

D3.7: Updates to Policy-Supporting Services

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Abstract:

This report presents updates of the policy supporting services developed in Task 3.2 of EOSCpilot. It builds on and expands the reports on the Open Science Monitor (D3.2), Open Science Policy Registry (D3.4), and Open Science Policy Toolkit (D3.5), and should be read as an addition and complement to these deliverables, rather than as a stand-alone document.

Against this background and the rapidly evolving policy requirements of the EOSC, the proposed specifications of the Policy Supporting services are updated - mostly in order to reflect requirements emerging from the final policy recommendations of EOSCpilot Task 3.1. With this opportunity, new information on tools and practices is also taken into consideration in the Toolkit and Monitor section. The purpose of this deliverable is thus to present an updated and integrated vision for the EOSCpilot Policy Supporting Services, including the Open Science Monitor, Policy Registry, and Toolkit.

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EXECUTIVE SUMMARY

This report presents updates of the policy supporting services developed in Task 3.2 of EOSCpilot. It builds on and expands the following deliverables, and familiarity with these is required to derive a full understanding of this deliverable:

- D3.2 Open Science Monitor specifications;
- D3.4 Open Science Policy Registry;
- D3.5 Open Science Policy Toolkit.

Against this background and the rapidly evolving policy requirements of the EOSC, the policy supporting services are updated in order to reflect requirements emerging from the final policy recommendations of EOSCpilot Task 3.1. This deliverable thus presents an update and integrated vision for the EOSCpilot Policy Supporting Services, including the Open Science Monitor, Policy Registry, and Toolkit, for consideration by the EOSC governance.

Three workstreams have been implemented to ensure this objective:

- First, to ensure that clear connections are made with the EOSCpilot Final Policy Recommendations, a comprehensive mapping exercise has been conducted, matching the Policy Recommendations and subsequent Implementing Actions with the Open Science Monitor and Policy Toolkit.
- Second, further progress has been made on the Open Science Monitor (OSM). A set of use cases has been defined to specify options for implementing the Open Science Monitor in different configurations. These would essentially aggregate and analyse the OSM data in different workflows, presenting differing insights to users. Additionally, an assessment of relevant data entities included in the Policy Registry data model has been conducted to better identify which specific data entities are directly relevant for the Open Science Monitor.
- Third, the Policy Registry's data model has been extended to include a series of new data entities emerging from the EOSCpilot Final Policy Recommendations.

Lastly, the report presents a tentative implementation roadmap, including small-scale piloting, highlighting specific interdependencies that must be considered as part of the service's implementation. A crucial limitation is that the service updates presented here only built on the EOSCpilot Policy Recommendations while there are a number of other policy propositions developed by various bodies involved with the EOSC. If the objective is however that the Policy Supporting Services shall eventually support these policy propositions in a more holistic manner (i.e. instead of focussing on only one of multiple propositions), then a greater degree of alignment as well as ongoing operationalisation will need to be achieved between them.

1. INTRODUCTION

This report presents updates of the proposed specifications for the policy supporting services developed in Task 3.2 of EOSCpilot. It builds on and expands the following deliverables, and should be read as an addition and complement to them:

- D3.2 Open Science Monitor specifications¹;
- D3.4 Open Science Policy Registry²;
- D3.5 Open Science Policy Toolkit³.

The revisions discussed in this report have been introduced to align the Policy Supporting Services with ongoing work, particularly in relation to the emerging and final policy recommendations⁴ of T3.1 of EOSCpilot. The purpose of this report is also to update the Policy Supporting Services and present a vision of how these services interrelate. Lastly, this report also aims to present crucial considerations for the implementation of these services as part of the larger EOSC ecosystem.

1.1. The policy-supporting services purpose and offer

EOSCpilot's policy work package (WP3) developed a broad range of policy recommendations and interventions to support the implementation of the EOSC. Additionally, the Rules of Participation of EOSCpilot WP2 - Governance specify a basic set of more operational policy requirements that service providers who wish to engage with the EOSC must comply with⁵. Taken together, EOSCpilot thus introduces various policy requirements that must be implemented and monitored by a very broad range of external stakeholders including Research Performing Organisations (RPOs), Research Infrastructures (RIs), funders, as well as (national) ministries and other policy makers. Additionally, some of the EOSCpilot Policy Recommendations also address internal and governance aspects of the EOSC, e.g. by recommending that the EOSC Executive Board or Stakeholder Forum implement different bodies such as an Ethics and Legal Advisory Board⁶.

As the name suggests, the purpose of the EOSCpilot Policy Supporting services is to support the implementation of the policy requirements, with a focus on external stakeholders wishing to engage with the EOSC. Additionally, the EOSCpilot Policy Supporting Services also aim to propose solutions that can produce data and other insights to support the evolution of the EOSC. This data could be used by EOSC-governance bodies such as the EOSC Executive Board and Stakeholder Forum to make informed, evidence-based decisions to further progress the EOSC. The services are specifically focused on supporting policies as opposed to being more general services to support, say, forms of text and data mining. They are also specified with the EOSC in mind rather than as policy supporting services in a more general context.

In the context of T3.2 of EOSCpilot, three different policy supporting services have been proposed:

- 1) The **Open Science Monitor** is a service to gather metrics and produce aggregate statistics on how EOSC stakeholders implement and operationalise Open Science-related policies and practices. This includes for example the harvesting of data on Open Access publishing by institutions, cost of Open Access publishing (in the form of Article Processing Charges), and the FAIRness of research data⁷. The Open Science Monitor's indicator framework focusses on aspects which are crucial to the EOSC's wider policy vision and proposition. While the objective is to make the Monitor's data openly available for external use, its primary purpose is to supply "EOSC-internal" EOSC governance bodies

¹ <https://www.eosc-pilot.eu/content/d32-eosc-open-science-monitor-specifications>

² <https://www.eosc-pilot.eu/content/d34-open-science-policy-registry>

³ <https://www.eosc-pilot.eu/content/d35-open-science-policy-toolkit>

⁴ See [D3.3 Draft Policy Recommendations](#) and [D3.6 EOSCpilot Final Policy Recommendations](#).

⁵ See [D2.5 Recommendations for a minimal set of Rules of Participation](#).

⁶ This proposition is made in implementing action 1.4, in order to further specify the concrete actionable requirements arising from the Policy Recommendation 1 - Ethics, presented in deliverable D3.6 EOSCpilot Final Policy Recommendations.

⁷ A full explanation of the Open Science Monitor's indicator framework can be found in Annex A of the deliverable D3.2 Open Science Monitor specifications.

(such as the Executive Board) with data to facilitate their decision-making in relation to operational and policy issues of the EOSC.

- 2) The **Open Science Policy Registry** is a service for EOSC stakeholders and service providers to assess and provide documentation on their alignment or compliance with the EOSC's Policy Recommendations and Rules of Participation. The Policy Registry is designed as an interactive self-assessment tool, providing automated assessments to applicants on their EOSC policy alignment and compliance. These assessments are made based on various policy-related metadata, which the relevant EOSCpilot stakeholders and service providers would submit when using the service. As such, the Policy Registry is the core mechanism and gatekeeper for external stakeholders and service providers to prove that they meet EOSC-relevant policy standards. Through this process, the Policy Registry also collects data on the adoption of policies by the relevant stakeholders. This data can also be fed to the Open Science Monitor.
- 3) The **Open Science Policy Toolkit** is a collection of 60 third-party tools to provide EOSC stakeholders and service providers with existing resources that can support them in the adoption of Open Science policies as required by the EOSC. The Toolkit adopts a very broad notion of tools, defined as any resource that can be used by to progress the implementation of Open Science-related measures. It thus contains a very broad array of auxiliary resources, including e.g. software applications, best practice reports and case studies, training resources, and (interactive) policy guidance tools.⁸

Together, the EOSCpilot Policy Supporting Services thus intend to support the implementation of EOSC policies in three different ways: monitoring and gathering data on the implementation of Open Science (Open Science Monitor) to facilitate policy-making within the EOSC; assessing stakeholders' and service providers' compliance with EOSCpilot Policy Recommendations and Rules of Participation (Policy Registry); and offering external resources to stakeholders and policy adopters to support their policy implementation (Policy Toolkit).

1.2. Motivation for the Policy Supporting Services in EOSC

The EOSCpilot Policy Supporting Services are introduced because, essentially, the implementation of the EOSC is more than a technical matter. It comes with a rapidly evolving environment of policies, governance principles, and related-technical requirements. Adding to the EOSCpilot Policy Recommendations, propositions for requirements are also included in the EOSCpilot Rules of Participation. Furthermore, policy-relevant recommendations have been made by the European Commission's successive High-Level Expert Groups on the European Open Science Cloud⁹ as well as the Commission's FAIR data expert group^{10 & 11}.

The underlying expectation is that external stakeholders such as research performing organisations, funders, policy makers, research infrastructures as well as service providers will need to adopt a number of EOSC's policy and governance requirements in order to be able to participate. With regards to the EOSC's Rules of Participation, this vision is clearly stated on the EOSC Portal website¹².

However, whether this expectation can be realised also depends on if those who the policies are addressed to can find suitable support for their policy implementation activities. This raises three different service needs:

- First, external stakeholders and service providers will need to find guidance and supportive resources in order to support the implementation of measures to ensure policy compliance. Crucially, this

⁸ The full Policy Toolkit can be accessed at:

https://docs.google.com/spreadsheets/d/1gqhL3NqdQ2FD47N2e26ifviovK30ZROW5TG_SgtW9Eo/edit#gid=2075068763

⁹ <https://ec.europa.eu/research/openscience/index.cfm?pg=open-science-cloud-hleg>

¹⁰ <http://www.codata.org/working-groups/fair-data-expert-group>

¹¹ The EOSCpilot Policy Supporting services have however only been developed in relation to policy propositions issued by EOSCpilot. As laid out in section 4.1, the different directions and maturity stages of policy propositions require further clarification, alignment, and - potentially – harmonisation, in order to be adoptable by the Policy Supporting Services.

¹² <https://www.eosc-portal.eu/governance/rules-participation>

involves resources that support - or at least inform - them in their efforts to operationalise the relatively high-level requirements of e.g. the EOSCpilot Policy Recommendations and Rules of Participation into concrete implementations that are directly applicable to their operations or services. Notably, due to the diversity of policy propositions made in the context of the EOSC, the required implementations can take very different forms, including the implementation of new policies (for their organisations or users), specific technical developments (e.g. adapting metadata frameworks or AAI), non-technical developments (e.g. conducting trainings on Open Science related matters for their staff or users), as well as procedural changes (e.g. in how publications or other IPR are released). To serve this need, the EOSC Open Science Policy Toolkit offers stakeholders and service providers a wide range of resources which they can reuse to inform very broad organisational, technical, and policy transitions required in the context of the EOSC.

- Second, once stakeholders and service providers have made their organisational changes as required, a mechanism is needed for them to supply evidence to the EOSC, documenting their compliance. The same mechanism should also be capable of assessing whether a sufficiently high level of compliance has been achieved - or whether further efforts are needed - in order to offer an assessment outcome to the applying stakeholder or service provider. This need can be served by the EOSCpilot Policy Registry, effectively a gatekeeper mechanism, which enables the submission of evidence on and implementation of policy implementation.
- Third, the EOSC will need a mechanism to keep track of practical developments and trends in the wider Open Science environment. This concerns statistics and metrics on policy-related developments such as the open access publishing activities, data publishing, training activities, etc. While many individual data sources are already in place, a need emerges from the EOSC's view to develop a comprehensive framework that allows the applicable decision-making bodies, such as the EOSC Executive Board, to manage the information and data that is relevant for EOSC decision-making. This framework is offered by the Open Science Monitor.

1.3. Scope of this deliverable

Against this background and the shifting grounds of EOSC, it was felt important that the policy supporting services are updated in order to reflect requirements emerging from the final policy recommendations of EOSCpilot T3.1. The purpose of this deliverable is thus to present an update and integrated vision for the EOSCpilot Policy Supporting Services, including the Open Science Monitor, Policy Registry, and Toolkit. Three workstreams have been implemented to ensure this objective:

First, to ensure that clear connections are made with the EOSCpilot Final Policy Recommendations, a comprehensive mapping exercise has been conducted, matching the Policy Recommendations and subsequent Implementing Actions with the Open Science Monitor and Policy Toolkit. The purpose of this mapping is to display in detail how these services interlink with and can support the Policy Recommendations. Different from the Open Science Policy Registry, the Open Science Monitor and Policy Toolkit have not been developed with a stable set of Policy Recommendations in mind. This is due to timing differences between T3.1 and T3.2, which saw the specifications for the Open Science Monitor and Policy Toolkit released before the Final Policy Recommendations. Hence, while the Policy Registry has been built on the EOSCpilot Policy Recommendations, the Open Science Monitor and Policy Toolkit required the additional mapping in order to gain a better view of how they relate exactly to Final Policy Recommendations.

Second, further progress has been made on the Open Science Monitor. A set of use cases has been defined to assess the feasibility of implementing the Open Science Monitor in two different configurations. Additionally, an assessment of relevant data entities included in the Policy Registry data model has been conducted to better identify which specific data entities are directly relevant for the Open Science Monitor.

Third, the Policy Registry's data model has been extended to include a series of new data entities emerging from the EOSCpilot Final Policy Recommendations. This has led to a significant number of changes, including

structural simplifications and harmonisations to increase the machine-readability and reduce the complexity of the Registry data model.

The following sections present the results of these workstreams service by service. To conclude, the report also identifies interdependencies and presents some recommendations for the implementation of the Policy Supporting Services.

2. OPEN SCIENCE MONITOR

2.1. Background and scope of OSM update

The initial report on the EOSC Open Science Monitor (D3.2) specifications provided a thorough review, specifications, and categorisation of the existing efforts and tools proposed for the monitoring of Open Science resources on the national, regional, European or international level. Building on this, it specified a methodology with the main concepts and the steps to be followed for the implementation of the OS monitoring framework by the EOSC and its adaptation by other interested organizations. Finally, it described the specifications for the implementation of such a framework, i.e. the key modelling concepts, architectural considerations, standards and processes that the OS Monitor framework must support, as well as an overview of the added value services that the framework must offer to end users. The two possible paths foreseen for the deployment and operation of the OS Monitor in EOSC are that:

- the OS Monitor framework will be one of the services in the overall EOSC system, i.e., a monitor-as-a service tool as part of the EOSC software stack, collecting indicators and monitoring data by the organizations participating in EOSC, and offering to the EOSC stakeholders the functionality for monitoring, visualizing and gaining insights about OS trends and impact;
- or the implementation, customisation and deployment of the OS monitor framework could be performed by each individual organization participating in the EOSC, which in turn publishes the monitoring results to the EOSC portal.

Since the release of these initial specifications, three main activities took place in order to revise the Open Science Monitor Framework and connect it with work undertaken by WP3 Task 3.1 on EOSC Policy Recommendations:

1. Simplifying the initial Framework: The D3.2 EOSC Open Science Monitor specifications were a product of extensive research on Open Science aspects of policies, trends and relevant monitoring attempts worldwide. One of the major objectives of the deliverable was a comparison between Open and FAIR principles so as to highlight commonalities and differences between them to more accurately provide an answer to what is open and what is FAIR and therefore what is measured in that context. The pool of Monitoring Targets, dimensions and indicators collected then reflected many monitoring levels which had to be re-examined and prioritised as WP3 work on policies was progressing. This refinement of the framework led to the identification of two configurations in which the OSM's measurements could be presented:
 - i. A *collective configuration* to measure Open Science, which takes into consideration the cumulative effect of all the elements of the framework combined to provide an aggregated picture of OS activities within a country or an institution.
 - ii. An *in-depth configuration* to assess measurements on the two Monitoring Targets Open Access and FAIR. This configuration of indicators provides granular measurements to assess the levels of openness and FAIRness of an institution's, funder's or individual's OS outcomes and practices.
2. Updating Monitoring Targets to include new monitoring concepts and to reflect more dimensions in line with D3.6 Final Policy Recommendations: D3.2 was submitted well before policy developments of WP3 T3.1 making the connection between the Monitor and the proposed set of policy recommendations challenging from the outset. Similarly, the majority of ongoing developments around FAIR had to be included as well for they address new practices and efforts

such as the ANDs FAIR self-assessment tool¹³. With D3.6 finalised, a review and re-prioritisation of the Monitoring Targets and their dimensions gave the opportunity to fill in some gaps in the framework. These relate to:

- Open Access, mainly the openness dimension, which among other things contains information about the costs to make a research output open. In addition, the Ethics and Intellectual Property Rights indicators are introduced to complement this dimension.
 - RDM (Research Data Management) costs for management and preserving of information and data is added in the model along with DMPs.
 - Research Collaboration, for inclusion of DMPs which among other things are a source for collaborations as it eases understanding and communication of data and research.
 - Skills, for new indicators were provided when connecting this Monitoring Target with the policy Recommendations and with the Registry.
3. Updating the model to reflect information exchange with the Registry: There is a clear interdependence with the Registry and because it can provide useful information with respect to the policy monitoring target of the Monitor. With the Registry data model being updated to be more policy-oriented, solutions on how to fit it into the Monitor or on workflows to be followed for policy information exchange with the Monitor were sought.

2.2. Revisions of Open Science Monitor framework

The following sections describes the revised OSM framework, which is based on eight Monitoring Targets outlined below. Each Monitoring Target has a set of dimensions which are explained below with regards to the Open Science aspect(s) to which they relate.

- 1) **Open Access** has five dimensions: Transparency, Findability, Accessibility, Interoperability, Reusability. They are primarily based on the comparison performed in D3.2¹⁴. Apart from that and complementary to this activity, levels of openness and fairness were also sought and are highlighted within the indicators.
 - **Transparency** relates to *costs*, *IPR* and *Ethics* of open conduct. It aims to gather information about the cost for publishing in OA (contributing to the normalisation of APCs and BPCs¹⁵). Transparency includes *IPR* and *Ethics* indicators for Openness is closely related to Responsible Research and Innovation¹⁶. Thus, IPR is seen here for open conditions and also restrictions affecting an output's (e.g. an article's or dataset's) openness and further manipulation. Ethics also look at conditions that have to do with research collaboration but also with information reuse.
 - **Findability** is based on measurements relating to *PIDs*, *metadata* and *directories*. PIDs for providing a persistent and unique location to information about a record/dataset, organisation, individual, metadata for structuring this information in a machine-readable way and directories for indexing and enhancing searchability and visibility of information.
 - **Accessibility** is based on a combination of measurements relating to *free access*, *availability* and *open protocols*. Free access at the point of use of information, so this is closely related to OA

¹³ <https://www.and-nectar-rds.org.au/fair-tool>

¹⁴ <https://www.eosc-pilot.eu/content/d32-eosc-open-science-monitor-specifications>: See p.22, Figure 3: Connection between Openness and FAIRness.

¹⁵ Article Processing Charges and Book Processing Charges.

