WP2 Report

Monitoring Framework for National Contributions to EOSC

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Abstract

This report describes a new Monitoring Framework for National Contributions to EOSC. The aim of the framework is to provide a systematic model for monitoring the implementation and uptake of EOSC and Open Science by Member States and Associated Countries in the EOSC Steering Board. The framework essentially consists of a wide range of indicators for policies, practices, and (in the future) impacts relevant for EOSC and Open Science. The framework will be used to structure both the questions in future annual surveys and the presentation of validated data collected from the countries and external data sources on National Contributions to EOSC in the EOSC Observatory. The framework will further serve as a mechanism for strategic alignment and coordination with monitoring activities by key stakeholders in the EOSC ecosystem. The report provides a high-level overview of the monitoring framework, including the monitoring landscape in which the framework is situated and a monitoring matrix with the different types of indicators that are deployed in the framework. The report also provides an extensive list of the specific indicators that have been selected to monitor policies and practices for EOSC and Open Science as well as a conclusion on next steps.

Version History

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V1.0	14/12/2022	Gareth O'Neill (TGB)	Final version of report published

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Glossary

EOSC Future project Glossary is incorporated by reference: https://wiki.eoscfuture.eu/x/JQCK

List of Abbreviations

Acronym	Definition
AAP	Additional Activities Plan
EC	European Commission
EGI	EGI Foundation
EOSC	European Open Science Cloud
EOSC-A	EOSC Association
EOSC-SB	EOSC Steering Board
ERA	European Research Area
FAIR	Findable Accessible Interoperable Reusable
GU	Ghent University
JNP	JNP Consulting
KPI	Key Performance Indicator
MESR	Ministry of Higher Education, Research and Innovation in France
MS/AC	Member States and Associated Countries
RFO	Research-funding Organisation
RPO	Research-performing Organisation
SRIA	Strategic Research and Innovation Agenda
TGB	Technopolis Group Belgium
TUW	TU Wien
UV	University of Vienna
VR	Swedish Research Council

1 Executive Summary

The Monitoring Framework for National Contributions to EOSC consists of three monitoring dimensions and eight categories that are relevant for EOSC and forms a matrix for the specific indicators as in Table 1-1.

Table 1-1: Monitoring Matrix for National Contributions to EOSC

	Policies	Practices	Impact
Publications	Indicators	Indicators	Indicators
Data			
Software			
Services			
Infrastructure			
Skills/Training			
Assessment			
Engagement			

The monitoring framework essentially consists of sets of indicators to track the implementation of EOSC across the policies, practices, and impacts identified for each of the eight categories relevant for EOSC. There are currently only indicators proposed for policies and practices (with none yet for impact) as in Table 1-2.

Table 1-2: Types of Indicators for National Contributions to EOSC

	Policies	Practices
Publications	Countries with a National Policy	Countries with National Monitoring
Data		
Software	Countries with a Financial Strategy	Countries with Use Cases
Services		
Infrastructure	Country RPOs with a Policy	Country Investments
Skills/Training		
Assessment	Country RFOs with a Policy	Country Outputs
Engagement		

The monitoring framework currently consists of 48 indicators for policies and 48 indicators for practices. The indicators will be integrated into a new revised survey on National Contributions to EOSC that will be targeted at Member States and Associated Countries in the EOSC Steering Board and will run annually from 2022. The indicators will be iteratively tested in the annual surveys and will be adjusted where necessary from feedback.

The data collected from the annual surveys will be openly published every year in the interactive online dashboard of the EOSC Observatory and will enable the EOSC Steering Board and EOSC community to track the EOSC readiness of the countries and support the countries in setting and aligning their EOSC targets, developing actionable policies for EOSC, and sharing EOSC use cases with each other for mutual learning.

