-term or in the long-term. Two major steps contribute to understanding those potentials:

4.a. A cost-benefit analysis highlighting recurring and non-recurring cost for:

4.a.1. *Infrastructures & services*, with clear distinction in terms of their development-enhancement-maintenance needs. For example, there are different needs, and associated costs, for a service which must be developed from scratch than for a service that should just be enhanced with extra capabilities.

4.a.2. *Human resources*, that are essential for the successful operation of the Open Science ecosystem, such as distribution of person months for infrastructures and service personnel, for administrative and data experts (e.g. data protection officers - DPOs or data stewards).

4.a.3. *Quantitative and qualitative benefits*, which might incorporate:

- ○ Savings from business process improvements on access to scientific publications
- ○ Reduce the purchase of commercial software packages for data analysis

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[74] https://web.archive.org/web/20190418154425/https://fitsm.itemo.org/downloads/fitsm-core-standard/

[75] https://www.egi.eu/services/fitsm-training/

- ○ Savings from workflow standardization which reduces the time to carry-out and complete a task
- ○ Saving from structural changes (eliminating system heterogeneity)
- ○ Improving the exploitation of national resources for research
- ○ GDP Growth
- ○ Innovation, etc

4.b. A sustainability plan

There are a couple of factors that should be considered when building a sustainability plan. They first take into consideration available funding before examining for new streams or alternate ways of sustaining certain operations. Below are some paradigms based on current efforts and opportunities available:

4.b.1. *Contribution to open calls* available (eg SCOSS, EOSC calls, etc), which could vary from building services to integration practices or even training researchers and depend on the nature of the call and the target audience concerned.

4.b.2. *Crowdsourcing*, mainly targeting the actions included in the national implementation plan

4.b.3. *National fund for OS and/ or National fund for infrastructures*[76].

4.b.4. *National projects*, similar to the above but issued sporadically and on an on-demand basis.

4.b.5. *Membership*, where stakeholders-members of the initiative could offer minimum fees.

The above should of course be considered as neither a required set of actions, nor an exhaustive set of options; any other meaningful possibilities should be explored and could be included. Moreover, suggestions above can also be used in combination.

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[76] https://libereurope.eu/wp-content/uploads/2018/07/SO_A4_2018_05-EN_print.pdf

5. Conclusions and next steps

Current deliverable aims to contribute to the preparatory activities that will lead to the setting up of the National Open Science Cloud Initiatives in the countries of South-East Europe. It, thus, should be considered as a first step and an enabler. It provides all necessary background information to understand current related developments across Europe, presenting the various paths that countries have taken to support Open Science and EOSC. It also presents main elements of OS theory and models, both being important in the discussions with national stakeholders and policy makers about their support to NOSCI. And finally, it proposes a model for the establishment of NOSCIs, along with related workflows and monitoring indicators. It is thus intended to be a "handbook", for any interested organisations that aim to support the EOSC-related efforts in the SEE countries.

The EOSC governance structure and operation will undergo significant changes, as the current mandate ends by the end of 2020. The end of December 2020 signifies also the closing of the initial period of the EOSC implementation, which has been based on the well-known three-pillars structure (Executive Board, Governance Board, Stakeholder forum & Working Groups), and has been carried out mainly through H2020 projects. The ongoing discussions and consultations have as main focus the organization and governance of the successor scheme: the EOSC Association which will be the legal entity that will take over from 2021. The establishment of the legal entity is a formal requirement, which will allow EOSC Association to enter into a co-programmed partnership with the EU.
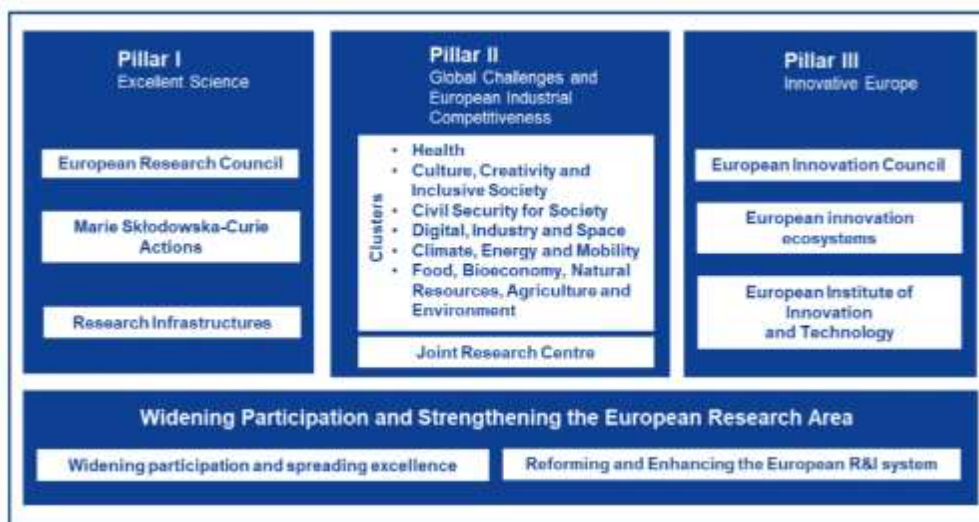