¹⁶ <https://www.fosteropenscience.eu/taxonomy/term/255>

routes especially for the locus of deposit or publication. Availability of information is yet another important factor along with open protocols used for information exchange.

- **Interoperability** concerns ways of communicating information and sharing data between diverse systems and technologies, so *machine readability* and *metadata completeness* are key aspects to be taken into consideration. Machine readability for ensuring digital communication of information and metadata completeness of metadata records for effectively achieving aggregation of collections.
 - **Reusability** is based on measurements relating to the licensing conditions attached to research outputs. Thus, this dimension concerns the granularity of openness in *licenses*, from standard licensing systems like Creative Commons to MIT or Apache for hardware and software.
- 2) **RDM** is based on the five dimensions Transparency, Findability, Accessibility, Interoperability, and Reusability:
- **Transparency** relates to *costs* for managing and preserving research data in the long term and to *DMPs*, as the documentation which makes research lifecycle activities and their outcomes comprehensible and exploitable by all.
 - Similarly, to the relevant Open Access dimension, PIDs, metadata and directories are driving **Findability**.
 - In addition to access, metadata availability and protocols, **accessibility** includes *APIs*, *authentication* and *understandability* of information. APIs for accessing datasets and other features of operating systems, authentication for granting access to users and understandability for exposing information which are important in comprehending vital aspects like the scope and use of datasets.
 - **Interoperability** has to do with machine readability, but also with *standards*, *vocabularies* and *linked information*. Metadata standards for being understandable and easily harvested, vocabularies or ontologies for semantics representation in the web and linkage between outputs and activities for information contextualisation.
 - **Reusability** concerns *provenance* and *community standards*. Provenance ensures raw data and tracking of activities and information while community standards refer to compliance conditions of acceptable datasets.
- 3) **Trustworthiness** recognises the importance of platforms to be safe and certified environments for the long-term preservation and management of information and data. Therefore, the two dimensions that apply here are *archiving* and *certification*.
- **Archiving** identifies and measures the usage of platforms (locus of deposit) that researchers use to archive their data (Institutional, subject repositories, libraries) and others that have provisions and mechanisms for long term preservation (e.g. back-ups, sensitive data storage).
 - **Certification** assesses compliance according to relevant certifications, such as the recently formulated CoreTrustSeal and ISO 16363.
- 4) **Research Collaboration** dimensions are relevant to communication and collaboration activities and their *transparency*. Hence, communication and collaboration activities which are included here are:
- peer review for highlighting how the open traits in peer-review are spread around the scholarly community regarding both publishers policies and researchers preferences.
 - citations for measuring the uptake of open scientific citations.
- 5) **Skills** is based on two dimensions: expertise as well as training and awareness.

- *Expertise* measures the types of skills that are necessary to perform OS (web technologies, data science, legal aspects etc) as addressed in the WP7 EOSC Skills and Capability Framework, and *training* is examined regarding training activities, literacy programs and people's participation in open science events and activities.
- 6) **Citizen Science** concerns specific aspects of *citizen science engagement*, even though the actual performance and implementation of Open Science by citizens is not included in measurements.
- Citizen Science Engagement collects information about communication of research beyond Academia, demographics of citizens participating in research related projects or enabling parts of them.
- 7) **Impact** aims to provide early stage measurements on the impact of (Open Science-based) research activities. Although it is very soon in measuring impact of Open Science, it is included here to provide an overview of specific aspects of impact as measured in science, the economy, and public/community sector as well as to capture elements of research excellence (mostly indicators on rewards and incentives).
- *Society* includes indicators which are helpful in measuring the impact that open research and products have for the public good, and could be also connected with the SDSN mission.
 - Of course, one of the anticipated impacts of Open Science is in *Economy*, not only with job openings but also with increase of AEP through re-using research therefore avoiding same research duplication.
 - *Research Excellence* has to do with researchers and how they behave inside an Open Research Lifecycle. Indicators here measure the open activities that are performed by individuals and the evaluation criteria required by Universities and organisations for researchers' evaluation.
- 8) **Policy** as a Monitoring Target is based on three dimensions: readiness adoption, and compliance.
- Readiness refers to all Open Science aspects' policy information that could be useful in assessing preparedness to welcome Open Science policies developments as well as to accommodate technical needs with infrastructures and services deployment. This dimension can be enriched with information from the policy checklists (D3.6, Recommendation 7).
 - Adoption relates to the current state of all Open Science policies enforced. This dimension can be used for a policy landscape review to assess different policy environments. It had been primarily introduced to discover the level of policy that the stakeholder is subject to (e.g., European, national, institutional) along with information about the type of policies (data sharing, open access, research data management, etc.) that have been developed by the stakeholders and commitment in following them (e.g. Open Access mandates).
 - Compliance is also reflected in policies regarding all Open Science aspects and is located between the two aforementioned targets. This dimension is tailored to the EOSC to demonstrate how EOSC stakeholders meet the EOSC policy criteria. Hence, it's closely related to the EOSC Policy Registry and its data model.
- 9) **Open Education** aims to strengthen pedagogical methods by providing the means for a responsible, open and transparent academic environment with courses open for use and re-use by everyone. The outputs of Open Education, i.e. the **Open Educational Resources** are the target here.
- Open Educational Resources are seen as the Open research outputs, thus similarly to some Open Access and RDM dimensions.

Measurements provided by these Monitoring Targets and their dimensions may relate in different degrees to **digital objects** (e.g. research outputs), **individuals** (e.g. researchers and other professionals), **organisations** (e.g. research and academic institutions, SMEs), and **infrastructures/services** (e.g. repositories and other open science services). Therefore, Table 1 shows the different dimensions map to these different subjects.

Table 1: Mapping of dimensions to measurement subjects

Monitoring target	Dimension	Digital Object	Individual	Organisation	Infrastructure/ service
Open Access	Transparency	✓	✓	✓	✓
RDM/FAIR	Findability	✓			✓
	Accessibility	✓			✓
	Interoperability	✓			✓
	Reusability	✓	✓		✓
Trustworthiness	Archiving	✓			✓
	Certification				✓
Skills	Expertise		✓		
	Training			✓	
Citizen Science	Engagement			✓	
Open Education	Open Educational Resources				✓
Policies	Readiness			✓	✓
	Adoption			✓	✓
	Compliance	✓	✓	✓	✓
Impact	Societal impact			✓	
	Economic impact			✓	✓

	Research excellence		✓	✓	
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Digital objects such as publications, research data, software but also DMPs, training material, metrics and even machine-readable policies should be Open and/or FAIR. That means that they are highly dependent on Open Access (Transparency) and RDM FAIR practices, but also on policies as eventually research outputs have to be made open and FAIR according to certain rules and conditions.

Individuals are researchers but also students, other professionals and citizens. Their practices should follow open principles to ensure open and ethical re-use of their research outputs (Transparency, Reusability), and therefore meet compliance conditions of Open Access and RDM FAIR policies. Individuals skills showcase their expertise and evaluation is highly dependent to their experience and contributions in Open Science aspects.

Organisations are institutions from the academic and research world, including libraries as well as third parties, like SMEs. They are the hubs where culture on responsible research and innovation is cultivated and they should ensure such thing through Open Science policies (Readiness, Adoption, Compliance). Policies set the right foundations for “openness” as well as FAIRness to be embedded in individuals’ open practices and achieve compliance with them. Organisations should decide on the main “open” criteria for individual’s academic or professional evaluation (research excellence) along with providing training for awareness and development purposes of their staff and community. They are the ones most directly affected by societal and economic factors which they are also more likely to drive.

Infrastructures/Services are research and e-infrastructures and services facilitating Open Science. They as well should be open (e.g. open source software) and provide the right means for outputs to be open, FAIR, measurable and retainable not only through their services but also through their policies. Infrastructures/Services are also affected by economic factors pertaining to the research conduct.

2.3. Connection with the Open Science Policy Registry

With the Registry updates to reflect the EOSCpilot Final Policy Recommendations, policy information collected by its metadata model and connections with the Monitor became clearer. The Policy Monitoring Target presented in D3.2 had been intended for measuring policy dimensions which, at the time of the initial release, were not fully known because both the EOSCpilot Policy Recommendations and the Policy Registry were still at an early stage. The Policy Monitoring Target’s scope was to draw conclusions about the *readiness/preparedness, adoption, compliance* from information collected by both Supporting Services. From the updated data model of the Policy Registry, we can conclude that the *stakeholder* metadata entity is highly relevant for the Open Science Monitor and should be integrated in the Policy Monitoring Target accordingly. Although the Monitor data model also collects information on stakeholders, this data from the Policy Registry provides a good opportunity to test for validity of information, especially on the occasion when stakeholders identify themselves in more than one stakeholder category.

Table 2: Policy data included in the Policy Registry data model

Policy Area/ Entity	Property
Open Science	Open science policy
	Citation policy

Policy Area/ Entity	Property
	Code of Conduct
	OA Policy
	PID Policy
	Reward Policy
	Rewarding Mechanism
	Open Science Accreditation Schemes
	Open Access Publishing Cost
	Research Data Management Cost
	IPR Policy
	IPR machine-readability
	EOSC TDM framework
	Data availability and sharing policy
	Data curation and preservation policy
	FAIR processes
	DMP policy
	Access Policy
	Peer review
	EOSC Charter for Access
Skills	Training commitment (Open Science Training, Training Ethics, Training Legal Issues, Training RDM, Training FAIR, Training GDPR)
	Training Materials (Open Science Training,

Policy Area/ Entity	Property
	Training Ethics, Training Legal Issues, Training RDM, Training FAIR, Training GDPR)
	EOSC Skills Framework
	Open Science Awareness Campaigns
Ethics	Ethics Policy
	Ethics Metadata Schema
Procurement	Procurement Policy URL
Data Protection	Security Policy
	Privacy Policy
	Data Protection Policy
	GDPR support
	Data Protection Officer

According to the Open Science Monitoring Conceptual Model¹⁷, there is a Policy element which refers to the OS Monitoring Target for which Actors are interested in. These actors are research administrators and end users of the monitor. Additionally, Open Science enablers, i.e. government bodies, research organizations, publishers etc., are initiators or providers of specific OS resources, which are monitored by the Monitoring Target, measured by indicators and computed by specific processes.

¹⁷ For a thorough explanation of the model, please refer to D3.2, p.50 <https://www.eosc-pilot.eu/content/d32-eosc-open-science-monitor-specifications>

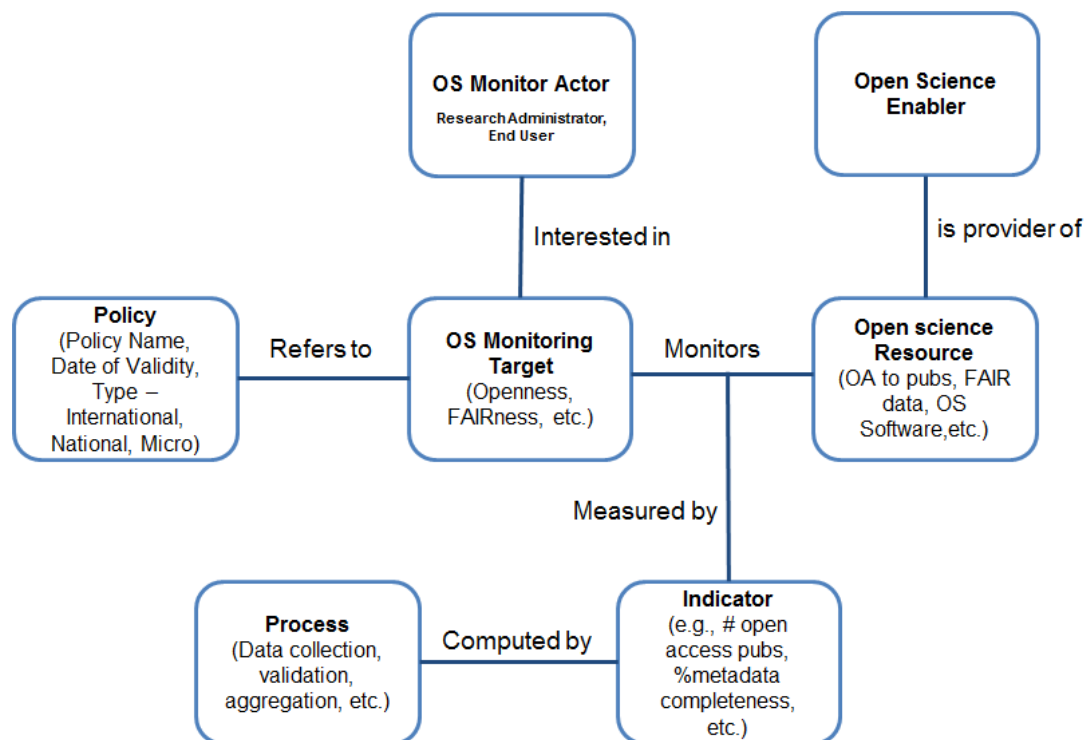


Figure 1: The Open Science Monitoring conceptual model

Consequently, communication between the Policy Registry model (see Section 3.1) and the OSM conceptual model occurs through the Policy element, information of which is collected by the Policy Registry and stored in the Policy Profile to then be fed to the OSM. Information about the Policy Registry's Stakeholder and OS Resource and type completes or compares what already exists in the OS enabler and Open Science Resource elements of the OSM, respectively.

2.4. Mapping of Open Science Monitor with EOSCpilot Final Policy Recommendations

The EOSCpilot final policy recommendations revolved around the four policy areas *Ethics*, *Open Science and Open Scholarship*, *Data Protection* and *Procurement*. Each of the nine recommendations in the EOSCpilot Final Policy Recommendations includes a set of implementing actions to further specify, operationalize, and prioritise any required actions. For more information, please refer to D3.6 Final Policy Recommendations¹⁸.

Table 3 maps the OSM's Monitoring Targets and Dimensions to the Policy Recommendation(s) and specific implementing action(s). It is worth noting that Data Protection and Procurement were not included as they seem to be out of scope for this particular activity.

¹⁸ <https://www.eoscipilot.eu/content/d36-final-policy-recommendations>

Table 3: Mapping of OSM to EOSCpilot Final Policy Recommendations

Monitoring Targets (MTs)	Dimensions	Policy Recommendations/ Implementing Actions
Open Access	Transparency (Costs; Funding Coverage; Availability; Ethics; IPR)	Ethics (1.1, 1.2); Access (2.1); Open Science Conduct and Outputs (3.2); Open Science Conduct and Outputs (3.3); IPR (4.1; 4.2; 4.5, 4.6)
	Findability/ Discoverability (PIDs; metadata; directories)	Ethics (1.1); Access (2.3); Open Science Conduct and Outputs (3.2)
	Accessibility (free access; availability; open protocols)	Ethics (1.1); Access (2.1); Open Science Conduct and Outputs (3.2)
	Interoperability (machine readability; metadata completeness)	Access (2.3); Open Science Conduct and Outputs (3.2)
	Reusability (Restrictions)	Open Science Conduct and Outputs (3.2); IPR (4.1, 4.6)
RDM	Transparency (Costs; DMPs)	Open Science Conduct and Outputs (3.2); Open Science Conduct and Outputs (3.3);
	Findability (PIDs; metadata; directories)	Access (2.3); Open Science Conduct and Outputs (3.2)
	Accessibility (mechanisms; protocols; APIs; authentication; metadata availability; understandability)	Access (2.1); Open Science Conduct and Outputs (3.2)
	Interoperability (machine readability; standards; vocabularies; linkage)	Access (2.2, 2.3); Open Science Conduct and Outputs (3.2)
	Reusability (licenses, provenance; community standards)	Open Science Conduct and Outputs (3.2); IPR (4.1, 4.6)

Monitoring Targets (MTs)	Dimensions	Policy Recommendations/ Implementing Actions
Trustworthiness	Archiving (locus of deposit; (long term) preservation policies)	Open Science Conduct and Outputs (3.2); Open Science Conduct and Outputs (3.3)
	Certification	Conduct and Outputs (3.4); Incentives and Rewards (6.3)
Research Collaboration	Transparency (peer review; citations; Other Communication and collaboration activities)	Open Science Conduct and Outputs (3.4)
Skills	Expertise (data stewardship)	Open Science Conduct and Outputs (3.2); Awareness and skills (5.1)
	Training (and awareness)	Open Science Conduct and Outputs (3.2); Awareness and skills (5.2, 5.3, 5.4)
Policies	Readiness	Incentives and Rewards (6.2); Policy Supporting Services (7.1, 7.2, 7.3)
	Adoption	Incentives and Rewards (6.1)
	Compliance	Incentives and Rewards (6.1)
Citizen Science	Citizen engagement	n/a
Open Education	Open Educational Resources	Open Science Conduct and Outputs (3.2); Open Science Conduct and Outputs (3.3)
Impact	Society	IPR (4.3)
	Economy	IPR (4.3)
	Research Excellence	IPR (4.3); Incentives and Rewards (6.1)

2.5. Use cases

The following use cases aim to describe the two ways in which the Monitor can be used. The “Collective Approach” produces a compact, solid estimate of how different organisations or even whole countries implement aspects of Open Science. This use case does not explore in great detail the specifics of each Open Science aspect (e.g. Open Access, Open Data, FAIR) but seeks to calculate the aggregated outcome of activities that highlight them. For example, the focus of the “Collective Approach” is on the amount of publications published in OA journals - not on policy details about how these publications meet open access criteria.

Complementing this, the “Individual Approach” provides more in-depth analysis and targets the outputs of the research to assess how Open and FAIR these are. Extensive diagrams showing the use cases explained below can be found at Zenodo¹⁹.

2.5.1. Collective Approach

This use case demonstrates how the Monitor can be used by an institution, a funder or a country to measure Open Science. The backbone of this approach is Open Access, FAIR, Open Collaborations, Open Educational resources and Citizen Science. Other Open Science aspects and movements were not included because of lack of metrics as of today in measuring them. This approach showcases how the Monitoring Targets, dimensions and indicators can be used in the form of indices which can be configured per stakeholders’ needs.

Open (and FAIR) outputs and infrastructures: This Target measures Open and FAIR principles to understand the developments of Open Access, Data Sharing/ Research Data Management (RDM) and Open Source policies and infrastructures, particularly revealing the amount of publications, open data and code currently been made openly and shared. Trustworthiness relates to infrastructures hence is taken into consideration along with restrictions in accessing and using content. Lastly, a major characteristic in Open Science is information contextualisation thus it couldn’t be out of such measurements.

Open Educational resources: This area has seen major developments in the past years from its dedicated community of practice. Below, some indicators are borrowed from the OER World Map²⁰ and OER Commons²¹ work.

Open Collaborations: This broad target accommodates indicators and metrics from a wide range of activities. However, for this exercise four different aspects are examined: Open Notebooks, Open Peer Review, Open Citations and Altmetrics.

Citizen Science: One of the goals of Open Science is to bring science developments into the mainstream in a more approachable manner for citizens. Therefore, this index includes indicators that show citizen engagement in scientific projects/efforts.