2   Introduction

The EOSC Steering Board (EOSC-SB) is an expert group consisting of representatives of European Member States and Countries Associated to Horizon Europe (MS/AC) and the European Commission (EC) [1]. The main purpose of EOSC-SB is to strategically advise the EC on the implementation of the European Open Science Cloud (EOSC) and Open Science as part of the European Research Area (ERA) Policy Agenda [2] The expert group also aims to support the coordination of policies and investments as well as to monitor the overall strategic development and implementation of EOSC and Open Science at European and national levels. EOSC-SB is one party in the EOSC Tripartite Governance [3], together with the EOSC Association (EOSC-A) [4] and EC, which is a non-formal collaboration to facilitate dialogue and strategic coordination across the three governing bodies towards achieving the policy objectives for EOSC and implementing the EOSC ecosystem in Europe. This includes organising joint activities such as the annual EOSC Tripartite Events.

Specific subgroups may be set up within EOSC-SB to work on strategic priorities for EOSC and EOSC-SB. The subgroup on National Contributions to EOSC aims to benchmark policies and practices for EOSC at European, national, regional, and institutional levels as well as to monitor the benefits of such policies and practices for researchers and the realisation of EOSC. The work of the subgroup is based on the ambition to exchange experiences and best practices and to foster collaboration and synergies to shape national policies for EOSC. The work of the subgroup was guided in 2022 by the ERA Policy Agenda for 2022-2024 [5], which includes the establishment of a mechanism to collect data on policies, investments, research outputs, skills/training, and infrastructure related to EOSC and Open Science. This mechanism should form a single joint capacity to monitor the uptake of Open Science and contributions to EOSC and link to the monitoring of the ERA [6].

The subgroup has four goals which acknowledge that EOSC is an enabler for the transition to Open Science:

- Understand how to assess and track the contributions that are made by MS/AC to develop EOSC and that are in line with the implementation of the Strategic Research and Innovation Agenda (SRIA)
- Evaluate how countries are supporting organisations, their data policies and financing mechanisms, and how they are advancing Findable Accessible Interoperable Reusable (FAIR) principles and EOSC
- Evaluate how national funding complements the contributions provided by members of EOSC-A
- Coordinate benchmarking and monitoring with EOSC-A and EC for strategic implementation and operationalisation of the EOSC ecosystem that is in line with SRIA priorities and without duplication

The benchmarking and monitoring of the implementation and uptake of EOSC was initiated with a first pilot survey on National Contributions to EOSC 2021 [7]. EOSC-SB developed the survey iteratively in collaboration with EOSC Future [8] by first gathering 145 questions relevant for EOSC and Open Science from EOSC-SB members, and then prioritising 19 questions on research data management, research infrastructures, and EOSC. The survey focused specifically on policies and practices at national and regional levels from the perspective of the countries. The survey was open from December 2021 until August 2022, whereby 34 validated responses from the countries were collected via the survey tool of the EOSC Observatory [9]. An in-depth analysis of the survey data was conducted [10] and the survey data [11] was openly published in the online dashboard of the EOSC Observatory [12] in November 2022. The pilot survey successfully served to test the questions and data collection for EOSC-SB and the survey tool and dashboard of the EOSC Observatory.

This report builds on the lessons learned from the pilot survey and describes a new Monitoring Framework for National Contributions to EOSC. The framework has been developed iteratively by EOSC Future in close collaboration with EOSC-SB. The aim of the framework is to provide a systematic model for monitoring the implementation and uptake of EOSC and Open Science by MS/AC in EOSC-SB (see Section 3). The framework essentially consists of a wide range of indicators for policies, practices, and (in the future) impacts relevant for EOSC and Open Science (see Section 4). The framework is developed to ensure strategic alignment and coordination with monitoring activities by key stakeholders in the EOSC ecosystem. The framework will be used to structure both the questions in future annual surveys and the presentation of validated data collected from the countries and external data sources on National Contributions to EOSC in the EOSC Observatory.