Figure 8: Preliminary Horizon Europe Structure[77]

The EOSC Association will be actually one of the 49 foreseen partnerships in the new Horizon Europe programme and the only one cross-pillar partnership, having as major aim

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the transformation of the European Research Area and the strengthening of the research and innovation culture to produce "FAIR-by-design" datasets. As such, the definition of the research and innovation priorities of this partnership is of major importance. The Strategic Research and Innovation Agenda (SRIA) of this partnership is not by chance a central discussion point, as this agenda will shape future work programmes and define projects that will be funded through Horizon Europe.

The above set the frame in which the National Open Science Cloud Initiatives will operate. The National Open Science Cloud Initiatives are, however, in parallel, important pillars of this effort: the strategic coherence at EU level and the FAIR data culture across Europe can be achieved through the coherence at national and institutional levels. Any model for National Open Science Cloud Initiatives has to take into account all the developments presented above, while also contributing to make EOSC a reality.

The presentation in section 3 of current status in SEE makes evident that we have to operate in a diversified environment. There is no one single starting point in our countries for establishing the NOSCIs and, thus, things will evolve at different paces. This highlights the usefulness of EOSC readiness indicators for making an accurate assessment and taking the necessary steps. It also makes clear that there are no fixed activities or steps to follow for establishing a NOSCI. It is important that the workflow proposal in section 4.2 is understood as an "inspiration playground" for national stakeholders. The modularity of workflow elements has to be stressed again.

The same holds for the blueprint proposal. Section 4 presents elements that we consider as important for any NOSCI model. Captured in broad terms, these are the approaches and policies related to governance, processes, infrastructure and services, and sustainability. It is, however, the national stakeholders who will decide about the mix between them and the level of granularity of each of the above in their national model.

EOSC is about serving European researchers, innovators and society at large. Having this in mind, inclusiveness and collaboration are the catalysts that can drive developments in each country. NI4OS-Europe partners, having the support of the related ministries in their countries, are well-positioned to initiate related activities, in the countries where these does not exist yet. Being main open science actors and infrastructure providers, they can bring together all relevant stakeholders in the country to work towards the common goal of National Open Science Cloud (NOSC). Reaching out to existing research and e-infrastructures in the country (e.g. ESFRI, OpenAIRE, GÉANT, PRACE, EuroHPC, EGI, EUDAT) and inviting them to become the building blocks of the initiative is an inclusive and pragmatic approach, which moreover provides direct links to the European network.

The drafting of an initial document or declaration is a determinant step towards the formation of the initiative. It not only makes the initiative known to the wider society but can also serve as an "open invitation" to any other interested stakeholders, and as an "internal glue" for forging a common understanding among the members. As such, it can be considered as the "pre-print" of the national plan or roadmap.

The national OSC plan should be also written early enough, as it is a strategy document that should be endorsed by the relevant ministries/governmental bodies and ideally serve as the basis for the related national legislation. Performing periodic updates to the OSC plan is very important for being connected to any research developments.

The formulation of a plan, however, does not guarantee its deployment. It is therefore important to bring to the table right from the beginning the question about the organizational form of the initiative. As presented in previous chapters, there are several organizational forms for implementing a NOSCI (legal entity, MoU, consortium, official appointment). The decision about this lies with the national stakeholders. Options come with constraints and possibilities at the same time: e.g. the official appointment may not reflect the views of OS communities the way the bottom-up approach would do, but it can be more effective.

Finally, sustainability of the endeavor is very important. This is related not only to funding (possibilities have been presented in previous chapter) but also to the quality of outcomes of the initiative. The policy and operational documents have to be reviewed and the overall impact of the activities has to be assessed. Metrics, as the ones introduced by the SEE-GRID project or the EOSC readiness indicators, can support this process. Training can play here a major role as well, increasing EOSC capacity in the country. It should be noted that the EOSC-Core ecosystem lacks a central training platform.

The EOSC vision, as it is captured in the *Draft proposal for a European Partnership under Horizon Europe* is one that can indeed change the whole research landscape in Europe:"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."

A multi-stakeholder European partnership is termed to implement the EOSC vision at European level. This is also the way NOSCIs should operate: link to any innovation-supporting initiatives in the country such as the Digital Innovation Hubs, Data Spaces, Competence Centers, etc. to reduce fragmentation and maximise the impact the "Web of FAIR data" can have in their country, in South-East Europe and in Europe as a whole.