¹⁹ <https://doi.org/10.5281/zenodo.2582528>

²⁰ <https://oerworldmap.org/>

²¹ <https://www.oercommons.org/>

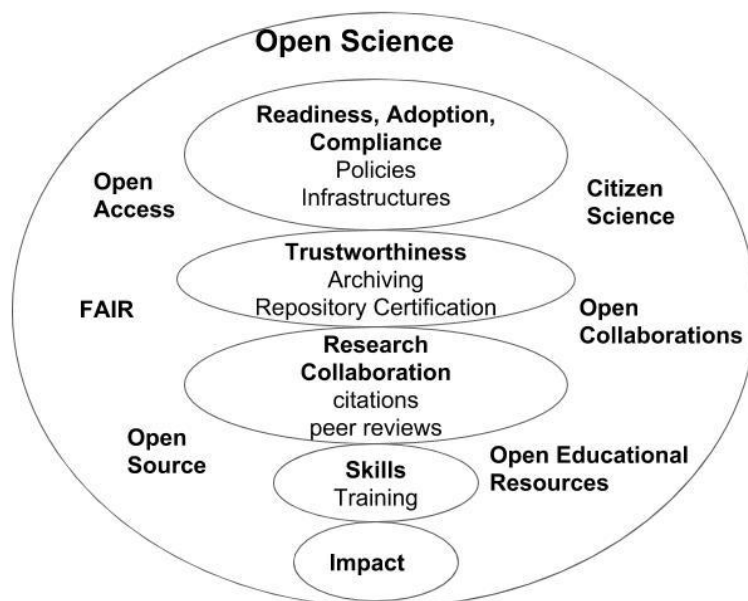


Figure 2: Open Science Monitoring Targets in relation to the 'Collective approach' use case

2.5.2. Individual in-depth Approach

This approach concentrates on the digital objects and infrastructures/services and the two Open Science aspects, those of Open Access and RDM FAIR principles. In addition to providing resource-specific measurements, it also aims to provide information on how to measure and differentiate openness and fairness. It is known that data may be open but not FAIR or the opposite but there are also cases that both open and FAIR applies to data. This approach highlights commonalities and differences in Open and FAIR and is ideal for understanding how open and FAIR are the research outputs. Therefore, it could be used as a self-assessment and compliance tool for measuring levels of Openness and FAIRness. Here, publications, data and software as well as repositories are put to the test and are matched to the relevant stakeholder for their monitoring.

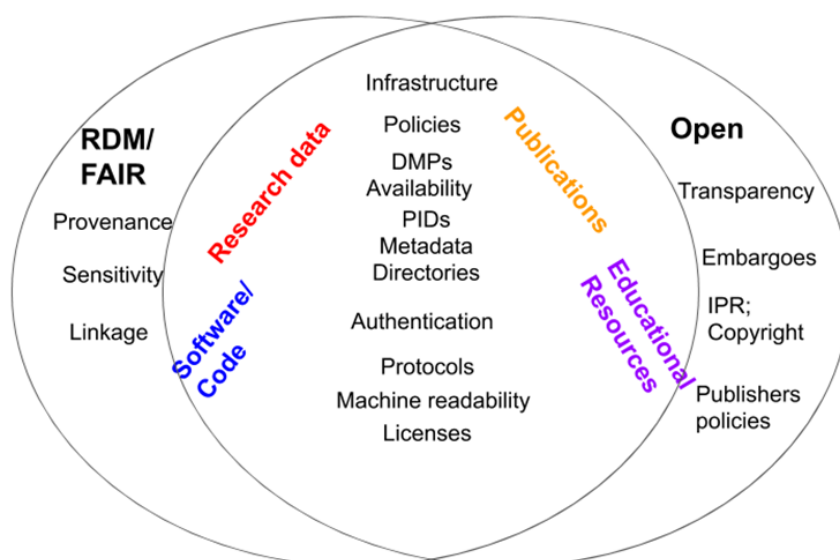


Figure 3: Open Science Monitoring Targets in relation to the 'Individual in-depth approach' use case

Measurement of Openness: Table 4 displays how the different indicators of the OSM apply to the configuration of the individual in-depth approach, depending on which stakeholder and resource type is under consideration

Table 4: Measurement of Openness

Stakeholder type	Resource type			
	Publications	Data	Software	Infrastructure/service
RPOs	Access Costs			Infrastructure Costs
			Ethics	
				Certification
RFOs	Funding Coverage	Funding Coverage		
Researchers	Publishing Costs	RDM and DMP costs		
	Availability of information	Availability of data	Availability of information	
			Ethics	

- **Transparency** includes indicators about publications for costs related to publishing, gaining access and developing or making an open access infrastructure. Similarly, it relates to funders' coverage for Open Research which is relevant to APCs and BPCs for publications and to RDM and DMPs for data. Availability of information as part of documenting practices contributes to research integrity along with Ethics and IPR indicators.
- **Trustworthiness** focuses solely on the infrastructure and service storing or providing research outputs. Indicators show whether a repository has attained a certification – as well as information on the reliability of the applicable citation format.

Measurement of FAIRness: Table 5 explains how the individual OSM indicators would apply to the measurement of FAIRness, depending on which stakeholder type and resource type is affected. Infrastructures and services are not included in the list of resources below as the measurement of FAIRness is limited to its main references, i.e. publications, data, and software. Open Educational Resources are not included in this measurement, however it would be interesting to understand how FAIR principles are or could be applied to those resources and others of relevance, such as training materials etc.

FAIR compliance of research outputs is achieved by measuring Findability, Accessibility, Interoperability and Reusability according to the FAIR data principles.

- For scientific outputs to be **findable**, the Monitor seeks for information that has to do with PIDs and metadata assigned to them, and with directories where the outputs are stored.
- **Accessibility** combines indicators for access through information on metadata availability, for queried access through APIs, for understanding of data through well documented information, for information exchange through protocols and for access modes through authentication.
- To achieve that data is **interoperable**, metadata should be described using Machine readable schemas, vocabularies, standards and should be linked to each other as well as to other resources and metadata.
- **Reusability** looks for information about licenses attributed to the outputs, so that it's clear the concept under which they can be exploited by others. Reusability also takes into consideration data provenance and community standards, so that researchers know what to use each time.

Table 5: Measurement of FAIRness

Stakeholder	FAIR Dimensions	Publications	Data	Software
RPOs/RIs	Findability	Directories	Directories	Directories
		Metadata	Metadata	Metadata
		PIDs	PIDs	PIDs
	Accessibility	Access	Access	Access
		Availability	APIs	
		Protocols	Protocols	
			Understandability	
			Authentication	
	Interoperability	Machine Readability	Machine Readability	
		Metadata Completeness	Vocabularies	
			Standardisation	
			Linkage	
	Reusability	Restrictions - Licenses	Licenses	Licenses
		Restrictions - Copyright	Provenance	Provenance
		Restrictions - Automatic Posting Rights	Community Standards	
RFOs	Interoperability	Standardisation		
	Reusability	Restrictions - Licenses		
OA publishers	Findability	Directories		Directories
		Metadata		Metadata
		PIDs		PIDs

Stakeholder	FAIR Dimensions	Publications	Data	Software
	Accessibility	Access		Access
		Availability		
		Protocols		
	Interoperability	Standardisation		
	Reusability	Licenses		Licenses
		Provenance		Provenance
Researchers	Findability		Directories	
			Metadata	
			PIDs	
	Accessibility		Access	
			Protocols	
			Authentication	
	Interoperability	Machine Readability	Vocabularies	
		Metadata Completeness		
	Reusability	Restrictions - Copyright	Licenses	Licenses
			Provenance	Provenance
			Community Standards	

An example of how the score can be calculated is as follows:

$$\text{FAIR} = w_1 * \text{Findable} + w_2 * \text{Accessible} + w_3 * \text{Interoperable} + w_4 * \text{Reusable}$$

Where, Findable = $w_1 * \text{Directory} + w_2 * \text{PIDs} + w_3 * \text{metadata}$

Thus, according to the indicators, a model formula to assess **findability** could be:

1. Directory
 - a. If data in a directory +1
 - b. If data in a repository +1
 - c. If data not in repository +0
 - d. If data not in a directory +0
2. PIDs
 - a. If with PID +1
 - b. If with URL +0.5
 - c. If with local identifier +0.5
 - d. If without a PID +0
3. Metadata
 - a. If metadata are linking to other resources +1
 - b. If metadata are described through standard metadata schemas +1
 - c. If metadata are described without standard metadata schemas +0.5
 - d. If brief title and description available +0.5
 - e. If no metadata available +0

Similarly, all other dimensions follow the same approach in calculating the score for the respective indicators, which, when combined, produces a total score for FAIR of a research output.

The same process can be used to measure Open as well as other Monitoring Targets and configurations which intend to provide an outcome which is scaled in a way to show levels of maturity in following this target or configuration. This assessment model could provide a useful measure of FAIR maturity, and also could potentially be further developed to incorporate sub-dimensions within FAIR. There is ongoing discussion, for example in GO FAIR and in the RDA, about the FAIR principles and their application, as a result of which it may be possible or necessary to update or further develop the OSM model described above.

3. OPEN SCIENCE POLICY REGISTRY

The Open Science Policy Registry has been further developed together with the release of the Final Policy Recommendations. The overall design and operational workflow of the Policy Registry described in D3.4 remained unchanged. The Policy Registry is a service which should allow external stakeholders and service providers to submit policy-related metadata in order to assess their compliance with the EOSCpilot Policy Recommendations as well as Rules of Participation. Users of the system would enter policy-related metadata, specific to their respective use case, via a metadata form. Based on this metadata, the Registry would provide an assessment outcome specific to their use case. Service providers who seek to validate their compliance with the Rules of Participation follow use case 1, providing them with an overall assessment outcome on whether they comply with the Rules of Participation. Other policy stakeholders who seek to assess their alignment with the EOSCpilot Final Policy Recommendations follow use case 2, providing them with a statement on how well they are aligned with the Policy Recommendations in four dimensions: Open Science, Ethics, Procurement as well as Data Protection and Privacy.

To better reflect the specific requirements and structure of the Final Policy Recommendations numerous amendments were made to the data model. The following section therefore focuses on the proposed changes to the data model. For a full discussion of the functioning and background of the Policy Registry, please refer to D3.4. For a full documentation of the updated data model, including a mapping between data properties and specific EOSCpilot Policy Recommendations and Rules of Participation, please refer to Annex A.

3.1. Updates to data entities and properties

In the Policy Registry's initial data model (see Figure 4), a two-tiered structure was introduced to separate policy metadata (light shaded) from supportive, administrative data about stakeholders and their resources. Capturing these types of data is essential because the Registry's inherent purpose is to collect not only information in relation to policies and their adoption - but also who develops these policies and for which resources they apply. Both data types are essential to ensure the data operation of the Policy Registry.

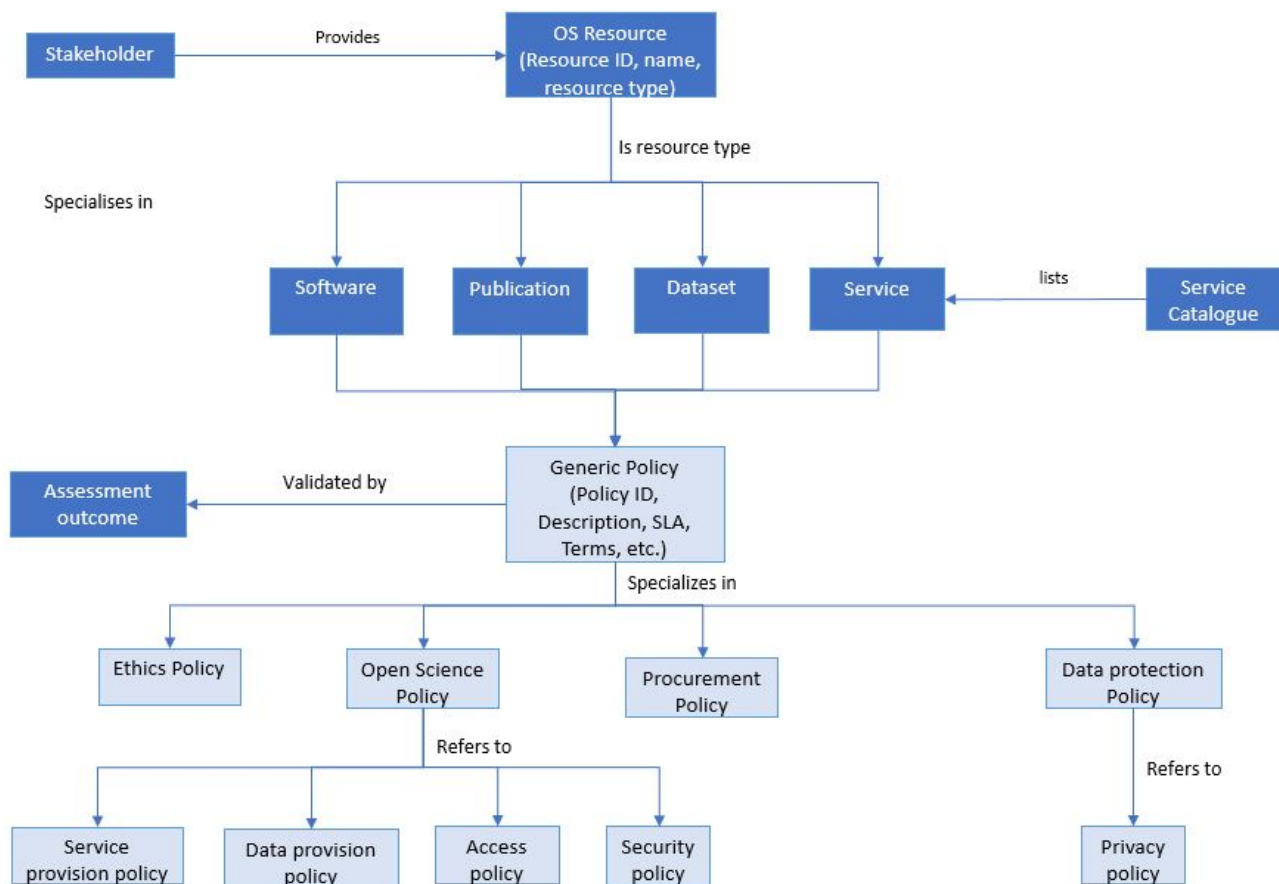


Figure 4: Initial Policy Registry data model

Accordingly, the updated data model (Figure 5) continues to use the same, basic two-tiered structure, with the administrative data properties remaining unchanged. Additionally, the data model also remains designed around two separate, but overlapping use cases: The verification of compliance with Rules of Participation (use case 1, targeted at EOSC service providers) and alignment with EOSCpilot Policy Recommendations (use case 2, targeted at external stakeholders). While some overlap exists between the two uses cases, this implies that not all data entities and their respective properties are relevant for both uses cases.

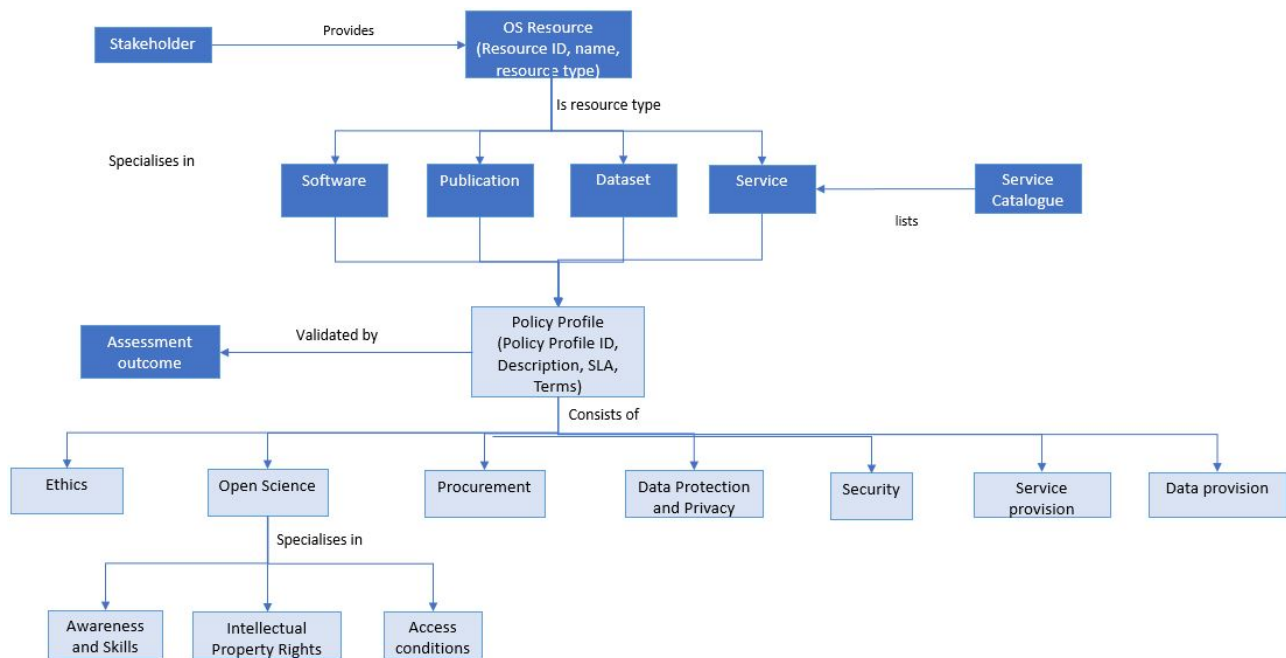


Figure 5: Revised Policy Registry data model

Extensive revisions have been made in relation to the policy metadata properties that are crucial to the data model's structure. Most obviously, the main policy entities of the data model have been adapted to the EOSCpilot Final Policy Recommendations. In the initial version of the data model, four main entities were proposed, based on the topical structure of subtasks in T3.1: Ethics Policy, Procurement Policy, Data Protection Policy (specialising further into Privacy Policy), and Open Science Policy, with the latter further specialising in Service Provision Policy, Data Provision Policy, Access Policy, and Security Policy.

In the revised data model, these entities have been partly restructured to better reflect the fact that the Final Policy Recommendations moved beyond the original structure of the four subtasks. Based on the structure of the Final Policy Recommendations and Implementing Actions, the following data properties have been established²²:

- **Service Provision:** This entity captures in its properties policy characteristics relating to *how* a service is provided. This covers primarily service provisioning aspects derived from the Rules of Participation, such as service availability and portability, documentation of relevant APIs, standards, and protocols, as well as information on user support and any certification schemes. For service providers following use case 1, it is mandatory to provide information on these aspects. Additionally, the property also incorporates entities to record whether the relevant organisation follows the EOSC API guidance and has adopted the AARC blueprint for AAs as recommended by the EOSCpilot Policy Recommendations. These aspects are however only mandatory in relation to use case 2.
- **Data Provision:** Similar to the Service Provision property, the Data Provision property includes entities which specify *how* any relevant data is provided by a service provider or stakeholder. In relation to compliance with EOSC Rules of Participation (use case 1), the property contains entities to record aspects such as data availability and portability, curation, and processes to ensure the FAIRness of data. Based on the EOSCpilot Final Policy Recommendations, the property also includes

²² The overview table in Annex A also contains notes on which specific Rules of Participation or Policy Recommendations (as well as Implementing Actions) the respective data properties refer to.

entities to record whether an organisation (or service provider) has adopted a DMP policy to govern how data is managed. The last aspect relates to use case 2 (mandatory) and is only recommended for use case 1.