3 Monitoring Framework

3.1 Monitoring Landscape

The implementation and uptake of EOSC is being monitored in varying capacities and by various stakeholders at European, national, regional. and institutional levels. There are three main monitoring domains for EOSC:

- **EOSC Association**: Consists of members representing the research community, including research-performing organisations (RPOs) and research-funding organisations (RFOs). Responsible for monitoring the implementation of the EOSC Partnership via two annual surveys on contributions to EOSC by member organisations of EOSC-A. The Additional Activities Plan (AAP) survey collects the annual contributions to EOSC and the Key Performance Indicators (KPIs) survey collects the annual contributions towards achieving the KPIs of the Monitoring Framework for the EOSC Partnership.
- **EOSC Steering Board**: Consists of representatives of MS/AC and the EC specialising in EOSC. Responsible for monitoring the EOSC readiness of MS/AC through the annual survey on National Contributions to EOSC, which collects the financial contributions to EOSC and contributions towards achieving the indicators of the Monitoring Framework for National Contributions to EOSC by MS/AC.
- **EOSC Ecosystem**: Consists of organisations and initiatives that are developing and implementing EOSC outside of the domains of EOSC-A and MS/AC. There are various monitoring activities taking place in the EOSC community, including under several EOSC-relevant projects such as EOSC-synergy [13], FAIRsFAIR [14], and NI4OS-Europe [15]. There are also various monitoring tools available that are collecting EOSC-relevant statistics, including the EOSC Portal [16], Eurostat [17], and OpenAIRE Open Science Observatory [18] which itself draws data from the OpenAIRE Research Graph [19].

Alignment of monitoring activities is crucial to ensure a coordinated monitoring ecosystem for EOSC that reduces overlap and improves efficiency in surveys addressed to the same stakeholders. There are also other monitoring activities which are not focused on but are nevertheless relevant for EOSC. A new monitoring mechanism to track the implementation of the ERA Policy Agenda is currently being developed, which will align with and draw data from the EOSC Observatory for several ERA actions, especially Action 1 on Enable Open Science including through EOSC [20]. The expert group on National Points of Reference on Scientific Information is coordinating the measures listed in and reporting on the follow-up of the Recommendation on Access to and Preservation of Scientific Information in Europe [21]. UNESCO is also developing a monitoring framework to track the implementation of the UNESCO Recommendation on Open Science [22]. The EOSC Observatory will act as a medium for sharing monitoring data and aligning monitoring surveys and activities.

3.2 Monitoring Matrix

The monitoring framework described in this report is a result of collaboration between EOSC Future and EOSC-SB as well as with EOSC-A and the Task Force on Landscaping of the INFRAEOSC-05-2018-2019 projects [23] . This collaboration builds on the work of many initiatives, including the Open Science Monitor [24], Open Science Policy Platform [25], expert group on National Points of Reference on Scientific Information [26], expert group on Indicators for Researchers' Engagement with Open Science [27], and EOSC Executive Board Working Group on Landscape [28]. An initial set of indicators for monitoring EOSC readiness was proposed by the Task Force on Landscaping in January 2021 [29]. This was followed by a proof of concept for a platform to monitor indicators for the EOSC readiness of MS/AC by the Task Force on Landscaping [30] as well as a proposal for a framework for monitoring the EOSC readiness of MS/AC with potential indicators by EOSC Future in September 2021 [31]. The framework was then elaborated through continuous discussions with EOSC-SB, EOSC-A, and invited experts[1] on EOSC and Open Science throughout 2022 as well as from the lessons learned with the pilot survey on National Contributions to EOSC 2021. A final interactive workshop was held with EOSC-SB and EOSC-A to validate the monitoring framework and indicators in October 2022. EOSC-SB will continue discussions with key EOSC stakeholders to ensure that the monitoring is continuously updated and oriented to measuring progress towards Open Science becoming the new normal by 2030 [32].

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[1] Special thanks are due to Diego Scardaci, Inge Van Nieuwerburgh, Karel Luyben, Natalia Manola, Paolo Budroni, Sofia Abrahamsson, Thomas Neidenmark, and Volker Beckmann for their expert feedback on the monitoring framework.

The Monitoring Framework for National Contributions to EOSC consists of three monitoring dimensions and eight categories that are relevant for EOSC and forms a matrix for the specific indicators as in Table 3-1.