Appendix A. Policy approaches in the European countries

Country	Type of Policy	Status of work
Albania	Acknowledgment	There is no national OA/ OS policy in place yet but according to the "The Open Government Partnership Third Open Government National Action Plan for Albania 2016-2018", the Albanian government will be committed to maximize access to research information resulting from public and private funds. Thus, the development, adoption and promotion of Open Science standards are in the Albanian agenda.
Austria	Funder Policy	Austria has no national policies, but the Austrian Science Fund (FWF), Austria's central funding organization for basic research, stipulates OA to research data collected and/or analysed using FWF funds for projects approved from 1 January 2019 and OA to publications that result from research funded by FWF. (source)
	Acknowledgment	Vienna Principles are the outcome of the "Open Access and Scholarly Communication" working group of the Open Access Network Austria (OANA). It is a set of 12 principles related to the future scholarly communication system. One out of the 12 principles, is "Accessibility" and one is "Reproducibility"
	Recommendations	The latest Austrian government programme, Government program 2020–2024 (p. 305), includes a statement regarding actively supporting Plan S for the implementation of Open Access.
Belarus	Concordat	"Belgorod Declaration on open access to scientific knowledge and cultural heritage" (2009): national recommendations
	Recommendations	"Regional Consultation on OA to Scientific Information" (2012): a consultation in Minsk, organised by the National Library of Belarus and UNESCO, which resulted in the production of a set of recommendations to advance OA (link or link)

Belgium	National Plan (Code of ethics)	The "Code of Ethics for Scientific Research in Belgium", in the "Reliability and verifiability" section, advocates for data accessibility stating that primary project data and protocols must be preserved and made accessible during a specific and sufficient period of time.
	Declaration	The Brussels Declaration on Open Access (2012) was signed by the Belgian, Flemish and French Community ministers of research. The declaration makes Open Access "the default infrastructure" for circulating the results of Belgian scientific research.
	National policies and legislation	An Open Access provision has been adopted in the Belgian law in Sep. 2018. This law gives authors the right to make scholarly publications available in open access if the publication is a result of research funded by public funds for at least 50%, with a maximum embargo period of 6 months for STM and 12 months for SSH.
	Funder Policy	The 'Open Access Decree' of the Wallonia-Brussels Federation consolidates the deposit policy of the Universities, stipulating that all scientific articles subsidized by public funds must be deposited in an institutional directory.
		Three main funders: BELSPO (federal), FWO (Flanders) and F.N.R.S. (Wallonia) have Open Access Mandates/requirements.
Bosnia and Herzegovina	Acknowledgment	In the Republic of Srpska, the "Law on scientific research and techological development" recognizes open science as one of the key principles of scientific research.
	Acknowledgment	On September 2014, Bosnia and Herzegovina officially joined the multilateral global initiative of the Open Government Partnership (OGP). The document "Bosnia and Herzegovina Action Plan 2019-2021" (2019) is the first Action Plan of the BiH Council of Ministers for implementation of the OGP in BiH for the period 2019-2021. Point n°4 of the document mentioned above addresses the problem of open data in the country and sets a plan

		in order to increase availability, openness and use of official statistical data. Also, Strategy of Development of Science in Bosnia and Herzegovina, Section 6.2. ERA Priorities, implementation in Bosnia and Herzegovina, states that research institutions should guarantee open access to the results and that lower level bodies should define this.
Bulgaria	Acknowledgment	In Bulgaria, there is no national OA/ OS policy in place yet but the governmental document "National Strategy for Development of the Scientific Research in the Republic of Bulgaria 2017 – 2030" indicates open access to scientific information as a strategic action point. A document "Concept for the application of the principle for open access to scientific information" has been developed and is currently under discussion.
Croatia	**National policies and legislation**	The Croatian Act on Scientific Activity and Higher Education mandates archiving digital versions of all higher education theses in a corresponding academic library repository. The new version of the Croatian Act on Scientific Activity and Higher Education, issued by the Ministry of Science and Education (MSE), supports more broadly and mandates Open Science at national level. Since it is not yet adopted, and from the last week there is a new government in place, it is unknown if this will undergo parliament procedure or not.
	Recommendations	MSE's Strategy of Education, Science, and Technology recognises that setting up an OA system for research data, publications, and teaching resources is a key to improving the research environment.
	Recommendations	The Croatian Research and Innovation Infrastructures Roadmap 2014-2020 addresses the promotion of OA to scientific papers and research data, especially those funded by public sources.
	Acknowledgment	The Croatian Rectors' Conference has declared support to OA in its document "Research assessment and promotion of OA to scientific information and research data". It states that OA would promote a transparent evaluation of individuals and organizations. It also supports the idea that OA to scientific publications should be mandated in Croatia.