- Security: This property requires the submission of details on the organisation's security policy in order to satisfy use case 1 (i.e. compliance with Rules of Participation).
- Ethics: This property contains entities to state whether submitting organisations have implemented an ethics policy and an ethics metadata schema, as suggested by the EOSCpilot Policy Recommendations. Completion of this entity is only mandatory for stakeholders in use case 2.
- Procurement: This property, which is only mandatory for use case 2, requires submitting stakeholders to submit information on their procurement policy, including a statement of whether they have such a policy, a URL with relevant documentation, and the adoption date of the policy.
- Data Protection and Privacy: This entity merges together the previously separate entities for Data Protection Policy and Privacy Policy, covering properties that relate both to the EOSCpilot Final Policy Recommendations (covered in use case 1) and Rules of Participation (covered in use case 2). It includes properties to assess whether organisations have implemented a privacy as well as data protection policy, documentation of tools and other user support to ensure GDPR compliance as well as details on the organisation's data protection officer.
- Open Science: The Open Science entity has been substantially expanded. Various properties have been added to reflect the detailed requirements emerging from the EOSCpilot Final Policy Recommendations. The Open Science entity thus consolidates aspects that relate to the implementation of Open Science as perceived by the EOSCpilot Policy Recommendations. This includes data on the stakeholder's or service provider's Open Science Policy, whether it follows the EOSC Code of Conduct (proposed by the EOSCpilot Policy Recommendations) and whether it has an organisational code of conduct, whether the organisation follows the EOSC Citation Policy and whether it has an organisational citation policy, and whether the organisation has a policy on the use of persistent identifiers. Furthermore, the Open Science entity includes data on whether the organisation follows the EOSC Rewarding Mechanism (as proposed by the EOSCpilot Final Policy Recommendations) or has developed its own reward policy. Lastly, it also asks for the provision of data on the existence of organisational mechanisms to ensure compliance with Open Access policies as well as information on whether the respective stakeholder records cost for research data management and open access publishing as separate items. All Open Science properties are only mandatory for use case 2 but are recommended for use case 1. The Open Science entity is further specified by three secondary policy entities - Intellectual Property Rights, Awareness and Skills, and Access Conditions - that are explained in the following.
- Intellectual Property Rights: This entirely new entity has been added to gather data on compliance with EOSCpilot Policy Recommendation 4 on Intellectual Property Rights. The entity is therefore only mandatory users following use case 2. It covers information on whether the submitting organisation has an IPR policy as well as whether this policy is available in a machine-readable format and which value production types this policy reflects²³. Furthermore, submitting

²³ Implementing action 4.3 recommends that EOSC stakeholders implement IPR policies which reflect different value production types such as the commercial IP value but also the social and ethical value of IP: <https://www.eoscipilot.eu/content/d36-final-policy-recommendations>.

stakeholders are requested to submit information on whether they have implemented procedures to ensure that the IPR terms of any research product have been fully specified and cleared before the relevant product is shared over the EOSC. Lastly, the IPR entity also requires a statement about whether the submitting stakeholder organisation has adopted the EOSC Text and Data Mining Framework (as proposed by the EOSCpilot Final Policy Recommendations).

- **Awareness and Skills:** The Awareness and Skills entity refers largely to EOSCpilot Policy Recommendation 5 on Awareness and Skills as well as, in one instance, to Recommendation 3 on Open Science. These recommendations lay out broad requirements for stakeholders to adopt policies and activities that intend to promote skills specific to Open Science and related areas. In accordance with the respective implementing actions, the data entity requires stakeholders to submit information on their training activities and materials in the areas of Open Science, ethics, legal issues, GDPR, research data management, and FAIR data. Additionally, the entity requires users to submit information on whether they have adopted the EOSC Skills Framework (as proposed by the EOSCpilot Policy Recommendations) and whether their organisation has made a formal commitment to support Open Science-related training for scientists and other users²⁴. The Awareness and Skills entity is only mandatory for use case 2.
- **Access Conditions:** The Access Conditions entity consolidates a variety of policy-specific characteristics relating to *how* a service provider or stakeholder manages access to its resources and services. It is a mixed entity, covering properties that refer to both use case 1 and 2. Mandatory for use case 1, the entity contains properties to record details of a service provider's access policy as well as details on allowed users, capacity limits, and access fees. In relation to use case 2, the entity records details about whether a stakeholder organisation has adopted the EOSC Charter for Access (as proposed by the EOSCpilot Policy Recommendations).

3.2. Simplification of data structure

In addition to the previously described alignments of the data model, the data structure has been simplified and streamlined. To increase the machine-readability of provided data, the number of free text fields has been significantly reduced, either by eliminating properties or by replacing them with lists of controlled values or otherwise standardised formats such as date formats or URLs.

Furthermore, the structure of policy metadata properties has been standardised and aligned across the data model. In a number of instances, the EOSCpilot Policy Recommendations as well as Rules of Participation require users to either develop a certain policy from scratch and *implement* it (e.g. in the case of access policies required by the Rules of Participation). In a similar set of cases, mostly in relation to the EOSCpilot Policy Recommendations, stakeholders and service providers are required to *adopt*²⁵ certain policies that would be developed by the EOSC. This is for example the case with the EOSC Code of Conduct, which is proposed by the EOSCpilot Policy Recommendations and is expected to be adopted by relevant stakeholders once it has been established.

The Policy Registry is designed as a lightweight, best-efforts mechanism to record and assess the degree to which service providers and stakeholders comply with these requirements. Therefore, to keep information requirements minimal, the data structures in relation to policy implementation and policy adoption have

²⁴ The last entity refers to implementing action 3.2 (i.e. Policy Recommendation 3 - Open Science) but has been subsumed in the Awareness and Skills entity for consistency reasons.

²⁵ Note the difference between *implementation* and *adoption*. The term *implementation* is used for cases where an organisation develops a policy on its own (i.e. in-house) and applies it within its own organisation. The term *adoption* is used to denote cases where an organisation endorses and incorporates an external policy, which has been developed by a third-party organisation (such as EOSC), into its own structure and operations.

been standardised. For each implementation and adoption case, a statement is required from the respective stakeholder on whether their organisation has either implemented or adopted a required policy. For this, a simple list of controlled values with the values “yes”, “no”, and “not applicable” is provided. Additionally, if “yes” is chosen, users are required to provide the policy adoption date, standardised in ISO8061 format (if no date is chosen, the date at which the entry is made is automatically entered). Furthermore, users are required to provide a documentation URL, which should provide the text of the respective policy or other evidence on the adoption of an externally defined policy.

On a last, but separate note, essentially the same approach has also been chosen to self-assess compliance with requirements that emerge from the EOSCpilot Policy Recommendations or Rules of Participation, but do not require the adoption or development of policies. This concerns for example the requirement, laid out by the EOSCpilot Policy Recommendations, to implement an AAI infrastructure that follows the AARC blueprint or to implement an explicitly documented metadata schema. In these cases, the data model requires users to state whether the requirement has been fulfilled, a documentation URL, and (where applicable) the date when the implementation was achieved.

In sum, this approach harmonises the structure of policy-related metadata and provides an easily transferrable format which will also be applicable if new data requirements, reflecting new or expanded policy requirements, need to be introduced to the data model.

3.3. Policy profiles and persistent identifiers

A notable difference from the first iteration of the data model is that the updated specifications propose a more extensive use of persistent identifiers for policies registered with the Policy Registry. A crucial feedback and outcome of the consultation on the EOSCpilot Policy Recommendations was that the EOSC should use a system of persistent identifiers to make resources, services, policies, and stakeholders uniquely identifiable. The updated data model reflects this requirement and uses persistent identifiers for a wider array of relevant properties. Together with stakeholder PIDs, policy PIDs can be used to form policy profile’s enabling the creation of a knowledge graph that allows the tracking of how individual stakeholder’s implementation of policies evolves.

On the level of administrative data entities, the stakeholder entity and resources in relation to which policies are registered will be assigned a persistent identifier upon registration. This includes separate persistent identifiers for publications, software, datasets, and any services.

On the level of policy metadata, all data properties that reflect a requirement for stakeholders to develop and implement a policy are assigned a persistent identifier. No persistent identifier is assigned in cases where stakeholders are only required to adopt a policy specified by the EOSC²⁶. Additionally, the Policy Profile entity, under which all further policy data is subsumed, now also includes a PID to link to the subsequent policy-specific PIDs (e.g. relating to ethics or procurement policies).

Based on these different PIDs, for each stakeholder and service provider, a detailed policy profile can be created. The policy profile is essentially a set of interconnected - or linked - PIDs related to the different policies and resources that stakeholders and service providers have created - and for which they have submitted details via the Policy Registry’s metadata form. Over time, a whole ecosystem of PIDs recording various policy statements of organisations which use the Policy Registry could thus emerge. Because each PID is associated with an adoption date, the timely evolution of these policy profiles could be tracked.

A crucial question in relation with this proposed structure is whether the EOSC should adopt an already existing PID scheme or whether a lightweight structure, designed for the specific, policy-centric requirements

²⁶ The rationale for this is that in the cases where only the adoption of an EOSC policy is required (e.g. to adopt the proposed EOSC Code of Conduct), the stakeholder will not actually develop its own policy but take secondary measures to achieve adoption. This does not lead to a fully-fledged new policy proposition that needs to be assigned a PID by the Policy Registry. Where stakeholders are instead required to develop their own policy from scratch, i.e. an ethics or procurement policy, an independent, new policy will be created. To track the evolution of such policies, a PID seems a useful addition to the data model.

of the Policy Registry's data model, can be developed. A DOI-based infrastructure could suffice these requirements as it offers a flexible PID infrastructure which could be integrated with the Policy Registry to automatically assign DOIs as soon as any relevant metadata is submitted via the Policy Registry's metadata form. Which option should be pursued is a matter to be considered by the relevant EOSC decision-making bodies before implementation.

However, ultimately, it should be clear that the issue is an administrative rather than a technical matter. The core question is who should provide the administrative infrastructure and processes that guarantee, over a sustained period of time, that persistent identifiers used for the EOSC Policy Registry will resolve to the relevant policy resources of stakeholders and content providers.

3.4. Related services and solutions

During the implementation phase, the EOSCpilot Policy Registry can rely on a number of related solutions, applications, and services that can deliver practical insights, lessons learned, and potentially concrete technical components. For the update of the Policy Registry, eight such closely related offers have been identified, including different solutions and approaches for functions which the Policy Registry will need to cover. It must be highlighted that, according to our knowledge, no exact match for the proposed Policy Registry exists today. Therefore, none of the solutions, applications, and services discussed in this section represents a full service comparable to the EOSCpilot Policy Registry. Instead, they present mechanisms and approaches for certain functions which the Policy Registry should cover. This analysis thus highlights that, during the implementation, lessons learned and options for concrete knowledge transfer and – where appropriate – collaboration should be pursued whenever possible in order to ensure resource efficient implementation.

Tables 6 to 13 list the related services and why they are potentially relevant for consideration during the implementation of the Policy Registry, as well as the Policy Registry functions for which they could be informative.

Table 6: Summary of SHERPA services

SHERPA Services (Jisc)	
Description	<p>The Sherpa services are designed to help authors and institutions make informed and confident decisions on open access publishing and open access policy compliance. Four Sherpa services exist: Sherpa RoMEO and Sherpa Juliet allow users to see publishers' open access archiving policies (RoMEO) as well as funders' open access publication conditions (Juliet). Sherpa FACT effectively combines data from Sherpa RoMEO and Juliet, enabling users to explore whether publishing in a journal allows them to comply with the open access policies of a funder. Hence, Sherpa FACT allows to validate the compatibility between two sets of policies, i.e. journal and funder policy. Sherpa REF applies this principle to HEFCE's (Higher Education Funding Council for England) open access policy, enabling users to check whether they can comply by publishing in a given journal. Sherpa data can also be retrieved via different APIs.</p> <p>Generally, Sherpa services are based on a set of databases with specific policy metadata (e.g. where publications must be archived, embargo periods, policy adoption dates, embargo periods). Sherpa FACT and Sherpa REF are essentially based on relational databases, which identify "ties" (i.e. matches) between the funder and journal policies under consideration. Users can search the databases for these ties via the system's interfaces. Crucially, policy metadata is produced manually by a dedicated team analysing policies and entering resulting data into the Sherpa system.</p>
Relevance for Policy Registry	<p>The Sherpa services' database design can be useful for the OS Policy Registry, particularly as it structures information on the compliance and compatibility of different policies. The data model also provides potential valuable information and learnings on how to structure policy (meta-)data, particularly also for the purpose of assessing whether one policy complies with a second policy. However, the policy area in which the Sherpa services operate (i.e. open access policy) is far more limited than the wider range of policies which the OS Policy Registry would need to handle. Additionally, Sherpa services are based on human assessments of policy information and thus only automate the retrieval of such information via a user-friendly front-end; back-end processes, instead, remain based on human data curation.</p>
Relevant Policy Registry functions	<p>Storage of policy metadata;</p> <p>Policy assessment and compliance validation;</p> <p>Data production</p>

Table 7: Summary of ROARMAP

ROARMAP (University of Southampton)	
Description	ROARMAP (Registry of Open Access Repository Mandates and Policies) is a searchable international database of policies, in principle similar to Sherpa Romeo and Juliet. It registers and tracks the growth of open access mandates and policies adopted by universities, research institutions and research funders, requiring researchers to provide open access to their peer-reviewed articles by depositing them in an open access repository. It contains a variety of structured policy metadata, such as policy adoption date, deposit location, embargo periods, and licensing conditions. Users can search the database based on these criteria. Policy makers (e.g. institutions or funders who have created an open access policy) can submit information on policies via a dedicated form (requiring a login); however, the provided information is then checked manually before being included - and published - in the database.
Relevance for Policy Registry	ROARMAP is useful as an example for a policy registry as well as for its data model, which can generally inform the further evolution of the design of the Policy Registry data model. The system is also useful because it provides a policy metadata form, allowing users to submit and register policy metadata. However, the system is also based on manual checks of the provided information.
Relevant Policy Registry functions	Storage of policy metadata; Policy submission and registration

Table 8: Summary of Amazon AWS Policy Validator

Amazon AWS Policy Validator (Amazon)	
Description	The Amazon AWS Policy Validator is a tool to automatically examine identity and access management (IAM) policies to ensure that they comply with the IAM policy grammar of Amazon Web Services. In the context of AWS, a Policy is a JSON document using the IAM policy grammar, written to define conditions for the management of identity and access management. It is important to understand that the AWS Policy Validator only checks JSON policy syntax and grammar, thus helping to ensure that the policy can generally be executed (because it is formulated in the correct syntax and grammar). It does however not validate that the resource and action names or condition keys are correct; therefore, the policy validator also cannot assess whether a policy will operate as intended (e.g. by granting users certain access or action rights). The latter can be tested with the AWS IAM Policy Simulator .
Relevance for Policy Registry	AWS Policy Validator is a relevant example for an automated policy validation engine. However, the policy type is substantially different from the policies handled by services such as SHERPA and ROARMAP. In the AWS context, a policy is essentially a piece of software code, written to execute a highly structured set of actions in a software context (e.g. allowing users to do something - or denying them certain actions). A general question for the OS Registry is thus, to what extent the more general organisational and contractual policies in EOSC can be expressed in such highly structured terms (e.g. granting a user permission to do something, requiring a user to do something, and prohibiting a user from doing something).
Relevant Policy Registry functions	Policy assessment and compliance validation

Table 9: Summary of Policy Models / Data Tags

Policy Models / Data Tags (Harvard University)	
Description	<p>PolicyModels (formerly: the DataTags toolset) is a pilot system for creating models of policies, e.g. policies for handling datasets or determining welfare entitlements. The policy models can be used to perform interactive interviews (or assessments), which are pre-structured, interactive decision guides to provide users with concrete, human- and machine-readable feedback on what to do in a specific policy application case. During the interview / assessment, the Policy Models system asks the user a series of questions to elicit information on the key properties which are relevant in relation to a given policy case. For example, a user who wants to publish datasets that contain personal data would be asked a series of questions to help determine how this can be done in compliance with laws, regulations; relevant questions would be how (and if) the dataset has been anonymised, how it will be shared, attained user consent etc. Based on the information entered by the user, the system would also return information on applicable laws, contracts, and best practices.</p> <p>A policy model consists of a policy space and a decision tree. The policy space provides a conceptual data model of all relevant concepts and treatments (i.e. policy outputs) defined in a policy. The decision tree describes the process of getting to a specific policy outcome in a flowchart (e.g. the decision process which needs to be completed before determining under which conditions a dataset can be published).</p>
Relevance for Policy Registry	<p>PolicyModels provides an example for a pilot service which structures complex policy information into a semi-automated decision-support system. Notably, the system's policy scope goes substantially beyond the narrower, "formal" policy scope of the AWS Policy Validator and OpenAIRE validator (see below) (which both only check whether inputs comply with a certain syntax or data requirements defined in a policy).</p> <p>Generally, the methodological approach to structure "traditional" policies into a conceptual (data) model and decision trees/flow charts provides a useful approach to model the OS Policy Registry's policy assessment and validation engine.</p>
Relevant Policy Registry functions	<p>Storage of policy metadata;</p> <p>Policy submission and registration</p>

Table 10: Summary of DMP Online

DMPonline (Digital Curation Center)	
Description	<p>The Digital Curation Center designed DMPonline to help researchers write research data management plans. Based on the DMP requirements of different funders, DMP offers a variety of interactive templates for data management plans. In addition to questions / sections which need to be answered to satisfy the DMP requirements of specific funders, DMP online can also show guidance for specific sections (either from DMPonline or a variety of other institutions). Additionally, multiple users can collaborate to draft, share, and review DMPs. Once completed, DMPs can be downloaded in different formats.</p> <p>By offering a structured, interactive mechanism to determine the questions for relevant policy conditions (in this case DMP requirements), DMPonline is similar to PolicyModels. It presents users with a structured view and set of questions which need to be answered in order to ensure policy compliance. This is achieved through an interactive data input form, where users enter DMP information in relation to their research project.</p>
Relevance for Policy Registry	<p>DMP online presents an interactive decision support mechanism allowing users to determine which criteria they must comply with in order to satisfy the data management policy of their respective funder. This structured approach, enabled through a data input form is highly relevant for the policy submission and registration function of the OS Policy Registry. The logical decision structure based on which the relevant questions are identified is furthermore of general interest to the Registry's policy assessment and compliance validation function.</p> <p>However, data entered into DMPonline is largely unstructured (i.e. free text) and thus cannot (yet) be included in automated validation processes to determine whether the provided information is sufficient for full policy compliance. On this aspect, DMPonline lags behind the requirements of the OS Policy Registry.</p>
Relevant Policy Registry functions	<p>Policy submission and registration; (Policy assessment and compliance validation)</p>