Table 3-1: *Monitoring Matrix for National Contributions to EOSC*

	Policies	Practices	Impact
Publications			
Data			
Software			
Services	Indicators	Indicators	Indicators
Infrastructure			
Skills/Training			
Assessment			
Engagement			

The monitoring framework consists of three overarching monitoring dimensions:

- Policies = policies guiding the implementation of EOSC
- Practices = actions being undertaken to implement EOSC
- Impact = outcomes showing the implementation of EOSC

These dimensions are divided into eight categories that are relevant for EOSC:

- Publications = research publications that are available in open access
- Data = research data management and research data that is FAIR/open
- Software = software that enables research and is available in open source
- Services = services that enable research data discovery and exploitation
- Infrastructure = data stewardship, data repositories, and data preservation
- Skills/Training = skills and training for researchers to practise Open Science
- Assessment = incentives and rewards for researchers to practise Open Science
- Engagement = research that engages and involves citizens via citizen science

3.3   Types of Indicators

The monitoring framework essentially consists of sets of indicators to track the implementation of EOSC across the policies, practices, and (in the future) impacts identified for each category relevant for EOSC. The indicators in this report are not set in stone, but rather will be iteratively tested in the annual surveys on National Contributions to EOSC and updated where necessary from feedback from the members of EOSC-SB. While some of the proposed indicators have been tested in the pilot survey, many indicators are new and still need to be proven as useful indicators and linked to reliable data sources and verification processes by MS/AC. Most of the responses to the indicators will be provided directly from MS/AC, although for some of the indicators, the data will be automatically harvested from existing external data sources as mentioned above. There are currently only indicators available for policies and practices (with none yet for impact) as in Table 3-2.

Table 3-2: *Types of Indicators for National Contributions to EOSC*

	Policies	Practices
Publications	Countries with a National Policy	Countries with National Monitoring
Data		
Software	Countries with a Financial Strategy	Countries with Use Cases
Services		
Infrastructure	Country RPOs with a Policy	Country Investments
Skills/Training		
Assessment	Country RFOs with a Policy	Country Outputs
Engagement		

There are four types of indicators for policies across each of the categories relevant for EOSC:

- Countries with a National Policy = share of countries with a national policy on the category
- Countries with a Financial Strategy = share of countries with a financial strategy on the category
- Country RPOs with a Policy = share of RPOs in a country with a policy on the category
- Country RFOs with a Policy = share of RFOs in a country with a policy on the category

There are four types of indicators for practices across each of the categories relevant for EOSC:

- Countries with National Monitoring = share of countries nationally monitoring the category
- Countries with Use Cases = share of countries with use cases on the category
- Country Investments = share of country investments in the category
- Country Outputs = share of country outputs for the category

4   Monitoring Indicators

4.1   Policy Indicators

There are 48 policy indicators across the eight categories relevant for EOSC in the monitoring framework:

Publications

1. Share of Countries with a National Policy on Open Access to Publications
2. Share of Countries with a Financial Strategy on Open Access to Publications
3. Share of Country RPOs with a Policy on Open Access to Publications
4. Share of Country RFOs with a Policy on Open Access to Publications

Data

5. Share of Countries with a National Policy on Data Management
6. Share of Countries with a Financial Strategy on Data Management
7. Share of Country RPOs with a Policy on Data Management
8. Share of Country RFOs with a Policy on Data Management

9. Share of Countries with a National Policy on FAIR Data
10. Share of Countries with a Financial Strategy on FAIR Data
11. Share of Country RPOs with a Policy on FAIR Data
12. Share of Country RFOs with a Policy on FAIR Data

13. Share of Countries with a National Policy on Open Data
14. Share of Countries with a Financial Strategy on Open Data
15. Share of Country RPOs with a Policy on Open Data
16. Share of Country RFOs with a Policy on Open Data

Software

17. Share of Countries with a National Policy on Open Source Software
18. Share of Countries with a Financial Strategy on Open Source Software
19. Share of Country RPOs with a Policy on Open Source Software
20. Share of Country RFOs with a Policy on Open Source Software

Services

21. Share of Countries with a National Policy on Offering Services through EOSC
22. Share of Countries with a Financial Strategy on Offering Services through EOSC
23. Share of Country RPOs with a Policy on Offering Services through EOSC
24. Share of Country RFOs with a Policy on Offering Services through EOSC