	Declaration	[Croatian Open Access Declaration](#), supported by ministries, HE and research institutions states: *"the state administration, headed by the ministry responsible for science, as well as scientific and educational institutions, organisations, professional associations, […] to act decisively and in coordination in order to store all the Croatian scientific information in Open Access form".*
Cyprus	**National Plan**	The document [National Policy of the Republic of Cyprus for Open Access to Scientific Information](#) was prepared by a working group and approved by the Council of Ministers in 2016. It is aligned with good practices of H2020 framework and provides guidelines and support for the implementation of Open Access for the outputs of the scientific work that is foremost publicly funded. Currently, the National Policy document is under revision.
Czech Republic	**National policies and legislation**	The [National Strategy on Open Access to Scientific Information for 2017-2020](#) (in Czech, no. 444) was approved by the Czech Government in 2017. It covers research publications and data.
Denmark	National Plan	The "Steering Group for National Data Management" produced the [National Strategy for Research Data Management](#) (2015). The Ministry of Higher Education and Science published "[Denmark's National Strategy for Open Access](#)" (2018) with the vision to open up publications from Danish research institutions financed by public funding and/or private foundations. The strategy is mainly focused on Green Open Access with a maximum 12-month embargo.
	Funder Policy	Public Danish funders with an Open Access Policy: Danish Council for Independent Research (DFF); Danish National Research Foundation; Danish Ministry of Science, Technology & Innovation; Innovationsfonden; and Nordic Council of Minister. Private Danish funders with an Open Access Policy: The Velux Foundations: Villum Foundation and Velux Foundation; and the Lundbeck Foundation.
Estonia	Recommendations	The Estonian Research Council established an expert committee on Open Science which produced a set of [principles and recommendations for the](#)

	Funder Policy	development of a national open science policy (2015).
		Funders with an Open Access Policy: Estonian Research Council, Ministry of Education and Research and Ministry of Economic Affairs and Communications. Estonian Research Council has started to require research data management plans from all personal grant applications and has officially started to evaluate these DMPs.
Finland	National Plan	"Open Science and Research Roadmap 2014–2017" is a set of guidelines for Finnish academia, decision-makers, funders and citizens regarding OS.
	Recommendations	The Finnish research community has jointly created a Declaration for Open Science and Research 2020-2025, which was approved by the National Open Science and Research Steering Group on December 10, 2019. It outlines a vision, where Open Science and research are seamlessly integrated in researchers' everyday work and support not only the effectiveness of research outputs but also the quality of research.
	Recommendations	"Open Science and Research Handbook" comprises guidelines and model processes to help researchers, research organisations, decision-makers, financiers, and the general public promote the adoption and use of OS.
	Funder Policy	Funders with an Open Access Policy: The Academy of Finland.
France	National policies and legislation	"Law for a Digital Republic" (Loi n°2016-1321 pour une République numérique,) passed by the French Senate in 2016, sets its focus on the right of publishing in OA and the re-use of research data generated with public funding.
	National Plan	The National Plan for Open Science (2018) condenses the ambition to make scientific results "*open to all*" into three commitments, accompanied by the respective Roadmaps. The three commitments regard OA to scientific publications, open data and the national position towards the international open science dynamic.
	Funder Policy	Funder policy: The ANR has a strong open access policy, fully aligned with the National Plan for Open Science.
Germany	Funder Policy	The major research funder in Germany, the Deutsche Forschungsgemeinschaft (DFG), has tied

	Recommendations	open access into its funding policy: "Guidelines on the Handling of Research Data".
	Recommendations	"Principles for the Handling of Research Data", adopted by the Alliance of German Science Organisations on 24 June 2010. In 2016, the German Federal Ministry of Education and Research (BMBF) also published an Open Access strategy.
Greece	Declaration	The National Plan for Open Science proposes a series of goals, commitments, policies and actions for the adoption of Open Science in Greece. The document has been prepared by the 'Open Science Task Force', a collaborative bottom-up initiative consisting of 11 national research performing organizations and 26 research infrastructures & civic initiatives, which aims to serve as a reference point for national policy makers towards the establishment of a national strategy for OS.
	Acknowledgment	Law 4310/2014 supports OA to publicly funded research, but Greece does not have an integrated national on OA/OS policy yet.
Hungary	National policies and legislation	The Act LXIII/2012 on Reuse of Public Data regulates the access and reuse of the public sector information (PSI) according to directive 2013/37/EC. The last modification of the directive has not yet been implemented in national law.
	National policies and legislation	The Act LXXVI/2014 on Scientific Research, Development and Innovation established the National Research, Development and Innovation Office (NRDI Office), which coordinates the usage of research and innovation funds. The office itself follows the Open Access guidelines of the Science Europe Position Statement and has set up an advisory board for developing an Open Science strategy. In October 2019, NRDI Office announced the latest Frontline Research Excellence Program that requires an RDM proposal. All new projects funded by NRDI Office require data management plan which should cover open access.
	Funder Policy	The major research funder OTKA (The Hungarian Scientific Research Fund) also requires DMPs from applicants. Hungarian Academy of Sciences introduced its OA mandate in 2013. Open Access policies are slowly adopted in Higher Educational Institutes (HEI). The policy in most HEI encourages researchers to deposit all research outputs at the institutional repository and to