Table 11: Summary of OpenAIRE validator

OpenAIRE validator (OpenAIRE)	
Description	The OpenAIRE validator service validates OAI-PMH metadata records against the OpenAIRE Guidelines for publication repositories, data archives and current research information systems. The validator service can thus be used to assess whether the metadata provided by a content provider (e.g. a repository) is compliant with the schematic and vocabulary requirements defined in the OpenAIRE guidelines.
Relevance for Policy Registry	The OpenAIRE validator provides an automated validation service, which can be used to check the "formal" compliance of provided metadata with OpenAIRE's Guidelines. This principle, which is similar to the AWS Policy Validator, can be applied to the OS Policy Registry, too. However, again, the validation scope of the validator service is limited to "formal" compliance validations such as certain data formats. It does not assess content aspects with regards to the provided metadata.
Relevant Policy Registry functions	Policy assessment and compliance validation

Table 12: Summary of FairSharing

FairSharing (FairSharing)	
Description	FairSharing is a database and resource that describes and interlinks community-driven standards, databases (including repositories), and data policies. For each of these resources, FairSharing lists how the respective resources are connected to and reference each other. Such linkages can be based on recommendations on behalf of the creator of the resource or explicit mentions (e.g. when a databases or standard is mentioned in a policy). For each resource, FairSharing also lists archival information such as the creator of the resource, contact details, implementation dates etc. Additionally, FairSharing also lists collections, which group together resources (i.e. databases, standards, and policies) by a domain, project, or organisation. The data contained in FairSharing is manually curated by a dedicated team, based on reading and interpretations of the resources and their descriptions. Externals can also contribute to the database by either claiming a record (when they are the creator of a resource) or proposing a new one.
Relevance for Policy Registry	FairSharing is a valuable example for a database which stores high-level policy metadata and relates this to relevant resources such as standards and databases. However, data is manually curated and thus provides no direct guidance for any further automation of this process.
Relevant Policy Registry functions	Storage of policy metadata

Table 13: Summary of Open Digital Rights Language

Open Digital Rights Language (W3C)	
Description	The Open Digital Rights Language (ODRL) is a policy expression language that provides a flexible and interoperable information model, vocabulary, and encoding mechanisms for representing statements about the usage of content and services. Policies are used to represent permitted and prohibited actions over a certain asset, as well as the obligations required to be met by stakeholders. In addition, policies may be limited by constraints (e.g., temporal or spatial constraints) and duties (e.g. payments) may be imposed on permissions.
Relevance for Policy Registry	The ODRL offers a structured language to represent the contents and, more specifically, the permissions, prohibitions, and duties of users expressed in a policy. It can therefore potentially serve as a basis to further develop EOOSC policies and policy recommendations into machine-readable and -actionable formats.
Relevant Policy Registry functions	Storage of policy metadata; Policy submission and registration

4. OPEN SCIENCE POLICY TOOLKIT

The EOSC Open Science Policy Toolkit has been developed to provide EOSC policy stakeholders with a selective set of resources that support them in their transition to Open Science, with a particular focus on the Open Science aspects relevant to the EOSC. Unlike the Policy Registry, the Policy Toolkit has not been explicitly designed *based* on the EOSCpilot Policy Recommendations. Instead, it presents a collection of 60 tools that relate - more or less directly - to selected areas and issues addressed by the Policy Recommendations. From an operational perspective, this approach was taken due to the reversed sequencing of the EOSCpilot WP3 Deliverables that saw the Policy Toolkit being released long before the EOSCpilot Final Policy Recommendations took shape. Furthermore, the Policy Toolkit is a collection of pre-existing tools - which will, naturally, not always fit the exact purposes or intentions of the EOSCpilot Policy Recommendations.

Despite the inherent limitations, it was important to assess which of the EOSCpilot Policy Recommendations the Policy Toolkit can support. Crucially, this is a progressive exercise that can help relevant EOSC bodies, such as the EOSC Executive Board and working groups, to identify policies that can already be supported by readily available tools as well as to identify policy requirements that are not yet – but should ideally be – supported in some form. We thus recommend a continuation of the Open Science Policy Toolkit and mapping exercise in order to continuously evaluate the EOSC’s evolving policy propositions.

The following tables represent the results of an extensive mapping exercise, which has been conducted to match EOSCpilot Policy Recommendations and Implementing Actions with tools included in the Toolkit. The intention of this is to give an overview over how well the different EOSCpilot Policy Recommendations can generally be supported by readily available tools²⁷. With this approach come some limitations: Most importantly, the Toolkit presented here is effectively retro-fitted to EOSCpilot’s Final Policy Recommendations, as mentioned before. On the flipside, however, this also presents an advantage because the Toolkit displays more strongly in which areas the EOSC should potentially seek to develop its own solutions in order to provide guidance and support for those who seek to implement policy recommendations relevant to the EOSC.

On this latter point, there are several policy recommendations and policy implementing actions for which no suitable match was identifiable in the policy toolkit. There are multiple reasons for this: Firstly, the EOSCpilot Final Policy Recommendations contain some very specific procedural, in some cases technical, propositions for which no directly applicable tools were identifiable. Examples for this are implementing actions 2.2 (to adopt the AARC blueprint infrastructure for an interoperable AAI), 4.3 (stating that IPR licensing policies should recognise different value production types), and 4.4 (on the adoption of user acknowledgement for EOSC policies). Equally, the EOSCpilot Policy Recommendations 1 (Ethics), 8 (Data Protection), and 9 (Procurement) are not matched by specific tools in the Policy Toolkit, mainly because these recommendations are framed in procedural terms for which no directly matching tools have been identified as part of the Toolkit research.

Secondly, various EOSCpilot Policy Recommendations are essentially framed in self-referential terms, i.e. these are recommendations for the development of the EOSC itself - often relating to specific governance or procedural aspects. Exemplary propositions for this are implementing actions 1.3 and 1.4 (recommending the establishment of time-limited expert groups as well as an Ethics and Legal Advisory Board), 3.1 (recommending the implementation of an EOSC Code of Conduct), and 5.1 (regarding the development of an EOSC Skills and Capability Framework). These cases have no exact matches in the Policy Toolkit, mainly

²⁷ In this context, it is important to understand the definition of “tools” in the Policy Toolkit: In the Toolkit report D3.5, tools were defined as any resource that can be used to implement policies that are relevant in an EOSC context, particularly focusing on the four fields of Open Science, Ethics, Procurement, and Data Protection. The Toolkit thus includes a very broad range of tools, including not only software “tools” and other readily useable products and services, but also (policy) guidance documents, handbooks, and diverse outputs such as board games.

because they concern the development of EOSC-specific policies or other governance mechanisms for which any supporting tools can only be developed once these are in place.

With these limitations in mind, Tables 14 to 18 present the results of the mapping exercise between the Toolkit and Final Policy Recommendations²⁸.

Mapping of tools to Policy Recommendation 2 - Access:

“EOSC resources must provide access to their facilities and be accessible themselves in an open, FAIR (Findable, Accessible, Interoperable, Reusable) and equitable manner for excellent Open Science and Open Scholarship to be performed, shared and exploited.”

Table 14: Overview of mapping for EOSCpilot Policy Recommendation 2 - Access

Implementing action	Toolkit tools in support	Explanation why
2.1 Encourage openness and ease of use of resources accessed through the EOSC by developing a Charter for Access to EOSC Infrastructures, Services and Other Resources	OpenAIRE Guidelines	Guidelines for participation in OpenAIRE, part of EOSC, effectively formulate a metadata framework / standard to ensure discoverability of research objects
	OpenAIRE Repository Validator	Validation and registration in OpenAIRE, part of EOSC
2.2. Adopt the AARC blueprint architecture for enabling services in an interoperable AAI (authentication and authorisation) infrastructure	None	n/a
2.3 Adopt a minimum metadata schema and define a set of APIs (application programming interfaces), including the use of community-accepted standards and conventions, to be considered as standard for services, infrastructures and other resources in the EOSC Service Catalogue	Data Fairport	Data Fairport is a tool-suite to create, publish, and search FAIR metadata, consisting of four tools: FAIRifier and Metadata Editor (to create FAIR data); FAIR Data Point (to publish data); FAIR Search Engine (to find data); and ORKA (to annotate data).

²⁸ To keep reported results short, only cursory explanations for the mapping are given, for a full explanation of each tool's functions, please refer to the Toolkit report D3.5: <https://www.eosc-pilot.eu/content/d35-open-science-policy-toolkit>

Mapping of tools to Policy Recommendation 3 - Open Science:

“Simplify, clarify and improve consistency to enable and encourage the practice of Open Science.”

Table 15: Overview of mapping for EOSCpilot Policy Recommendation 3 - Open Science

Implementing action	Toolkit tools in support	Explanation why
3.1. Provide clarity for all participants in Open Science around expected behaviour and standards by developing and adopting a European Open Science Code of Conduct	None	n/a
3.2. Support openness and FAIRness of research outputs and other resources produced in or provided through the EOSC	A design framework and exemplar metrics for FAIRness.	Provides a framework for monitoring FAIRness
	FAIR-TLC: Metrics to Assess Value of Biomedical Digital Repositories: Response to RFI NOT-OD-16-133	Provides a framework for monitoring FAIRness
	HowOpenIsIt? A Guide for Evaluating the Openness of Journals	Provides a framework for monitoring open access
	HowOpenIsIt? Guide to Research Funder Policies	Provides a framework for evaluating open access requirements
	Monitor Local	Helps to monitor open access
	NARCIS - National Academic Research and Collaborations Information System	Monitoring open access
	Open Access Spectrum Evaluation Tool	Monitor for open access policies
	Open Science Monitor	Provides a monitoring framework for EU-wide Open Science developments
	The Danish Open Access Indicator	National monitoring tool for open access
	ADA-M Automatable Discovery and Access Matrix	Automated data discovery and access framework
	Data Stewardship Wizard	Data stewardship support tool
	DMP OPIDoR	Data Management Plan drafting tool

Implementing action	Toolkit tools in support	Explanation why
	DMPOnline	Data Management Plan drafting tool
	Framework for Discipline-specific Research Data Management	Guide for discipline-specific data management plans
	LEARN Toolkit of Best Practice for Research Data Management	Best practice toolkit for data management plans
	RDMO - Research Data Management Organiser	Tool to support research data management
	Research Data Management Toolkit	Guide to support research data management
	The realities of Research Data Management	Report on research data management
	Budapest Open Access Initiative	Open access declaration
	FAIR Data Advanced Use Cases: from principles to practice in the Netherlands	Report on FAIR data use cases
	FORCE11 Decision Trees	Open Science compliance support tool
	FORCE11: Guiding principles for findable, accessible, interoperable and re-usable data publishing version B1.0	Guide to FAIR data
	Kopernio	Open access discovery tool
	Open Access Toolkit	Guide to support open access
	Open Peer Review protocol	Open peer review tool
	OSF Toolkit for Digital Scholarship Support	Implementation guide for Open Science / Scholarship
	Pathways to Open Access	Open access implementation guide
	Rainbow of Open Science Practices	Framework for open science practices
	OpenAccessButton	Open access discovery tool
	OpenDOAR	Global registry of open access repositories

Implementing action	Toolkit tools in support	Explanation why
	re3data	Global registry of data archives
	B2SAFE - Data Manager Policy Tool	Tool to create and define data management policies
	Parthenos Policy Wizard	Discovery tool for FAIR data policies
	PASTEUR4OA	Open access toolkit
	RDA Practical Policy Working - Outcomes Policy Templates	Data policy survey
	RECODE	Report with policy recommendations on open access
	SHERPA FACT	Open access policy compliance tool
	SHERPA Juliet v2	Tool to understand for journals' open access policies
	SHERPA RoMEO	Open access policy tool for journals
	The framework for the Open Science and Research	Guide for national open science policy
	Toolkit on Public Engagement with Science	Public engagement toolkit / citizen science
	Transparency and Openness Promotion Guidelines	Guidelines for journal policies
	Wiley Author Compliance Tool	Compliance tool for open access journals
	Open Science and Research Handbook	Open science implementation guide
	OpenUpHub	Collection of best practices for open science
	FOSTER Open Science Resources	General open science resources
	SHERPA REF [Beta]	Policy compliance tool for open access journals
3.3. Facilitate EOSC and Open Science uptake by contributing to standardising cost types for Open Science and Open Access, including publishing costs,	APCDOI	Tool to retrieve information on journal APCs
	Monitor UK	Monitoring service covering journal APCs

Implementing action	Toolkit tools in support	Explanation why
preservation (not simply storage), and research data management for active and archived datasets.	Open APC initiative	Monitoring on APC costs
3.4 Adopt user acknowledgement of use of or contribution to research results of EOSC services, infrastructures and other resources	none	n/a

Mapping of tools to Policy Recommendation 4 - Intellectual Property Rights:

“Encourage open access to and reutilisation of research outputs by providing a comprehensive and coherent IPR framework.”

Table 16: Overview of mapping for EOSCpilot Policy Recommendation 4 - Intellectual Property Rights

Implementing action	Toolkit tools in support	Explanation why
4.1. Ensure that research resources have IPR clearance and are fully and clearly documented in terms of IPR before being shared over EOSC	Choose a licence	Decision support tool to facilitate licencing choices.
	Creative Commons	Decision tree to support CC licencing choices
4.2 Each organisation participating in the EOSC should develop and require adherence to a set of explicit, coherent, consistent and machine-readable IPR ownership and licensing policies.	none	n/a
4.3. Ensure that licensing policies accommodate different types of value production (e.g. commercial, social, ethical)	none	n/a
4.4. Introduce mechanisms for consistent enforcement of Open Access policies, rights and licences across EOSC.	SHERPA FACT	Open access policy compliance tool
	SHERPA Juliet v2	Tool to understand for journals' open access policies
	SHERPA RoMEO	Open access policy tool for journals

Implementing action	Toolkit tools in support	Explanation why
4.5. Devise and deploy open patent systems alongside the existing national/international patent systems, and support the use of open data for assessing the state of the art in a patent ecosystem (open patent data)	none	n/a
4.6. Encourage the development of an EOSC Text and Data Mining Policy Framework	none	n/a

Mapping of tools to Policy Recommendation 5 - Awareness and Skills:

“Help develop the necessary awareness and skills for the EOSC.”

Table 17: Overview of mapping for EOSCpilot Policy Recommendation 5 - Awareness and Skills

Implementing action	Toolkit tools in support	Explanation why
5.1 Develop, support and promote an EOSC Skills and Capability Framework as a common reference point	none	n/a
5.2 Support EOSC utilisation, Open Science uptake and proper research conduct, and the EOSC Skills and Capability Framework, with awareness-raising and skills development for users	Open Science and Research Handbook	Guide to open science research practice
	OpenUpHub	Platform with best practice resources
5.3 Provide information and training materials in EOSC services and relevant ethical, legal, FAIR and RDM, GDPR and Open Science issues related to EOSC for research staff (including library staff) and data subjects (including data donors)	FOSTER Open Science Resources	Collection of open science training materials

Implementing action	Toolkit tools in support	Explanation why
5.4 Provide and promote skills development for the staff of Research Producing Organisations and Research Infrastructures in Open Access publishing, RDM and FAIR practices, GDPR, as well as ethical and legal issues (also for data subjects) related to EOSC and research performance in the EOSC	The Publishing Trap (boardgame)	Boardgame to learn about open access and open science

Mapping of tools in relation to Policy Recommendation 6 - Incentives and Rewards:

Provide incentives for practicing Open Science and embed open principles in recruitment, promotion and evaluation of researchers at all stages of their careers.

Table 18: Overview of mapping for EOSCpilot Policy Recommendation 6 - Incentives and Rewards

Implementing action	Toolkit tools in support	Explanation why
6.1 Develop and implement an EOSC Rewarding Mechanism which structures incentivisation, assessment and rewarding of researchers and other relevant stakeholder staff to encompass all aspects of their achievements, including Open Science	Metrics Toolkit	Toolkit to assess research impact claims
6.2. Relevant European Research Area (ERA) and national policies and roadmaps relating to rewards and incentives should be appropriately revised to support practice of Open Science	SHERPA REF [Beta]	Compliance of journals in relation to national open access requirements (here: UK Research Excellence Framework)

Implementing action	Toolkit tools in support	Explanation why
<p>6.3 Ensure that infrastructures, services and other resources supplied through the EOSC provide assurance, for example by developing accreditation or certification schemes:</p> <ul style="list-style-type: none"> • to users, that their research outputs are open, FAIR and citable • to the EOSC for the purposes of FAIR data governance and compliance monitoring 	None	n/a

5. IMPLEMENTATION AND INTERDEPENDENCIES

Report D3.6 on the EOSCpilot Final Policy Recommendations presented an implementation roadmap which also covered initial detail for the implementation of the Policy Supporting Services (which are covered in the implementing actions 7.1, 7.2, and 7.3). It is recommended that the Policy Supporting Services are implemented in parallel and with a view to completing their implementation by the end of EOSC's phase 1 in December 2020. Figure 4 below displays an initial implementation plan for the three services. It should be highlighted, however, that subject to confirmation by the respective decision-making bodies such as the EOSC Executive Board, more detailed implementation plans, including financial and personnel resources, would be required.