Infrastructure

25. Share of Countries with a National Policy on Connecting Repositories to EOSC
26. Share of Countries with a Financial Strategy on Connecting Repositories to EOSC
27. Share of Country RPOs with a Policy on Connecting Repositories to EOSC
28. Share of Country RFOs with a Policy on Connecting Repositories to EOSC

29. Share of Countries with a National Policy on Data Stewardship
30. Share of Countries with a Financial Strategy on Data Stewardship
31. Share of Country RPOs with a Policy on Data Stewardship
32. Share of Country RFOs with a Policy on Data Stewardship

33. Share of Countries with a National Policy on Long-term Data Preservation
34. Share of Countries with a Financial Strategy on Long-term Data Preservation
35. Share of Country RPOs with a Policy on Long-term Data Preservation

36. Share of Country RFOs with a Policy on Long-term Data Preservation

Skills/Training

37. Share of Countries with a National Policy on Skills/Training for Open Science
38. Share of Countries with a Financial Strategy on Skills/Training for Open Science
39. Share of Country RPOs with a Policy on Skills/Training for Open Science
40. Share of Country RFOs with a Policy on Skills/Training for Open Science

Assessment

41. Share of Countries with a National Policy on Incentives/Rewards for Open Science
42. Share of Countries with a Financial Strategy on Incentives/Rewards for Open Science
43. Share of Country RPOs with a Policy on Incentives/Rewards for Open Science
44. Share of Country RFOs with a Policy on Incentives/Rewards for Open Science

Engagement

45. Share of Countries with a National Policy on Citizen Science
46. Share of Countries with a Financial Strategy on Citizen Science
47. Share of Country RPOs with a Policy on Citizen Science
48. Share of Country RFOs with a Policy on Citizen Science

4.2 Practice Indicators

There are 48 practice indicators across the eight categories relevant for EOSC in the monitoring framework:

Publications

49. Share of Countries with National Monitoring on Open Access to Publications
50. Share of Countries with Use Cases on Open Access to Publications
51. Share of Country Investments in Open Access to Publications
52. Share of Country Open Access Publications

Data

53. Share of Countries with National Monitoring on Data Management
54. Share of Countries with Use Cases on Data Management
55. Share of Country Investments in Data Management
56. Share of Country Data Management Plans

57. Share of Countries with National Monitoring on FAIR Data
58. Share of Countries with Use Cases on FAIR Data
59. Share of Country Investments in FAIR Data
60. Share of Country FAIR Data Sets

61. Share of Countries with National Monitoring on Open Data
62. Share of Countries with Use Cases on Open Data
63. Share of Country Investments in Open Data
64. Share of Country Open Data Sets

Software

65. Share of Countries with National Monitoring on Open Source Software
66. Share of Countries with Use Cases on Open Source Software
67. Share of Country Investments in Open Source Software
68. Share of Country Open Source Software Sets

Services

69. Share of Countries with National Monitoring on Offering Services through EOSC

70. Share of Countries with Use Cases on Offering Services through EOSC
71. Share of Country Investments in Offering Services through EOSC
72. Share of Country Services Offered through EOSC

Infrastructure

73. Share of Countries with National Monitoring on Data Stewardship
74. Share of Countries with Use Cases on Data Stewardship
75. Share of Country Investments in Data Stewardship
76. Share of Country Data Stewards

77. Share of Countries with National Monitoring on Connecting Repositories to EOSC
78. Share of Countries with Use Cases on Connecting Repositories to EOSC
79. Share of Country Investments in Connecting Repositories to EOSC
80. Share of Country Repositories Connected to EOSC

81. Share of Countries with National Monitoring on Long-term Data Preservation
82. Share of Countries with Use Cases on Long-term Data Preservation
83. Share of Country Investments in Long-term Data Preservation
84. Share of Country Repositories Offering Long-term Data Preservation