	National legislation	provide open access upon publication or as soon as possible (respecting publishers' policies). Section 53 of the National Higher Education Act: "The doctoral dissertation - and its theses - is open to everyone."
	National legislation	Governmental decree 376/2017 (XII. 11) stipulating a new requirement. While it had been mandatory for museums to set up data repositories, the new regulation provides an exact definition for its content and function. It is stated that a museum data repository constitutes the paper-based, textual, visual, audio and digital reports, documentation, exhibition scripts, manuscripts, archive correspondences pertaining to cultural assets preserved in the given institution, and its function is also to preserve the documents and press materials relevant to the institution's history. Data repositories can also be set up according to special branches of museology: for example, an art history data repository can be established in museums with fine art collections. In the digital discipline, however, the broad definition of a data repository is the physical and virtual collections preserving the materials of special areas; these include fine art and art history data repositories.
Iceland	Acknowledgment	Efforts are being made to produce a plan for education and research that includes OA to research data.
	Funder Policy	Icelandic Center for Research, Rannís issued an open access policy in 2003 with later amendments.
Ireland	National Plan	The National Framework on the Transition to an Open Research Environment is the Irish national action plan for the free flow of scientific information.
	Funder Policy	Irish funding agencies have been very proactive about implementing Open Access policies aligned with international best practice. Some of the funding agency policies: Environmental Protection Agency (EPA), Health Research Board Ireland (HRB), Irish Research Council (IRC) and Science Foundation Ireland (SFI).
Italy	National policies and legislation	A law on cultural assets, activities and tourism (L. 112 /2013) states that results of research, funded at least 50 % with public funds and published in scholarly journals should be open access.

	Funder Policy	In January 2014 the Ministry of Education, Universities and Research mandated OA for publications and datasets arising from the funding programme for young scientists (Bando SIR Scientific Independence for young scientists programme D. D. 23/01/14 n. 17).
		In 2015 and 2017 the research funding programme Bandi PRIN financed by MIUR mandates open access to publications resulting from the funding programme in line with the law (L. 112 /2013).
	Declaration	Three private research funders, Telethon and Fondazione Cariplo and Educatt, have adopted OA mandates.
		Italian Computing and Data Infrastructure ([ICDI](#)) is a forum assembled by major representatives of Italian research infrastructures and e-infrastructures, with the aim of promoting national synergies, and optimising national participation to the European Open Science Cloud (EOSC), the European Data Infrastructure (EDI) and HPC. ICDI is regulated by a [MoU](#) signed by nine organisations, and it is open for signature by other organisations too.
Latvia	Acknowledgment	"[Latvian European Research Area Roadmap 2016-2020](#)" (2016) sets Open Access as a top priority.
Lithuania	National policies and legislation	Law on Higher Education and Research (2009, revised 2015 and 2016) states that scientific outputs resulting from publicly funded research carried out in state higher education and research institutions, must be communicated to the public (Article 51).
	Recommendations (Funder Policy)	In 2016 the Research Council of Lithuania adopted the "[Guidelines on Open Access to Scientific Publications and Data](#)". These guidelines cover OA to both research publications and data in alignment with the Horizon 2020 (H2020) OA mandate, the Open Research Data Pilot, and the Commission's recommendations on access to and preservation of scientific information.
Luxemburg	Declaration (Concordat)	Luxembourg's **research institutions** signed and adopted seven common principles on Open Access constituting the [National Policy on Open Access](#) (2015).

	Funder Policy	The Luxembourg National Research Fund (FNR) introduced a new [Open Access policy](#) for publications from FNR (co-) funded projects granted after 1 January 2017 (exception: monographs).
Malta	Acknowledgment	In 2014, the Malta Council for Science and Technology launched the [National Research and Innovation Strategy 2020](#), which sets out Malta's strategy for a seven-year period proclaiming Research and Innovation as an integral part of Maltese economy. Open access to publications resulting from publicly funded research is linked to innovation and is mentioned as a "*principle which Malta supports as a means to achieve optimal circulation of knowledge*".
Moldova	Declaration	During the first National Scientific Conference "Open Science" on November 22, 2018 the [Declaration on Open Science in the Republic of Moldova](#) (in Romanian) was signed.
	National Plan	Code on Science and Innovation of the Republic of Moldova, approved in 2004, with amendments in 2018 (No. 259 of 15.07.2004) ensures free and non-discriminatory access to scientific and technological information resources (Articles 54, 57, 79 and 85).
	Acknowledgement	The R&D strategy of the Republic of Moldova promotes transparent engagement of citizens and civil society in the development of research topics by facilitating access to scientific knowledge (General Objective 4 - Continuous Dialogue between science and society, the dissemination of knowledge and the implementation in practice of research results). All specific programmes of the national funding framework should include a dissemination component, including free access to research results of end-users, citizens, business, civil society organizations and policy makers.
Montenegro	National Plan	"[Programme of Implementation of Open Science Principles in Montenegro with the Action Plan (2020–2022)](#)" The strategic document related to Open Science in Montenegro has been adopted by Government of Montenegro on June 25, 2020.
Netherlands	National Plan	The "[Nationaal Plan Open Science](#)" (2017) focuses on three areas: 1) advancing OA to scientific publications, 2) reusing research data, addresses