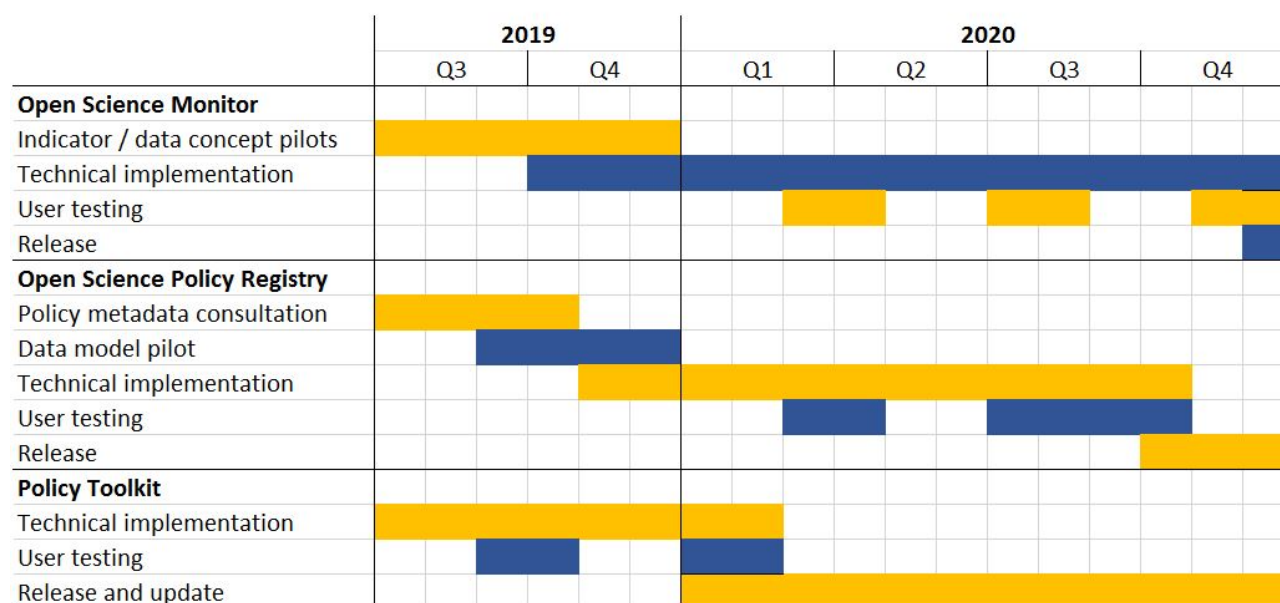


Figure 6: Implementation plan for Policy Supporting Services

Work on the Open Science Monitor could start with a series of small scale pilots to assess aggregation models and workflows of the OSM indicators and to test their acceptance by users. The use cases presented in Section 2.5 of this report lay out the basic use case design, which however would require further tests to assess how the available data can be aggregated to address policy-issues in the EOSC-context and how useful these aggregated data profiles would be from a user-perspective. The latter would need to evaluate the utility as perceived by EOSC-internal and -external end-users. Once these interdependencies have been resolved, the technical implementation of the Open Science Monitor could commence in an iterative manner, structured into three releases (alpha, beta, production) and three user-testing phases.

Based on the assumption that the EOSC Governance accepts and will want to adopt the EOSCpilot Policy Recommendations (including the Recommendation that the three policy supporting services are developed), work on the Open Science Policy Registry should begin with a consultation on the proposed metadata format, involving mainly the EOSC Executive Board and subsequent bodies. As mentioned in this report, the EOSC Final Policy Recommendations have only been released recently and a series of related policy developments are still under way – or continue to advance at a high pace. The purpose of the policy metadata consultation would be to ensure that the proposed entities in the metadata model indeed cover the most important aspects from the EOSC's perspective. While the data model is designed to be flexible and extensible at any time, it will be important to confirm the stability of the assumptions underlying the data model. The consultation would be followed by a metadata pilot, which would engage prospective users of the Policy Registry in assessing the required input as well as feasibility of the data model from an end-user perspective. Following these initial tests, the technical implementation could commence, based on three releases and user testing phases. The final release of both the Open Science Monitor and Policy Registry would be foreseen for the end of 2020.

Being a much simpler application, the Open Science Policy Toolkit could likely be developed in a much shorter timeframe. Essentially, the Toolkit would only require to be implemented as a searchable, categorised database of resources, presented in an appropriate place on the EOSC Portal. A release could therefore already be possible in early 2020.

Particularly for the OSM, it should be noted that a connection with the EC OSM²⁹ team was sought so as to better understand the context under which this “new” monitor is being performed, the scope that it serves, the audience that it’s targeted at, etc. Similarly, the EOSCpilot OSM Framework, its scope, use and suggestions for future implementation was explained to an open dialogue between EU OSM, EOSCpilot OSM and OpenAIRE Monitor teams. OpenAIRE has been successfully monitoring Open Access publications for many years now, providing the EC with valuable information about its uptake. With the modified Horizon2020 Guidelines, OpenAIRE includes information about data and software which are connected to EU funded projects. This pool of information combined with the technical means and knowledge capabilities of the OpenAIRE team in this field, could prove beneficial to both OSM approaches. Furthermore, OpenAIRE could become the first one to test the development of the proposed EOSCpilot OSM Framework. Focusing on the “open” parts of the Monitor, and in response to the EU OSM call for contributions and feedback which was running last year, the EOSCpilot OSM and the OpenAIRE team provided insights regarding open indicators and metrics in the workshop for Open Science indicators which was organised in October³⁰.

While this has been alluded to in various places of this report, a cautious note needs to be made with regards to the various interdependencies of the Policy Supporting Services. Naturally, the Policy Supporting Services depend on a somewhat stable – or otherwise at least predictable – policy environment with a clear understanding of the exact meaning and purpose of different rules, recommendations, and governance arrangements. The proposed consultation and pilot and phases for the Open Science Monitor and Policy Registry aim at stability of the underlying assumptions in the short term, assuming that the EOSC Governance will accept and adopt the EOSCpilot Policy Recommendations.

However, in the medium and long run, the relevant EOSC bodies (e.g. the EOSC Executive Board) will need to establish mechanisms that help to translate any relevant policy propositions into precise operational requirements for the Policy Supporting Services. The EOSC Executive Board could delegate this work to designated technical committees that are similar to World Wide Web Consortium’s working groups³¹. This is particularly important because, as mentioned in the D3.6 report, the EOSCpilot Final Policy Recommendations contain various propositions whose operational meaning must be fleshed out further. Most importantly, this concerns the various proposed EOSC policies and frameworks, which stakeholders are expected to adopt, such as the EOSC Code of Conduct and the EOSC Skills and Capability Framework. Equally, the long-term evolution of the EOSC’s policy requirements will need to be managed in order to ensure that new policy requirements are translated consistently into operational terms that can be implemented by the Policy Supporting Services.

Lastly, the EOSC’s final federation model will impact the operations – and particularly quality requirements – of the Policy Supporting Services. A tighter federation would likely require at least the Policy Registry to adhere to stricter service standards. Therefore, the development of these – and other – policy propositions could have a substantive impact on the Policy Supporting Services. The policy recommendations and the proposed policy supporting services are therefore somewhat speculative as long as the actual business model and funding of the EOSC remain unclear. The proposals in this deliverable are therefore, of course, subject to acceptance by the EOSC governance – which may include an evaluation of the cost they would incur versus the benefits they would deliver – and firm provision of funding for their development, implementation and operation.

²⁹ https://ec.europa.eu/info/research-and-innovation/strategy/goals-research-and-innovation-policy/open-science/open-science-monitor_en

³⁰ https://ec.europa.eu/info/sites/info/files/open_science_monitor_indicators_workshop_summarydoki.pdf

³¹ <https://www.w3.org/>

6. CONCLUSIONS

This report has presented crucial updates to the EOSCpilot Policy Supporting Services, i.e. the Open Science Monitor, Open Science Policy Registry, and Policy Toolkit. As the name suggest, the purpose of these services is to provide solutions that facilitate the implementation of the EOSC's policy requirements. While there are a number of policy developments evolving rapidly in the EOSC's context, this deliverable focussed on the EOSCpilot Final Policy Recommendations, seeing them as the main driver for the work that led to this report.

The report discussed mainly two broad areas of progress: First, in light of the EOSCpilot Final Policy Recommendations, extensive revisions have been made to the Open Science Monitor and the Open Science Policy Registry. This led to refinements and, where possible, simplifications of the respective indicator frameworks as well as data models. In particular, the Open Science Policy Registry's data model now proposes the extensive use of PIDs in order to ensure that the evolution of stakeholder-specific policy profiles can be tracked easily. Furthermore, eight related services have been identified which can serve to inform an efficient implementation of the Policy Registry.

Second, an extensive mapping exercise has been conducted in order to analyse and display how the three Policy Supporting Services can support specific aspects of the EOSCpilot Final Policy Recommendations. The results of this mapping are presented as part of each update. Particularly in relation to the mapping of the Policy Toolkit, this mapping should be continued in an appropriate manner in order to ensure that a) concrete tools are identified as quickly as possible to support policy implementation on behalf of those who the policies are addressed to and b) unsupported policy requirements are identified. The latter would ensure that the EOSC can, where necessary, develop support for these policy requirements in a targeted and efficient manner.

The report presents a tentative implementation roadmap, highlighting specific interdependencies that must be considered as part of the service's implementation, and including pilot phases to test implementation of the services on a small scale. A crucial limitation is that the service updates presented here only build on the EOSCpilot Policy Recommendations, while there are also a number of other policy propositions developed by various bodies involved with the EOSC. If the objective is indeed that the Policy Supporting Services shall support these policy propositions in a more holistic manner (i.e. instead of focussing on only one of multiple competing propositions), then a greater degree of alignment as well as operationalisation will need to be achieved between them. As the policy landscape is constantly evolving – including discussion of implementation of the FAIR principles – so the policy supporting services will need to evolve too, to remain fit-for-purpose and to be able to secure stakeholder support. The task of breaking down high-level policy recommendations into more operational, implementable requirements and tasks could be realised by a specific committee or working group working under the auspices of the EOSC Executive Board.

ANNEX A. OPEN SCIENCE POLICY REGISTRY DATA MODEL - UPDATE

Tables 19 and 20 present the details of the structure of the EOSCpilot Open Science Policy Registry Data Model, structured into policy metadata (Table 19) and administrative, non-policy metadata (Table 20).

Table 19: Policy metadata for Open Science Policy Registry

Property	Mandatory (M) / recommended (R) / optional (O)		Machine readable (Y/N)	Description	Value type	Rule of Participation crosswalk	eInfraCentral cross-walk		Cross-walk to EOSCpilot Final Policy Recommendation on implementing action
	Use case 1	Use case 2					Property	Entity	
Entity: Policy Profile									
Policy Profile PID	M	M	Y	Persistent identifier for the policy profile in relation to which information is submitted.	Multiple formats possible, e.g. DOI.	-	-	-	
Policy Profile Type	M	M	Y	High-level categorisation of the policy types about which information is being submitted as part of the policy profile. This can be Terms and Conditions, Service Level Agreement, other organisational policy (e.g. RPO privacy policy), other contractual policy. Organisational policies are policies (including internal guidance documents) which have been adopted to direct the way an organisation organises itself, or provides services and other resources (a privacy or security policy are examples for this). Contractual policies regulate the duties and behaviour of several parties (e.g. service provider and user) in relation to each other. They can therefore take any form of a contract which is binding for two or more parties.	Controlled values: Terms and Conditions; Service Level Agreement; general organisational policy; general contractual policy (NOTE: Multiple values need to be separated by a colon ":")	-	-	-	
Policy Profile Description	O	R	N	Summary statement of the policy profile, including information on the purpose and motivation about different policies and what the organisation or service provider aims to achieve through its different policies.	Free text / string	-	-	-	

Property	Mandatory (M) / recommended (R) / optional (O)		Machine readable (Y/N)	Description	Value type	Rule of Participation crosswalk	eInfraCentral cross-walk		Cross-walk to EOSCpilot Final Policy Recommendation on implementing action
	Use case 1	Use case 2					Property	Entity	
Policy Profile URL	O	R	Y	URL of a dedicated website where information or documentation in relation to the organisation's policy activities can be found.	URL	-	-	-	
Policy Profile Creation Date	M	M	Y	Date when the policy profile was created (i.e. date when first entry was made in the Policy Registry). Note: date can be automatically created	ISO8601: YYYY-MM-DD (e.g. 2018-12-24)	-	-	-	
Terms and Conditions	M	O	Y	Statement of whether the organisation's or service provider's policy profile contains contractual policy terms (such as Terms and Conditions).	Controlled values: yes (y); no (n); not applicable (n_a)	1	Service Contractual Information	Service Terms Of Use	
Terms and Conditions Copy	M (if "/terms_y_n" = y)	R (if "/terms_y_n" = y)	N	A copy of the contractual policy (e.g. terms and conditions) under which a service or open science resource is supplied. These terms regulate the contractual relationship between the supplier of the service or resource and customers.	Free text / string.	1	Service Contractual Information	Service Terms Of Use	
Terms and Conditions URL	M (if "/terms_y_n" = y)	R (if "/terms_y_n" = y)	Y	URL of dedicated website with information on the contractual policy (e.g. terms and conditions) under which a service or resource is provided.	URL	1	Service Contractual Information	Service Terms Of Use	
Terms and Conditions PID	M (if "/terms_y_n" = y)	M (if "/terms_y_n" = y)	Y	Persistent identifier for the organisation's or service provider's contractual policy information (e.g. Terms and Conditions) as deposited in the Policy Registry.	PID value (automatically assigned)	-	-	-	

Property	Mandatory (M) / recommended (R) / optional (O)		Machine readable (Y/N)	Description	Value type	Rule of Participation crosswalk	eInfraCentral cross-walk		Cross-walk to EOSCpilot Final Policy Recommendation on implementing action
	Use case 1	Use case 2					Property	Entity	
Service Level Agreement	M	O	Y	Statement of whether the organisation's or service provider's policy profile contains a service level agreement.	Controlled values: yes (y); no (n); not applicable (n_a)	3	Service Contractual Information	Service Level Agreement	
Service Level Agreement Copy	M (if "/sla_y_n" = y)	R (if "/sla_y_n" = y)	N	A copy of the service level agreement framework which is used to manage the performance level of service provision. In contrast to the "Terms of Use", which define the contractual relationship between supplier and customer, the SLA information should clearly state how performance in relation to the contract is measured.	Free text / string.	3	Service Contractual Information	Service Level Agreement	
Service Level Agreement URL	M (if "/sla_y_n" = y)	R (if "/sla_y_n" = y)	Y	URL of dedicated website of the organisation or service provider with information on service level agreement.	URL	3	Service Contractual Information	Service Level Agreement	
Service Level Agreement PID	M (if "/sla_y_n" = y)	M (if "/sla_y_n" = y)	Y	Persistent identifier for the organisation's or service provider's service level agreement as deposited in the Policy Registry.	PID value (automatically assigned)	-	-	-	
Entity: Open Science									
Open Science Policy statement	O	M	Y	Statement of whether an Open Science Policy for the provided resource exists or not - or is not applicable (e.g. in case of publications).	Controlled values: yes (y); no (n); not applicable (n_a)	-	-	-	
Open Science Policy adoption date	R (if "/os_y_n" = y)	M (if "/os_y_n" = y)	Y	Adoption date of the Open Science Policy.	ISO8601: YYYY-MM-DD (e.g. 2018-12-24)	-	-	-	
Open Science Policy URL	R (if "/os_y_n" = y)	M (if "/os_y_n" = y)	Y	URL to dedicated website with copy of the Open Science Policy.	URL	-	-	-	
Open Science Policy PID	M (if "/os_y_n" = y)	M (if "/os_y_n" = y)	Y	Persistent identifier for the organisation's or service provider's Open Science Policy as deposited in the Policy Registry.	PID value (automatically assigned)				

Property	Mandatory (M) / recommended (R) / optional (O)		Machine readable (Y/N)	Description	Value type	Rule of Participation crosswalk	eInfraCentral cross-walk		Cross-walk to EOSCpilot Final Policy Recommendation on implementing action
	Use case 1	Use case 2					Property	Entity	
EOSC Citation Policy	O	M	Y	Statement of whether the respective organisation or service has adopted the EOSC citation policy.	Controlled values: yes (y); no (n); not applicable (n_a)				SA 3.4
EOSC Citation Policy adoption date	R (if "/eosc_cit_policy_y_n" = y)	M (if "/eosc_cit_policy_y_n" = y)	Y	Adoption date of the EOSC Citation Policy.	ISO8601: YYYY-MM-DD (e.g. 2018-12-24)				SA 3.4
EOSC Citation Policy URL	R (if "/eosc_cit_policy_y_n" = y)	M (if "/eosc_cit_policy_y_n" = y)	Y	URL to any documentation on the adoption of the EOSC Citation Policy by the respective organisation or service provider.	URL				SA 3.4
Organisation Citation Policy Statement	O	R	Y	Statement whether an organisation has implemented a dedicated policy or a general policy requirement (which can be included in a different policy) to cite all research outputs used for the production of a given publication.	Controlled values: yes (y); no (n); not applicable (n_a)				
Organisation Citation Policy adoption date	R (if "/org_cit_policy_y_n" = y)	M (if "/org_cit_policy_y_n" = y)	Y	Adoption date of the organisation's citation policy or adoption date of the policy which includes the requirement to cite all research outputs used for the production of a given publication.	ISO8601: YYYY-MM-DD (e.g. 2018-12-24)				
Organisation Citation Policy URL	R (if "/org_cit_policy_y_n" = y)	M (if "/org_cit_policy_y_n" = y)	Y	URL of the website covering documentation of the organisation's citation policy or documentation of the policy which includes the requirement to cite all research outputs used for the production of a given publication.	URL				
Organisation Citation Policy PID	M (if "/org_cit_policy_y_n" = y)	M (if "/org_cit_policy_y_n" = y)	Y	Persistent identifier of the organisation's citation policy.	PID value (automatically assigned)				

Property	Mandatory (M) / recommended (R) / optional (O)		Machine readable (Y/N)	Description	Value type	Rule of Participation crosswalk	eInfraCentral cross-walk		Cross-walk to EOSCpilot Final Policy Recommendation on implementing action
	Use case 1	Use case 2					Property	Entity	
EOSC Code of Conduct	O	M	Y	Statement on whether the EOSC Open Science Code of Conduct has been adopted by the respective organisation or service provider.	Controlled values: yes (y); no (n); not applicable (n_a)				SA 3.1
EOSC Code of Conduct adoption date	R (if "/os_conduct_y_n" = y)	M (if "/os_conduct_y_n" = y)	Y	Adoption date of the Open Science Code of Conduct.	ISO8601: YYYY-MM-DD (e.g. 2018-12-24)				SA 3.1
EOSC Code of Conduct URL	R (if "/os_conduct_y_n" = y)	M (if "/os_conduct_y_n" = y)	Y	URL to organisational policy or other documentation which proves the adoption of the Open Science Code of Conduct.	URL				SA 3.1
Organisation conduct policy statement	O	R	Y	Statement whether the organisation has implemented a conduct policy for its staff. Note: This can also be covered by the adoption of a policy developed by an independent body other than EOSC.	Controlled values: yes (y); no (n); not applicable (n_a)				SA 3.1
Organisation conduct policy adoption date	R (if "/org_conduct_y_n" = y)	M (if "/org_conduct_y_n" = y)	Y	Date when the organisational conduct policy, or a third party policy, has been adopted.	ISO8601: YYYY-MM-DD (e.g. 2018-12-24)				SA 3.1
Organisation conduct policy URL	R (if "/org_conduct_y_n" = y)	M (if "/org_conduct_y_n" = y)	Y	URL with documentation about the organisational conduct policy. In the case of third party policies, this can link to a website other than the organisation's own website.	URL				SA 3.1
Organisation conduct policy PID	R (if "/org_conduct_y_n" = y)	M (if "/org_conduct_y_n" = y)	Y	Persistent identifier of the conduct policy.	PID value (automatically assigned)				SA 3.1
OA Policy enforcement mechanism	O	M	Y	Statement of whether the respective organisation or service has implemented mechanisms to enforce OA policies. Note: This can be achieved by a variety of mechanisms, such as offering reporting	Controlled values: yes (y); no (n); not applicable (n_a)				SA 4.4