Skills/Training

85. Share of Countries with National Monitoring on Skills/Training for Open Science
86. Share of Countries with Use Cases on Skills/Training for Open Science
87. Share of Country Investments in Skills/Training for Open Science
88. Share of Country Educational Curricula with an Open Science Dimension

Assessment

89. Share of Countries with National Monitoring on Incentives/Rewards for Open Science
90. Share of Countries with Use Cases on Incentives/Rewards for Open Science
91. Share of Country Investments in Incentives/Rewards for Open Science
92. Share of Country Signatories of Agreement on Reforming Research Assessment

Engagement

93. Share of Countries with National Monitoring on Citizen Science
94. Share of Countries with Use Cases on Citizen Science
95. Share of Country Investments in Citizen Science
96. Share of Country Projects with a Citizen Science Dimension

4.3 Impact Indicators

There are currently no indicators developed for monitoring impact across the eight EOSC categories as other ongoing initiatives are working in parallel on definitions of impact for EOSC and Open Science. This includes the EC which is developing criteria for assessing the impact of EOSC and Open Science and the PathOS project [33] which is defining key impact pathways for EOSC and Open Science. The outcomes of these initiatives will be incorporated into the development of the impact indicators for the monitoring framework.

5 Next Steps

The monitoring framework and indicators will be integrated into a new revised survey on National Contributions to EOSC that will be targeted at MS/AC in EOSC-SB and will be published annually from 2022. The new survey will be structured around the monitoring dimensions and categories relevant for EOSC from the monitoring framework. The indicators will be translated into questions in the revised survey which will be repeated in each annual survey to allow longitudinal tracking of the implementation and uptake of EOSC. For example, the indicator 'Share of Countries with a National Policy on Open Access to Publications' will be translated into the yes-no question 'Does your country have a national policy on open access to publications?' Respondents will further be able to clarify their responses and provide relevant links and documentation. Key definitions in the questions, for example what is meant by 'policy' and 'open access', will be explained further in the survey along with suggestions for survey respondents on how to calculate the national contributions.

The monitoring indicators will be iteratively tested in the annual surveys and will be adjusted where necessary from feedback from EOSC-SB members. While some of the indicators have already been tested in the pilot survey, many indicators are new and will only be tested in the survey on National Contributions to EOSC 2022. For example, the indicator 'Share of Country Data Stewards' is new and will require MS/AC to provide data on the number of data stewards employed in full-time equivalents in the country. The impact indicators are further expected to be developed in collaboration with the EC and PathOS project and will potentially only be tested in the survey on National Contributions to EOSC 2023. Existing indicators may thus be adjusted depending on their usefulness and the availability of reliable data for the indicators by MS/AC. New indicators may also be added depending on the evolving policy landscape and evolving needs of MS/AC in the future.

The data collected from the annual surveys will be openly published every year in the interactive online dashboard of the EOSC Observatory and will enable EOSC-SB and the research community to track the EOSC readiness of countries in Europe and support MS/AC in setting and aligning their EOSC targets, developing actionable policies for EOSC, and sharing EOSC use cases with each other for mutual learning [34]. All future collected survey data will be structured around the three high-level dimensions and eight categories relevant for EOSC from the monitoring framework in the EOSC Observatory. The functionalities of the EOSC Observatory will be developed by EOSC Future to improve the user experience and to collect data more effectively from survey respondents and external data sources as well as to maximally visualise and allow exploitation of collected data by users. The EOSC Observatory will also be enriched with country pages for every MS/AC which provide users with a narrative and statistics on the current situation of EOSC and Open Science in a given country. This includes allowing users to select the most relevant survey data to be presented in their own personal dashboard and providing information on contact persons and activities for the countries

The success of the monitoring framework and monitoring rests upon the collected data from the MS/AC in the EOSC Steering Board. It is imperative that national coordination is pursued to ensure that the right expertise contributes to the collection of data for the questions in the survey. The better the data that is collected in the survey, the better the support that can be provided by the EOSC Observatory to national discussions on policies and practices for EOSC, and the better the monitoring of the implementation and uptake of EOSC.

References

[1] Website of the EOSC Steering Board hosted by the European Commission. Link: [https://ec.europa.eu/transparency/expert-groups-register/screen/expert-groups/consult?lang=en&groupID=3756]. Accessed 13 December 2022.