	Declaration (Concordat) Funder Policy	and 3) shaping an evaluation and incentivization system. It also highlights the necessity of supporting and involving researchers in matters of OS. Together with the publishing of the plan it took place the signing of the Dutch Open Science Declaration. Netherlands Organisation for Scientific Research (NWO) and Royal Netherlands Academy of Arts and Sciences (KNAW) have OA policies for publications and data.
North Macedonia	Acknowledgment	There isn't a national OA/ OS policy in place yet but there are plans for creating one.
Norway	National Plan	In December 2017 the Norwegian Ministry of Education and Research produced the "National strategy on access to and sharing of research data". The strategy covers the accessibility and the reuse of publicly funded research data and sets three principles: 1. Research data should be as open as possible and as closed as necessary. 2. Research data should be processed and adapted in such way that the content of the data can be exploited in the best possible way. 3. Decisions on archiving and facilitating research data must be taken in the research communities.
	Recommendations Recommendations	In 2017 the Norwegian government announced the national goals and guidelines for Open Access to research publications. The Research Council of Norway released a policy on Open Access to Research Data in 2014 and updated in 2017.
Poland	Recommendations	"Directions of the development of open access to research publications and research results in Poland" (2015): non-binding recommendations/ best practices on OA.
	Funder Policy	In February, 2020 The National Science Centre (NSN) approved a new OA policy to publications Together with OA to research data policy (adopted in 2019), OA to published research findings represents a coherent policy of the NSC as part of a broader OS framework, aimed at transparency in the dissemination of research findings by researchers funded from public funds.

Portugal	Acknowledgement	There isn't a national OA/ OS policy in place yet, but efforts are underway for the formation of a National Open Science Policy under the auspices of the Ministry of Science, Technology and Higher Education (MCTES). Following the Resolution of the Council of Ministers nr 21/2016, the MCTES was assigned to create an Interministerial Working Group whose mission is to produce a proposal for a Strategic Plan for the implementation of the national policy. The working group has produced the following documents: First report of the Executive Committee of the Working Group - National Open Science Policy (in Portuguese) Second report of the Executive Committee of the Working Group - National Open Science Policy (in Portuguese)
	Funder Policy	Fundação para a Ciência e a Tecnologia (FCT), the national research funder which operates under the jurisdiction of the MCTES, has a policy on free, online access to peer-reviewed publications and data arising from FCT funding. The policies came into force on 5 May 2014 and they mainly constitute guidelines for researchers. Both are available online, only in Portuguese: Open Access to publications of results of FCT-funded research Policy on Data Availability and other Results of R&D Projects Financed by FCT
Romania	Acknowledgment	Romania does not implement a national Open Access/Open Science policy yet. Open Access is however mentioned in The National Plan for Research and Innovation 2015-2020.
Serbia	National Plan	Serbia adopted a national science policy called 'Open Science Platform' in July 2018. The document was produced by the Ministry of Education, Science and Technological Development (MESTD) and regards OA to research publications and data.
	National policies and legislation	On 8 July 2019, the Serbian government passed a new law on science and research that recognizes open science as a fundamental principle of science and research (Article 4). The law regards open access to research publications and data.

Slovakia	Acknowledgment	The Slovak Research and Development Agency recommends OA for publications and Ministry of Education recommends CC license in KEGA projects
		"Open Government Partnership National Action Plan of the Slovak Republic 2017 –2019"(2017) advocates Open Access to research results.
		In November 2019, a new Open Government Partnership (OGP) Action Plan 2020-2021 was adopted, that covers open data, open education, OS, open justice and citizen participation.
Slovenia	National Plan	The Government of the Republic of Slovenia adopted the National Strategy of Open Access to Scientific Publications and Research Data in Slovenia 2015-2020 in 2015.
		Two years later, the government strategy was followed by the publication of the Action plan in May 2017, which sets its focus on open data.
	Funder Policy	Slovenian Research Agency signed Plan S in September 2018 and the DORA Declaration in July 2019.
Spain	National policies and legislation	Article 37 "Open access dissemination" of the Act 14/2011, of June 1, on Science, Technology and Innovation focuses on OA to scientific publication.
	Recommendations	In October 2014, the Spanish Foundation for Science and Technology (FECYT) produced Recommendations for the implementation of Article 37 of the Act 14/2011.
	National Plan	The Spanish Government published the State Plan for Research, Development and Innovation 2017-2020 in January 2018.
	Funder Policy	At the regional level, OA policies have also been developed by some funders, such as the governments of Madrid, Asturias or Catalonia.
Sweden	Recommendation	The Swedish Research Council (Vetenskapsrådet, VR) was commissioned by the Swedish Government to develop national guidelines for open access to scientific information. In January 2015, the VR published the "Proposal for National Guidelines for Open Access to Scientific Information" report which proposes the strategic objective for the next ten years. This proposal