Property	Mandatory (M) / recommended (R) / optional (O)		Machine readable (Y/N)	Description	Value type	Rule of Participation crosswalk	eInfraCentral cross-walk		Cross-walk to EOSCpilot Final Policy Recommendation on implementing action
	Use case 1	Use case 2					Property	Entity	
				mechanisms for licensing violations, legal help & support (e.g. by facilitating collective action), or alternative dispute resolution mechanisms.					
OA Policy enforcement mechanism URL	R (if "/oa_enforce_y_n" = y)	M (if "/oa_enforce_y_n" = y)	Y	URL to any documentation which gives details about the OA Policy enforcement mechanisms implemented by the respective organisation.	URL				SA 4.4
OA Policy enforcement mechanism implementation date	R (if "/oa_enforce_y_n" = y)	M (if "/oa_enforce_y_n" = y)	Y	Date when the organisation has implemented the OA policy enforcement mechanism.	ISO8601: YYYY-MM-DD (e.g. 2018-12-24)				SA 4.4
PID policy	O	M	Y	Statement of whether the service provider or organisation has adopted a policy which requires the use of persistent identifiers for all natural and legal persons, inputs (e.g. funding), and outputs (e.g. publications, research data, software) involved in the research process.	Controlled values: yes (y); no (n); not applicable (n_a)				SA 3.2
PID policy adoption date	R (if "/pid_policy_y_n" = y)	M (if "/pid_policy_y_n" = y)	Y	Adoption date of the organisational or service provider policy requiring use of persistent identifiers.	ISO8601: YYYY-MM-DD (e.g. 2018-12-24)				SA 3.2
PID policy URL	R (if "/pid_policy_y_n" = y)	M (if "/pid_policy_y_n" = y)	Y	URL to the organisational/service provider PID policy or other documentation which displays the adoption of a PID policy.	URL				SA 3.2
PID policy PID	M (if "/pid_policy_y_n" = y)	M	Y	Persistent identifier of the organisation's or service provider's PID policy.	PID value (automatically assigned)				SA 3.2

Property	Mandatory (M) / recommended (R) / optional (O)		Machine readable (Y/N)	Description	Value type	Rule of Participation crosswalk	eInfraCentral cross-walk		Cross-walk to EOSCpilot Final Policy Recommendation on implementing action
	Use case 1	Use case 2					Property	Entity	
EOSC Rewarding Mechanism	O	M	Y	Statement of whether the respective organisation or service provider has adopted the EOSC Rewarding Mechanism.	Controlled values: yes (y); no (n); not applicable (n_a)				SA 6.1
EOSC Rewarding Mechanism adoption date	R (if "/eosrc_reward_mech_adopdate" = y)	M (if "/eosrc_reward_mech_adopdate" = y)	Y	Date when EOSC Rewarding Mechanism was adopted.	ISO8601: YYYY-MM-DD (e.g. 2018-12-24)				SA 6.1
EOSC Rewarding Mechanism URL	R (if "/eosrc_reward_mech_adopdate" = y)	M (if "/eosrc_reward_mech_adopdate" = y)	Y	URL to any documentation with further information about organisational adoption of the EOSC Rewarding Mechanism.	URL				SA 6.1
Reward policy statement	O	M	Y	Statement whether the organisation has adopted a policy which rewards behaviour of staff along Open Science principles, e.g. for the publication of datasets in relation to publications and for publishing in Open Access journals.	Controlled values: yes (y); no (n); not applicable (n_a)				SA 6.1
Reward policy title	R (if "/reward_y_n" = y)	M (if "/reward_y_n" = y)	N	Title of the policy which provides rewards for staff who behave in compliance with Open Science conduct requirements.	Free text				SA 6.1
Reward policy adopt date	R (if "/reward_y_n" = y)	M (if "/reward_y_n" = y)	Y	Adoption date of the organisation's reward policy.	ISO8601: YYYY-MM-DD (e.g. 2018-12-24)				SA 6.1
Reward policy URL	R (if "/reward_y_n" = y)	M (if "/reward_y_n" = y)	Y	URL with document of the organisation's reward policy.	URL				SA 6.1
Reward policy PID	M (if "/reward_y_n" = y)	M (if "/reward_y_n" = y)	Y	PID of the organisation's reward policy	PID value (automatically assigned)				SA 6.1
Open Science Accreditation Schemes	O	M	Y	Statement of whether the organisation is using certification or accreditation schemes for its services.	Controlled values: yes (y); no (n); not applicable (n_a)				SA 6.3

Property	Mandatory (M) / recommended (R) / optional (O)		Machine readable (Y/N)	Description	Value type	Rule of Participation crosswalk	eInfraCentral cross-walk		Cross-walk to EOSCpilot Final Policy Recommendation on implementing action
	Use case 1	Use case 2					Property	Entity	
Open Science Accreditation Schemes adoption date	M (if "/os_accr editation_y_n" = y)	M (if "/os_accr editation_y_n" = y)	Y	Adoption date of the accreditation scheme.	ISO8601: YYYY-MM-DD (e.g. 2018-12-24)				SA 6.3
Open Science Accreditation Schemes URLs	M (if "/os_accr editation_y_n" = y)	M (if "/os_accr editation_y_n" = y)	Y	URL(s) to any documentation with documentation about how the organisation is using the accreditation / certification scheme.	URL(s) - Note: several entries to be separated by a colon ":".				SA 6.3
Open Access Publishing Cost	R	M	Y	Statement whether the organisation or service provider records annual expenses made in relation to Open Access publishing (e.g. article processing charges).	Controlled values: yes (y); no (n); not applicable (n_a)				SA 3.3
Research Data Management Cost	R	M	Y	Statement whether the organisation or service provider records annual expenses made in relation to research data management (including expenses to pay for long-term data preservation as well as data curation).	Controlled values: yes (y); no (n); not applicable (n_a)				SA 3.3
Entity: Awareness and Skills									
Training commitment	O	M	Y	Statement on whether the organisation has made a formal commitment to support Open Science related training needs of scientists and other relevant individuals.	Controlled list of values: y / n				SA 3.2
Training commitment date	R (if "/training_commit_y_n" = y)	M (if "/training_commit_y_n" = y)	Y	Date at which the organisation has made a formal, public commitment to support Open Science related training needs of scientists and other relevant individuals.	ISO8601: YYYY-MM-DD (e.g. 2018-12-24)				SA 3.2
Training commitment URL	R (if "/training_commit_y_n" = y)	M (if "/training_commit_y_n" = y)	Y	URL to any documentation which displays the organisation's commitment to supporting Open Science training needs.	URL				SA 3.2

Property	Mandatory (M) / recommended (R) / optional (O)		Machine readable (Y/N)	Description	Value type	Rule of Participation crosswalk	eInfraCentral cross-walk		Cross-walk to EOSCpilot Final Policy Recommendation on implementing action
	Use case 1	Use case 2					Property	Entity	
EOSC Skills Framework	O	M	Y	Statement whether the organisation or service provider has adopted the EOSC Skills and Capability Framework.	Controlled list of values: y / n				SA 5.1
EOSC Skills Framework adoption date	R (if "/eoscs_kills_adoptdate" = y)	M (if "/eoscs_kills_adoptdate" = y)	Y	Date when the organisation or service provider has adopted the EOSC Skills and Capability Framework.	ISO8601: YYYY-MM-DD (e.g. 2018-12-24)				SA 5.1
EOSC Skills Framework URL	R (if "/eoscs_kills_adoptdate" = y)	M (if "/eoscs_kills_adoptdate" = y)	Y	URL to any documentation which displays the adoption of the EOSC Skills and Capability Framework.	URL				SA 5.1
Open Science Awareness Campaigns	O	M	Y	Statement of the number of events which an organisation has conducted in the past 2 years to raise awareness among and educate practitioners on Open Science.	Number of events (e.g. 2); if no events have been conducted, enter "0".				SA 5.2
Open Science Awareness Campaigns URL	R (if "/aware_campaigns_number" > 0)	M (if "/aware_campaigns_number" > 0)	Y	URL(s) to any documentation of awareness raising campaigns.	URL; multiple URLs to be separated by ":"				SA 5.2
Training Ethics	O	M	Y	Number of training events on ethics provided to organisational staff and users of the organisation's services in the past two years.	Number of events (e.g. 2); if no events have been conducted, enter "0".				SA 5.2
Training Ethics URL	R (if "/training_ethics_url" > 0)	M (if "/training_ethics_url" > 0)	Y	URL(s) to any training events on ethics provided to organisational staff and users of the organisation's services in the past two years.	URL; multiple URLs to be separated by ":"				SA 5.2
Training Legal Issues	O	M	Y	Number of training events on legal issues (relating to Open Science) provided to organisational staff and users of the organisation's services in the past two years.	Number of events (e.g. 2); if no events have been conducted, enter "0".				SA 5.2
Training Legal Issues URL	R (if "/training_legal_num" > 0)	M (if "/training_legal_num" > 0)	Y	URL(s) to any training events on legal issues (relating to Open Science) provided to	URL; multiple URLs to be separated by ":"				SA 5.2

Property	Mandatory (M) / recommended (R) / optional (O)		Machine readable (Y/N)	Description	Value type	Rule of Participation crosswalk	eInfraCentral cross-walk		Cross-walk to EOSCpilot Final Policy Recommendation on implementing action
	Use case 1	Use case 2					Property	Entity	
	mber" > 0)	mber" > 0)		organisational staff and users of the organisation's services in the past two years.					
Training RDM URL	O	M	Y	Number of training events on Research Data Management provided to organisational staff and users of the organisation's services in the past two years.	Number of events (e.g. 2); if no events have been conducted, enter "0".				SA 5.2
Training RDM URL	R (if "/training_rdm_number" > 0)	M (if "/training_rdm_number" > 0)	Y	URL(s) to any training events on Research Data Management provided to organisational staff and users of the organisation's services in the past two years.	URL; multiple URLs to be separated by ":"				SA 5.2
Training FAIR	O	M	Y	Number of training events on FAIR provided to organisational staff and users of the organisation's services in the past two years.	Number of events (e.g. 2); if no events have been conducted, enter "0".				SA 5.2
Training FAIR URL	R (if "/training_fair_number" > 0)	M (if "/training_fair_number" > 0)	Y	URL(s) to documentation about any training events on FAIR provided to organisational staff and users of the organisation's services in the past two years.	URL; multiple URLs to be separated by ":"				SA 5.2
Training GDPR	O	M	Y	Number of training events on GDPR provided to organisational staff and users of the organisation's services in the past two years.	Number of events (e.g. 2); if no events have been conducted, enter "0".				SA 5.2
Training GDPR URL	R (if "/training_gdpr_url" > 0)	M (if "/training_gdpr_url" > 0)	Y	URL(s) to any training events on GDPR provided to organisational staff and users of the organisation's services in the past two years.	URL; multiple URLs to be separated by ":"				SA 5.2
Open Science Training	O	M	Y	Number of training events on Open Science provided to organisational staff and users of the organisation's services in the past two years.	Number of events (e.g. 2); if no events have been conducted, enter "0".				SA 5.2
Open Science Training URL	R (if "/os_training_url" > 0)	M (if "/os_training_url" > 0)	Y	URL(s) to any training events on Open Science provided to organisational staff and users of the organisation's services in the past two years.	URL; multiple URLs to be separated by ":"				SA 5.2

Property	Mandatory (M) / recommended (R) / optional (O)		Machine readable (Y/N)	Description	Value type	Rule of Participation crosswalk	eInfraCentral cross-walk		Cross-walk to EOSCpilot Final Policy Recommendation on implementing action
	Use case 1	Use case 2					Property	Entity	
Training Materials Ethics URL	O	M	Y	URL(s) to any training materials on ethics provided to organisational staff and users of the organisation's services.	URL; multiple URLs to be separated by ":"				SA 5.3
Training Materials Legal Issues URL	O	M	Y	URL(s) to any training materials on legal issues (relating to Open Science) provided to organisational staff and users of the organisation's services.	URL; multiple URLs to be separated by ":"				SA 5.3
Training Materials RDM URL	O	M	Y	URL(s) to any training materials on Research Data Management provided to organisational staff and users of the organisation's services.	URL; multiple URLs to be separated by ":"				SA 5.3
Training Materials FAIR URL	O	M	Y	URL(s) to any training materials on FAIR provided to organisational staff and users of the organisation's services.	URL; multiple URLs to be separated by ":"				SA 5.3
Training Materials GDPR URL	O	M	Y	URL(s) to any training materials on GDPR provided to organisational staff and users of the organisation's services.	URL; multiple URLs to be separated by ":"				SA 5.3
Open Science Training Materials URL	O	M	Y	URL(s) to any training materials on Open Science provided to organisational staff and users of the organisation's services.	URL; multiple URLs to be separated by ":"				SA 5.3
Entity: Intellectual Property Rights									
IPR Policy	O	M	Y	Statement of whether the respective organisation or service provider has adopted an organisation-wide IPR policy.	Controlled list of values: y / n				SA 4.2
IPR Policy adoption date	R (if "/policy_y_n" = y)	M (if "/policy_y_n" = y)	Y	Adoption date of the IPR policy.	ISO8601: YYYY-MM-DD (e.g. 2018-12-24)				SA 4.2
IPR Policy URL	R (if "/policy_y_n" = y)	M (if "/policy_y_n" = y)	Y	URL to any documentation which displays content of the IPR policy.	URL				SA 4.2

Property	Mandatory (M) / recommended (R) / optional (O)		Machine readable (Y/N)	Description	Value type	Rule of Participation crosswalk	eInfraCentral cross-walk		Cross-walk to EOSCpilot Final Policy Recommendation on implementing action
	Use case 1	Use case 2					Property	Entity	
IPR Policy PID	M (if "/policy_y_n" = y)	M (if "/policy_y_n" = y)	Y	Persistent identifier of the organisation's or service provider's IPR policy.	PID value (automatically assigned)				SA 4.2
IPR machine-readability	O	M	Y	Statement of whether the adopted IPR policy requires licenses to be available in machine-readable formats.	Controlled list of values: y / n				SA 4.2
IPR machine-readability URL	R (if "/machine_read_y_n" = y)	M (if "/machine_read_y_n" = y)	Y	URL to any documentation on the IPR policy requirement that licenses are available in machine-readable formats.	URL				SA 4.2
Policy resource clearance	O	M	Y	Statement of whether the respective organisation's or service provider's IPR policy ensures that the IPR licensing terms of any resources are specified before external sharing or publication.	Controlled list of values: y / n				SA 4.1
Policy resource clearance URL	R (if "/resource_clear_y_n" = y)	M (if "/resource_clear_y_n" = y)	Y	URL to any documentation about policy and processes implemented by the respective organisation to ensure that the IPR licensing terms of any resources are specified before external sharing or publication.	URL				SA 4.1
Policy value production types	O	M	Y	Statement of which types of value production the organisation's or service's IPR policy recognises.	Controlled list of values: monetary / commercial value; social value; environmental value; value-agnostic (i.e. licensing framework does not assume specific value type); not applicable				SA 4.3
Policy value production types URL	R (if "/value_types" ≠ not applicable)	M (if "/value_types" ≠ not applicable)	Y	URL to any documentation which gives details about different value types that are within scope of the organisation's or service's IPR policy. (Note: In most cases this may be the IPR policy's URL.)	URL				SA 4.3

Property	Mandatory (M) / recommended (R) / optional (O)		Machine readable (Y/N)	Description	Value type	Rule of Participation crosswalk	eInfraCentral cross-walk		Cross-walk to EOSCpilot Final Policy Recommendation on implementing action
	Use case 1	Use case 2					Property	Entity	
EOSC TDM framework	O	M	Y	Statement whether the respective service provider or organisation has adopted the EOSC Text and Data Mining framework.	Controlled list of values: monetary / commercial value; social value; environmental value; value-agnostic (i.e. licensing framework does not assume specific value type)				SA 4.6
EOSC TDM framework adoption date	R (if "/eossc_td m_y_n" = y)	M (if "/eossc_td m_y_n" = y)	Y	Adoption date of the EOSC Text and Data Mining Framework.	ISO8601: YYYY-MM-DD (e.g. 2018-12-24)				SA 4.6
EOSC TDM framework URL	R (if "/eossc_td m_y_n" = y)	M (if "/eossc_td m_y_n" = y)	Y	URL to any documentation which shows adoption of the EOSC Text and Data Mining Framework.	URL				SA 4.6
Entity: Ethics									
Ethics Policy statement	O	M	Y	Statement of whether an EthicsPolicy for the provided resource exists or not - or is not applicable (e.g. in case of publications).	Controlled values: yes (y); no (n); not applicable (n_a)	-			
Ethics Policy adoption date	R (if "/y_n" = y)	M (if "/y_n" = y)	Y	Adoption date of the Ethics Policy.	ISO8601: YYYY-MM-DD (e.g. 2018-12-24)	-	-	-	
Ethics Policy URL	R (if "/y_n" = y)	M (if "/y_n" = y)	Y	URL to dedicated website with copy of the Ethics Policy.	URL	-	-	-	
Ethics Policy PID	M (if "/y_n" = y)	M (if "/y_n" = y)	Y	Persistent identifier for the organisation's or service provider's ethics policy.	PID value (automatically assigned) (automatically assigned)				

Property	Mandatory (M) / recommended (R) / optional (O)		Machine readable (Y/N)	Description	Value type	Rule of Participation crosswalk	eInfraCentral cross-walk		Cross-walk to EOSCpilot Final Policy Recommendation on implementing action
	Use case 1	Use case 2					Property	Entity	
Ethics Metadata Schema statement	O	M	Y	Statement whether the organisation has adopted a metadata schema	Controlled values: yes (y); no (n); not applicable (n_a)				SA 1.1
Ethics Metadata Schema	R (if "/eth_metadata_y_n" = y)	M (if "/eth_metadata_y_n" = y)	Y	A copy of the organisation's metadata schema.	Free text				SA 1.1
Ethics Metadata Schema URL	R (if "/eth_metadata_y_n" = y)	M (if "/eth_metadata_y_n" = y)	Y	URL to documentation of the organisation's metadata schema.	URL				SA 1.1
<i>Entity: Procurement</i>									
Procurement Policy Statement	M	M	Y	Statement of whether a Procurement Policy for the provided resource exists or not - or is not applicable (e.g. in case of publications).	Controlled values: yes (y); no (n); not applicable (n_a)	-			
Procurement Policy adoption date	R (if "y_n" = y)	M (if "y_n" = y)	Y	Adoption date of the Procurement Policy.	ISO8601: YYYY-MM-DD (e.g. 2018-12-24)	-	-	-	
Procurement Policy URL	R (if "y_n" = y)	M (if "y_n" = y)	Y	URL to dedicated website with copy of the Procurement Policy.	URL	-	-	-	
Procurement Policy PID	M (if "y_n" = y)	M (if "y_n" = y)	Y	Persistent identifier for the organisation's or service provider's procurement policy.	PID value (automatically assigned)				
<i>Entity: Service provision</i>									
Service availability	M	O	Y	Quantitative factor (percentage) describing the fraction of a time period that an item is in a condition to perform its intended function upon demand; described as a percentage.	percentage (0 - 100%)	1	Service level targets and performance information	Service Availability	
API Statement	M	R	Y	Statement of whether the organisation or service provider uses APIs as part of its service offer.	Controlled values: yes (y); no (n); not applicable (n_a)	2.3			