[2] Webpage on the European Research Area hosted by the European Commission. Link: [https://research-and-innovation.ec.europa.eu/strategy/strategy-2020-2024/our-digital-future/european-research-area_en]. Accessed 13 December 2022.

[3] Webpage on the European Open Science Cloud hosted by the European Commission. Link: [https://research-and-innovation.ec.europa.eu/strategy/strategy-2020-2024/our-digital-future/open-science/european-open-science-cloud-eosc_en#eosc-tripartite-governance]. Accessed 13 December 2022.

[4] Website of the EOSC Association. Link: [https://www.eosc.eu]. Accessed 13 December 2022.

[5] European Council. *Council Conclusions on the Future Governance of the European Research Area (ERA)* (2021) Link: [https://data.consilium.europa.eu/doc/document/ST-13567-2020-INIT/en/pdf]. Accessed 13 December 2022.

[6] EOSC Tripartite Governance. *Paving the Way for a Synergetic Implementation of EOSC* (2021) Public report from the EOSC Tripartite Event 2021. Link: [https://eosc.eu/sites/default/files/2022-02/2022-02-02_EOSC-TE_Public%20report%20from%20Tripartite%20event%202021_FINAL.pdf]. Accessed 13 December 2022.

[7] EOSC Steering Board and EOSC Future. *Survey on National Contributions to EOSC 2021*. Link: [https://zenodo.org/record/7423953]. Accessed 13 December 2022.

[8] Webpage of the EOSC Future project on CORDIS hosted by the European Commission. Link: [https://cordis.europa.eu/project/id/101017536]. Accessed 13 December 2022.

[9] O'Neill, Gareth and Stefania Martziou (2022) *EOSC Observatory*. Deliverable D2.8a of the EOSC Future project. Link: [https://zenodo.org/record/7424032]. Accessed 13 December 2022.

[10] Komljenović, Vanja and Irena Vipavc Brvar (2022) *Analysis of Survey on National Contributions to EOSC 2021*. Report of the EOSC Future project. Link: [https://zenodo.org/record/7410828]. Accessed 13 December 2022.

[11] O'Neill, Gareth and Stefania Martziou (2022) *Data of Survey on National Contributions to EOSC 2021*. Data set of the EOSC Future project. Link: [https://zenodo.org/record/7431678]. Accessed 13 December 2022.

[12] Website of the EOSC Observatory hosted by the EOSC Future project. Link: [https://eoscobservatory.eosc-portal.eu]. Accessed 13 December 2022.

[13] Webpage of the EOSC-synergy project on CORDIS hosted by the European Commission. Link: [https://cordis.europa.eu/project/id/857647]. Accessed 13 December 2022.

[14] Webpage of the FAIRsFAIR project on CORDIS hosted by the European Commission. Link: [https://cordis.europa.eu/project/id/831558]. Accessed 13 December 2022.

[15] Webpage of the NI4OS-Europe project on CORDIS hosted by the European Commission. Link: [https://cordis.europa.eu/project/id/857645]. Accessed 13 December 2022.

[16]   Website of the EOSC Portal hosted by the EOSC Future project. Link: [https://eosc-portal.eu]. Accessed 13 December 2022.

[17] Website of Eurostat hosted by the European Commission. Link: [https://ec.europa.eu/eurostat]. Accessed 13 December 2022.

[18] Website of the OpenAIRE Open Science Observatory hosted by OpenAIRE. Link: [https://osobservatory.openaire.eu]. Accessed 13 December 2022.

[19]   Website of the OpenAIRE Research Graph hosted by OpenAIRE. Link: [https://graph.openaire.eu]. Accessed 13 December 2022.

[20]   Whittle, Mark, Marta Guasp Teschendorff, and Andrew Sikorski (2021) *Study to Evaluate the ERA Policy Framework and ERA Monitoring Mechanism*. Link: [https://op.europa.eu/en/publication-detail/-/publication/98a8edb4-c763-11ec-b6f4-01aa75ed71a1]. Accessed 13 December 2022.