	National policies and legislation	addresses the need for open access to publications, and research data.
		In 2016, the Swedish Government presented the research policy bill "Collaborating for knowledge – for society's challenges and strengthened competitiveness". The bill presented the national goal that all scientific publications deriving from publicly funded research should be made open access, giving emphasis to the next ten years (2016-2026).
	Recommendation	In 2017, the National Library of Sweden (NLS) was assigned by the Swedish Government to coordinate the implementation of open access to publications, in consultation with the VR. To complete this task, the NLS launched five studies to produce recommendations on how to overcome the barriers to the realisation of open access to publications.
	Recommendation	In 2017 the VR was assigned by the Swedish Government to nationally coordinate the implementation of open access to research data, in consultation with the NLS and the National Archive of Sweden. This endeavor regards the preparation of guidelines to open up research data.
	Funder Policy	Three of the four national agencies – the Swedish Research Council (VR), Swedish Research Council for Environment, Agricultural Sciences and Spatial Planning (Formas) and Swedish Research Council for Health, Working Life and Welfare (Forte) have mandates for OA to publications. The Swedish Foundation for Humanities and Social Sciences - Riksbankens Jubileumsfond (RJ), The Knut and Alice Wallenberg Foundation and the Foundation for Baltic and East European Studies adopted OA mandates.
Switzerland	Funder Policy	"White Paper for a Swiss Information Provisioning and Processing Infrastructure 2020"
		The Swiss National Science Foundation (SNSF) requires grantees to provide OA to research results obtained with the help of SNSF grants (Article 44 Funding Regulations) and also has a Research Policy on Open Research Data.
		The Swiss Academy of Humanities and Social Sciences (SAGW) supports the implementation of OA.

Russia	Concordat	[Belgorod Declaration on open access to scientific knowledge and cultural heritage](#) (2009): national recommendations
Ukraine	National policies and legislation Concordat Concordat	In 2007, [legislation](#) was passed requiring open access to publicly funded research (Law of Ukraine On the principles of Developing Information Society in Ukraine in 2007-2015). [Belgorod Declaration on open access to scientific knowledge and cultural heritage](#) (2009): a set of national recommendations Olvia Declaration: declaration in support of OA to research information endorsed by Ukrainian universities
UK	Concordat	In July 2016, a multi-stakeholder group produced the "[Concordat on Open Research Data](#)" with the aim to help to ensure that the research data are made openly available.

Appendix B. SEE-GRID metrics

Metrics developed by the SEE-GRID project for measuring the success for setting-up of the National Grid Initiatives (NGI).

A. NGI organization

    1.a. Set-up metrics
    1.a.1. National-level JRU established [Yes [Date]/No]
    1.a.2. NGI established [Yes [Date]/No]
    1.a.3. NGI initiating body [Name, Type]
    1.a.4. NGI set-up document [Description, URL]
    1.a.5. NGI mandate duration [Period/Date]
    1.a.6. NGI set-up event carried out [Date, Type of event]
    1.b. Organizational metrics
    1.b.1. Form of organization: [task force / consortium / national programme /professional association / standalone organization / other]
    1.b.2. Juridical status / Nomination of the legal representative [Description / Name, Date]
    1.b.3. Establishment of the Coordination body / decision making mechanism [Name, Description]
    1.b.4. NGI recognition at the national level [Document, Date]
    1.c. Membership
    1.c.1 Membership: number of organizations [number]
    1.c.2 Membership: type of organizations [Number of: Academic / Research / Industrial Organizations]
    1.c.3 Collaboration with NREN [Yes (type of collaboration)/No]
    1.d. NGI Documents
    1.d.1. National Strategy document existence (Yes (URL, Date of Establishment]/No)
    1.d.2. Adoption of other policy and technical management documents (Type of document, Pointer to it, Date of Adoption)
    1.d.3. Adoption of NREGI policies: e.g. Operational procedures, Users AUP, security policies, Operational SLAs, VO SLAs (Type of document, Pointer to it, Date of Adoption)

B. Infrastructure, operations and middleware

    2.a. Infrastructure metrics
    2.a.1. Number of sites [number]
    2.a.2. Number of CPU cores [number]
    2.a.3. Storage size [number in TB]
    2.b. Operational metrics
    2.b.1. Certification authority [Yes/No]
    2.b.2. User registration [Yes (URL) / No]
    2.b.3. National VOs (Number of disciplines, Number of VOs)
    2.b.4. List of core services deployed (i.e VOMS, WMS, BDII, LFC, FTS, MyProxy)
    2.b.5. National portal [Yes/No]
    2.b.6. National helpdesk [Yes/No]

2.b.7. National monitoring [Yes/No]

2.b.8. National SLA monitoring and national SLAs in place [Yes/No]

2.c. Middleware metrics

2.c.1 Middleware stacks used: [List of Middleware Stacks, Level of Interoperability/Interoperation between them]

C. User community

3.a. User Community Metrics

3.a.1. Number of international (European and regional) VOs supported [Number]

3.a.2. Number of international applications supported [Number]

3.a.3. Number of national applications supported [Number]

3.a.4. Number of local users [number of Users with grid certificates]

D. Sustainability and international collaboration

4.a. Funding Metrics

4.a.1. Funding: national grid project [type: infrastructure/software/applications; total funds; total FTEs; Duration].

4.a.2. Funding: other national grid projects [type: infrastructure/software/applications; total funds; total FTEs; Duration].

4.a.3. Funding: possibility of national contribution to EGI.org or SEGI.org

4.a.4. Funding: International Grid Projects (type: infrastructure/software/applications; total funds; total FTEs: number; Duration).

4.b Metrics concerning membership in international bodies / fora:

4.b.1. EGI support letter (Yes/No)

4.b.2. eIRG membership (Yes/No)

4.c. Industrial cooperation metric

4.c.1. National Grid projects where industry is involved (Number, Names)

Appendix C. Indicators proposed by the INFRAEOSC-5b projects

Candidate readiness indicators proposed by the INFRAEOSC-5b projects.

Architecture

    A. National (regional) registry or other federation mechanisms for data in place/planned
       a1 Number of enrolled services
       a2 Number of searches
       a3 SLAs available
    B. National(regional) dataset catalogue(s) in place/planned
       b1 Number of enrolled datasets
       b2 Number of searches
       b3 Integration with other data catalogues
    C. National PID policy in place/planned

Organization and Governance

    A. National Initiative in place/planned/etc.
       a1. Funding – structural, internal, per project.
       a2. Funding plans
       a3. Stakeholders involved (number, type)
    B. Strategic roadmap (IR, OS, etc)?
    C. Specific funding programmes for OS/EOSC/data science?

Policies

    A. OS/FAIR policies supported/ monitored/ planned
       a1. National
       a2. At the organisation level
       a3. Mandatory/formal/informal
       a4. Funding constraints
       a5. Incentives
    B. Data Management policies in e/supported/ monitored/ planned
       b1. National
       b2. At the organisation level
       b3. Mandatory/formal/informal
       b4. Funding constraints
       b5. Incentives

Infrastructure

    A. Resources
       a1. # of CPUs
       a2. Storage capacity
       a3. Infrastructure Availability 7/24
       a4. Helpdesk support 7/24

a5. Availability of certain types of infrastructure services to researchers (HPC, storage, HTC, GPUs, remote access to science facilities...)
B. # of infrastructure users (individuals, organisations)
C. National NREN delegates security and user management policies?
D. National IdP exists?
E. TRLs

Training & Skills

A. National/regional curricula in place/planned (compliance with international?)
    a1. Data scientists
    a2. Data stewards
    a3. How many university courses? How many graduates?
B. Basic training available for researchers & research support staff
    b1. National competence centres
    b2. Certification of competences?
C. Number of trained people per year

Appendix D. Possible articles of the NOSCI MoU

1. **Purpose of the Agreement and Objectives**
2. **Activities and guiding actions**
3. **Methods of implementing the Agreement**
4. **Decision mechanisms and internal organization aspects**
5. **Resources and Charges**
6. **Entry into force, duration, changes and withdrawal**
7. **Confidentiality and Intellectual Property**
8. **Public information and public relations**
9. **Data processing information**

Appendix E. Outline of the Greek proposal for a national OS plan

Introduction

- What is Open Science and its value added
- Open Science in Europe - what is the current state
- How Greece participates in the European Open Science Framework
- Why the need for a National Strategy for Open Science in Greece
- A vision about Open Science in Greece

State-of-the-art in Greece

- State-of-the-art in Europe
- What Open Science components Greece already has and what's missing
- Objectives of the Strategy

Commitments

- Open Access to and preservation of scientific publications - Green and Gold
- Management and sharing of research data - gradually FAIR; first F,A,R
- Open Research Software development and management - FAIR research software
- Enriching the national research ecosystem - capacity building, new evaluation methods
- National Research Infrastructures and digital research services for Open Science - access to infrastructures, maintenance and enhancement
- Connection with the European Open Science and Innovation Ecosystem - subscription to EU infrastructures, link services with EOSC catalogue, link with innovation

Annexes

Roadmap for each one of the Commitments

Glossary