[21] Website of the expert group on National Points of Reference on Scientific Information hosted by the European Commission. Link: [https://ec.europa.eu/transparency/expert-groups-register/screen/expert-groups/consult?lang=en&groupID=3477]. Accessed 13 December 2022.

[22]   Webpage on the implementation of the UNESCO Recommendation on Open Science hosted by UNESCO. Link: [https://www.unesco.org/en/natural-sciences/open-science/implementation]. Accessed 13 December 2022.

[23] Webpage on the Task Forces of the INFRAEOSC-05-2018-2019 projects hosted by the EOSC-Pillar project. Link: [https://www.eosc-pillar.eu/infraeosc-5-collaboration]. Accessed 13 December 2022.

[24]   Webpage on the Open Science Monitor hosted by the European Commission. Link: [https://research-and-innovation.ec.europa.eu/strategy/strategy-2020-2024/our-digital-future/open-science/open-science-monitor/about-open-science-monitor_en]. Accessed 13 December 2022.

[25]   Open Science Policy Platform (2020) *Progress on Open Science. Towards a Shared Research Knowledge System*. Final report of the Open Science Policy Platform. Link: [https://op.europa.eu/en/publication-detail/-/publication/d36f8071-99bd-11ea-aac4-01aa75ed71a1]. Accessed 13 December 2022.

[26]   Expert Group on National Points of Reference on Scientific Information (2020) *Access to and Preservation of Scientific Information in Europe*. Report on the implementation of European Commission Recommendation C(2018)2375. Link: [https://op.europa.eu/en/publication-detail/-/publication/6e5718ef-f179-11ea-991b-01aa75ed71a1]. Accessed 13 December 2022.

[27] Expert Group on Indicators for Researchers' Engagement with Open Science (2019). *Indicator Frameworks for Fostering Open Knowledge Practices in Science and Scholarship*. Link: [https://op.europa.eu/en/publication-detail/-/publication/b69944d4-01f3-11ea-8c1f-01aa75ed71a1]. Accessed 13 December 2022.

[28]   EOSC Executive Board Working Group on Landscape (2020) *Landscape of EOSC-related Infrastructures and Initiatives*. Version 2. Link: [https://op.europa.eu/en/publication-detail/-/publication/9c7f3c1e-2aea-11eb-9d7e-01aa75ed71a1]. Accessed 13 December 2022.

[29]   Di Giorgio, Sara, Federica Tanlongo, and Iiris Liinamaa (2021) *Second Working Proposal for Living Indicators to Monitor MS Progresses towards EOSC Readiness*. Link: [https://zenodo.org/record/4452799#.YrrHiJDP03Q]. Accessed 13 December 2022.

[30] Passani, Antonella, Simona De Rosa, Andrea Nicolai, Marco Piras, Andrea Montaldo, and Francesco Nespoli-Catchy (2021) *Consultancy to Design and PoC a Platform for Monitoring Live Indicators to Measure EOSC Readiness within MS/AC*. Link: [https://zenodo.org/record/5595779#.YrrHj5DP03Q]. Accessed 13 December 2022.

[31] Tasić, Bojana and Carsten Thiel. *Mapping of EOSC Readiness of EU MS/AC*. Deliverable D2.2a of the EOSC Future project. Link: [https://zenodo.org/record/7425860]. Accessed 13 December 2022.

[32] EOSC Steering Board. *Monitoring Open Science*. Opinion paper by the EOSC Steering Board. Link: [https://doi.org/10.2777/382490]. Accessed 13 December 2022.

[33] Webpage of the PathOS project on CORDIS hosted by the European Commission. Link: [https://cordis.europa.eu/project/id/101058728]. Accessed 13 December 2022.

[34]   O'Neill, Gareth, Volker Beckmann, Sofia Abrahamsson, and Natalia Manola (2022) *Introduction to EOSC Observatory*. Link: [https://zenodo.org/record/7410634]. Video available to watch on YouTube: [https://www.youtube.com/watch?v=jMWA1D1yai0]. Accessed 13 December 2022.