Property	Mandatory (M) / recommended (R) / optional (O)		Machine readable (Y/N)	Description	Value type	Rule of Participation crosswalk	eInfraCentral cross-walk		Cross-walk to EOSCpilot Final Policy Recommendation on implementing action
	Use case 1	Use case 2					Property	Entity	
API Documentation	M (if "/api" = y)	R (if "/api" = y)	N	Summary of API documentation.	Free text; if not applicable, enter "n/a"	2.3	-	-	
API URL	M (if "/api" = y)	R (if "/api" = y)	Y	Link to API documentation for service.	URL	2.3	-	-	
EOSC APIs	O	M	Y	Statement of whether the organisation or service provider has adopted APIs for data exchange as required by EOSC. (Note: Specific requirement are still to be developed with the EOSC.)	Controlled values: yes (y); no (n); not applicable (n_a)				SA 2.3
EOSC API Documentation	R (if "/eosc_api_y_n" = y)	M (if "/eosc_api_y_n" = y)	Y	URL to any documentation regarding API documentation in line with EOSC requirements	URL				SA 2.3
Standard Statement	M	R	Y	Statement of whether the respective organisation or service provider uses standard(s) to enable or offer its services or resource provision.	Controlled values: yes (y); no (n); not applicable (n_a)	2.3			
Standard list	M (if "/standards_list" = y)	R (if "/standards_list" = y)	N	List and description of applicable standards used by the service.	Free text	2.3	-	-	
Standard URL	M (if "/standards_list" = y)	R (if "/standards_list" = y)	Y	URL(s) of standard description.	URL(s) - Note: several entries to be separated by a colon ":".	2.3	-	-	

Property	Mandatory (M) / recommended (R) / optional (O)		Machine readable (Y/N)	Description	Value type	Rule of Participation crosswalk	eInfraCentral cross-walk		Cross-walk to EOSCpilot Final Policy Recommendation on implementing action
	Use case 1	Use case 2					Property	Entity	
Protocols statement	M	R	Y	Statement of whether the respective organisation or service provider uses technical protocols to enable or offer its services or resource provision.	Controlled values: yes (y); no (n); not applicable (n_a)	2.3			
Protocols list	M (if "/protocol s_y_n" = y)	R (if "/protocol s_y_n" = y)	N	Description of applicable protocols used by the service.	Free text	2.3	-	-	
Protocols URL	M (if "/protocol s_y_n" = y)	R (if "/protocol s_y_n" = y)	Y	URL of standard description on service provider or stakeholder website.	URL(s) - Note: several entries to be separated by a colon ":".	2.3	-	-	
Service portability statement	M	R	Y	Statement of whether the respective service is portable as required by the EOSC Rules of Participation.	Controlled values: yes (y); no (n); not applicable (n_a)	2.4			
Service portability documentation	M (if "/service_portability_y_n" = y)	R (if "/service_portability_y_n" = y)	N	Documentation of the steps undertaken by the service provider to ensure the portability of the service (i.e. the option of the service being usable e.g. in different operating systems, cloud computing environments, etc.).	Free text	2.4	-	-	
Service portability URL	M (if "/service_portability_y_n" = y)	R (if "/service_portability_y_n" = y)	Y	URL to dedicated website with service portability documentation.	URL(s) linking to service documentation indicating service portability. - Note: several entries to be separated by a colon ":".	2.4	-	-	
Quality of service	M	O	N	Description of the service quality, particularly: service capacity (i.e. how many users or service requests can a service host in a given time); service usage (i.e. at what percentage of the service capacity does the service operate on average); service reliability (i.e. the probability that a service operates without failure in a given amount of	Free text	2.6	Service Level Targets and Performance Information		

Property	Mandatory (M) / recommended (R) / optional (O)		Machine readable (Y/N)	Description	Value type	Rule of Participation crosswalk	eInfraCentral cross-walk		Cross-walk to EOSCpilot Final Policy Recommendation on implementing action
	Use case 1	Use case 2					Property	Entity	
				time, provided that the service is generally available in this period of time (cf. service availability)).					
Quality certification statement	M	R	Y	Statement whether the respective organisation or service provider uses certification or accreditation mechanisms (e.g. CoreTrustSeal) to provide quality assurance of its services and/or resources.	Controlled values: yes (y); no (n); not applicable (n_a)	2.6			
Quality certification documentation	M (if "/certification_y_n" = y)	R (if "/certification_y_n" = y)	N	Description of the quality certification mechanisms which the service complies with, e.g. CoreTrustSeal.	Free text (e.g. CoreTrustSeal; ISO27001)	2.6	-	-	
Quality certification URL	M (if "/certification_y_n" = y)	R (if "/certification_y_n" = y)	Y	URL to service provider or stakeholder site where applicable quality certification is documented.	URL(s) - Note: several entries to be separated by a colon ":".	2.6	-	-	
User support statement	M	R	Y	Statement whether the organisation or service provider offers user support documentation and other user support channels (e.g. hotlines and hotdesks) for its services and/or resources.	Controlled values: yes (y); no (n); not applicable (n_a)	2.7, 1	Service Support Information	Service User Manual; Service Training Information; Service Helpdesk	
User support documentation	M (if "/user_support_y_n" = y)	R (if "/user_support_y_n" = y)	N	Description of the user documentation and user support channels (e.g. helpdesk contact form or phone line, service manuals, etc.) for a given service.	Free text	2.7, 1	Service Support Information	Service User Manual; Service Training Information; Service Helpdesk	

Property	Mandatory (M) / recommended (R) / optional (O)		Machine readable (Y/N)	Description	Value type	Rule of Participation crosswalk	eInfraCentral cross-walk		Cross-walk to EOSCpilot Final Policy Recommendation on implementing action
	Use case 1	Use case 2					Property	Entity	
User support URL	M (if "/user_support_y_n" = y)	R (if "/user_support_y_n" = y)	Y	URL to dedicated website with user support documentation.	URL(s) - Note: several entries to be separated by a colon ":".	2.7, 1	Service Support Information	Service User Manual; Service Training Information; Service Helpdesk	
Implementation of AARC	O	M	Y	Statement of whether the respective service provider or organisation uses the AARC blueprint architecture to implement its AAI.	Controlled values: yes (y); no (n); not applicable (n_a)				SA 2.2
AARC URL	M (if "/aarc_aai_y_n" = y)	M (if "/aarc_aai_y_n" = y)	Y	URL to any documentation which shows that the AARC has been implemented by the respective service provider.	URL(s) - Note: several entries to be separated by a colon ":".				SA 2.2
RFO AARC funding requirement	O	M (if "stakeholder/type" = Funder)	Y	Statement of whether adopting the AARC is a funding requirement set by the respective RFO.	Controlled values: yes (y); no (n); not applicable (n_a)				SA 2.2
Entity: Data Provision									
Data availability and sharing statement	M	R	Y	Statement of whether the organisation's or service provider's data, including data produced by its users, are made available and shared with externals.	Controlled values: yes (y); no (n); not applicable (n_a)	2.2			
Data availability and sharing documentation	M (if "/availability_sharing_y_n" = y)	R (if "/availability_sharing_y_n" = y)	N	Documentation of the conditions under which data is made available and how it is being shared.	Free text	2.2	-	-	

Property	Mandatory (M) / recommended (R) / optional (O)		Machine readable (Y/N)	Description	Value type	Rule of Participation crosswalk	eInfraCentral cross-walk		Cross-walk to EOSCpilot Final Policy Recommendation on implementing action
	Use case 1	Use case 2					Property	Entity	
Data availability and sharing URL	M (if "/availability_sharing_y_n" = y)	R (if "/availability_sharing_y_n" = y)	Y	URL to dedicated website with information data sharing conditions.	URL(s) - Note: several entries to be separated by a colon ":".	2.2	-	-	
Data curation and preservation policy statement	M	R	Y	Statement of whether a Data Curation and Preservation Policy for the provided resource exists or not - or is not applicable (e.g. in case of publications).	Controlled values: yes (y); no (n); not applicable (n_a)	2.2	-	-	
Data curation and preservation policy URL	M (if "/curation_preservation_y_n" = y)	R (if "/curation_preservation_y_n" = y)	Y	URL to dedicated website where data curation and preservation processes are documented.	URL(s) - Note: several entries to be separated by a colon ":".	2.2	-	-	
Data curation and preservation policy adoption date	M (if "/curation_preservation_y_n" = y)	R (if "/curation_preservation_y_n" = y)	Y	Adoption date of the Data Curation and Preservation Policy.	ISO8601: YYYY-MM-DD (e.g. 2018-12-24)	2.2	-	-	
Data curation and preservation policy PID	M	R (if "/curation_preservation_y_n" = y)	Y	Persistent identifier of the organisation's or service provider's Data Curation and Preservation Policy.	PID value (automatically assigned)	2.2			

Property	Mandatory (M) / recommended (R) / optional (O)		Machine readable (Y/N)	Description	Value type	Rule of Participation crosswalk	eInfraCentral cross-walk		Cross-walk to EOSCpilot Final Policy Recommendation on implementing action
	Use case 1	Use case 2					Property	Entity	
Data portability statement	M	R	Y	Statement of whether the data generated by users when using the service is portable (i.e. can data which is produced by the service be transferred to other equivalent services in order to avoid service provider lock-ins).	Controlled values: yes (y); no (n); not applicable (n_a)	2.4			
Data portability documentation	M (if "/dataportability_y_n" = y)	R (if "/dataportability_y_n" = y)	N	Short documentation of the steps undertaken by the service provider to ensure the portability of the data (i.e. the option of the data which is produced by the service being transferred to other equivalent services in order to avoid service provider lock-ins).	Free text	2.4	-	-	
Data portability URL	M (if "/dataportability_y_n" = y)	R (if "/dataportability_y_n" = y)	Y	URL to dedicated website with information and documentation on data portability.	URL(s) - Note: several entries to be separated by a colon ":".	2.4	-	-	
FAIR processes statement	M	R	Y	Statement whether the organisation or service provider has implemented processes and/or tools to ensure that data produced as part of its service is FAIR.	Controlled values: yes (y); no (n); not applicable (n_a)	2.7			
FAIR processes documentation	M (if "/fair_y_n" = y)	R (if "/fair_y_n" = y)	N	Description of the procedures and service means which a service provider offers in order to help users of the service ensure that data is FAIR.	Free text	2.7	-	-	
FAIR processes URL	M (if "/fair_y_n" = y)	R (if "/fair_y_n" = y)	Y	URL to dedicated website with information on implemented processes to ensure FAIRness of data.	URL(s) - Note: several entries to be separated by a colon ":".	2.7	-	-	
DMP policy	O	M	Y	Statement of whether the respective organisation (RFO, RPO, RI) has a policy requiring the use of data management plans for all relevant projects.	Controlled values: yes (y); no (n); not applicable (n_a)				SA 3.2

Property	Mandatory (M) / recommended (R) / optional (O)		Machine readable (Y/N)	Description	Value type	Rule of Participation crosswalk	eInfraCentral cross-walk		Cross-walk to EOSCpilot Final Policy Recommendation on implementing action
	Use case 1	Use case 2					Property	Entity	
DMP policy adoption date	R (if "/machine_DMP_y_n" = y)	M (if "/machine_DMP_y_n" = y)	Y	Adoption date of the policy requiring the use of DMPs.	ISO8601: YYYY-MM-DD (e.g. 2018-12-24)				SA 3.2
DMP policy URL	R (if "/machine_DMP_y_n" = y)	M (if "/machine_DMP_y_n" = y)	Y	URL to the organisational policy or other documentation which displays the adoption of a DMP policy	URL				SA 3.2
DMP policy PID	M (if "/machine_DMP_y_n" = y)	M (if "/machine_DMP_y_n" = y)	Y	Persistent identifier of the organisational or service provider policy requiring the use of DMPs.	PID value (automatically assigned)				SA 3.2
DMP policy machine-readability	M (if "/machine_DMP_y_n" = y)	M (if "/machine_DMP_y_n" = y)	Y	Statement whether organisation's DMP policy also requires the use of machine-readable DMPs.	Controlled values: yes (y); no (n)				SA 3.2
Entity: Access Conditions									
Access Policy statement	M	R	Y	Statement of whether an Access Policy for the provided resource exists or not - or is not applicable (e.g. in case of publications).	Controlled values: yes (y); no (n); not applicable (n_a)	2.2	-	-	
Access Policy URL	M (if "/accesspolicy_y_n" = y)	R (if "/accesspolicy_y_n" = y)	Y	URL of dedicated website with access policy information.	URL	2.2	[Basic Service Information ; Service Contractual Information]	[Target Users; Terms of Use]	
Access Policy adoption date	M (if "/accesspolicy_y_n" = y)	R (if "/accesspolicy_y_n" = y)	Y	Adoption date of the Access Policy.	ISO8601: YYYY-MM-DD (e.g. 2018-12-24)	2.2	-	-	

Property	Mandatory (M) / recommended (R) / optional (O)		Machine readable (Y/N)	Description	Value type	Rule of Participation crosswalk	eInfraCentral cross-walk		Cross-walk to EOSCpilot Final Policy Recommendation on implementing action
	Use case 1	Use case 2					Property	Entity	
Access Policy PID	M	M (if "/accesspolicy_y_n" = y)	Y	Persistent identifier of the organisation's or service provider's access policy.	PID value (automatically assigned)	2.2			
Allowed users	M	R	Y	Provides a typology of who can access a service or other open science resource, e.g. all, researchers, research managers, specific disciplines (will need to provide information on which discipline).	Controlled list of values based on eInfraCentral schema: Research Organisations, Industry, SMEs, Researchers, Scientists, Funders, Policy Makers, Service Providers, Data Providers, others	2.2	Service description	Target users	
Capacity limits	M	R	N	Description of constraints on capacity while maintaining standards of service quality and performance, e.g. "maximum 20,000 concurrent users per day", "10 access requests per second".	Free text	2.2	Service Level Targets and Performance Information	Service capacity	
Access conditions	M	R	Y	Typological description of the conditions under which access is granted to a given service or other open science resources offered by a relevant stakeholder.	Controlled list of values: open; fee-based; research excellence (e.g. based on assessment by peer reviewers); name-based access; group-based access	2.3	-	-	
Access fee type	M	R	Y	Short description of the type of access fee incurred by users.	Controlled values, e.g.: free; freemium (free basic service, charges apply for premium service); flat rate (e.g. daily/monthly/annual fees, but no usage caps); unit-based fees (i.e. charges are based on	2.5	Service Contractual Information	Service Price	

Property	Mandatory (M) / recommended (R) / optional (O)		Machine readable (Y/N)	Description	Value type	Rule of Participation crosswalk	eInfraCentral cross-walk		Cross-walk to EOSCpilot Final Policy Recommendation on implementing action
	Use case 1	Use case 2					Property	Entity	
					specific units, e.g. hours of service used, number of projects hosted, amount of data hosted, etc.)				
Access fee statement	M	R	N	Clear explanation of the fees and pricing model which applies to a given service as well as other open science resources offered by a relevant stakeholder.	Free text	2.5	Service Contractual Information	Service Price	
Access fee documentation	M	R	Y	URL of dedicated website with information on fees or other access cost.	URL	2.5	Service Contractual Information	Service Price	
Peer review	O	O	N	Provides information or links to resources which inform users about how the peer review process (if applicable) to determine access to the resource is structured as well as which decision-criteria apply.	Free text	2.2	-	-	
Peer review URL	O	O	Y	URL to dedicated website with information on peer review process to determine access to resources.	URL	2.2	-	-	
EOSC Charter for Access	O	M	Y	Declaration of whether the organisation or service providers has adopted the EOSC Open Access Charter (to be developed).	Controlled values: yes (y); no (n); not applicable (n_a)				SA 2.1
EOSC Charter for Access adoption date	R (if "/eossc_access_charter_y_n" = y)	M (if "/eossc_access_charter_y_n" = y)	Y	Adoption date of the EOSC Charter for Access.	ISO8601: YYYY-MM-DD (e.g. 2018-12-24)				SA 2.2
EOSC Charter for Access URL	R (if "/eossc_access_charter_y_n" = y)	M (if "/eossc_access_charter_y_n" = y)	Y	URL to any documentation which proves and provides further information on how the EOSC Charter for Access has been adopted.	URL				SA 2.1
Entity:									

Property	Mandatory (M) / recommended (R) / optional (O)		Machine readable (Y/N)	Description	Value type	Rule of Participation crosswalk	eInfraCentral cross-walk		Cross-walk to EOSCpilot Final Policy Recommendation on implementing action
	Use case 1	Use case 2					Property	Entity	
Security									
Security Policy statement	M	O	Y	Statement of whether a Security Policy for the provided resource exists or not - or is not applicable (e.g. in case of publications).	Controlled values: yes (y); no (n); not applicable (n_a)	2.2	-	-	
Security Policy adoption date	M (if "/y_n" = y)	R (if "/y_n" = y)	Y	Adoption date of the Security Policy.	ISO8601: YYYY-MM-DD (e.g. 2018-12-24)	2.2	-	-	
Security Policy URL	M (if "/y_n" = y)	R (if "/y_n" = y)	Y	URL to dedicated website with copy of the Security Policy.	URL	2.2	-	-	
Security Policy PID	M	M (if "/y_n" = y)	Y	Persistent identifier of the organisation's or service provider's security policy.	PID value (automatically assigned)	2.2			
Entity: Privacy and Data Protection									
Privacy Policy statement	M	R	Y	Statement of whether a Privacy Policy for the provided resource exists or not - or is not applicable (e.g. in case of publications).	Controlled values: yes (y); no (n); not applicable (n_a)	1	-	-	
Privacy Policy adoption date	M (if "/y_n" = y)	M (if "/y_n" = y)	Y	Adoption date of the Privacy Policy.	ISO8601: YYYY-MM-DD (e.g. 2018-12-24)	1	-	-	
Privacy Policy URL	M (if "/y_n" = y)	M (if "/y_n" = y)	Y	URL to dedicated website with data protection / GDPR compliance statement.	URL	1	-	-	

Property	Mandatory (M) / recommended (R) / optional (O)		Machine readable (Y/N)	Description	Value type	Rule of Participation crosswalk	eInfraCentral cross-walk		Cross-walk to EOSCpilot Final Policy Recommendation on implementing action
	Use case 1	Use case 2					Property	Entity	
Privacy Policy PID	M	M (if "/y_n" = y)	Y	Persistent identifier of the organisation's or service provider's privacy policy.	PID value (automatically assigned)	1			
Data Protection Policy statement	M	M	Y	Statement of whether an Data Protection policy for the provided resource exists or not - or is not applicable (e.g. in case of publications).	Controlled values: yes (y); no (n); not applicable (n_a)	-	-	-	
Data Protection Policy adoption date	R (if "y_n" = y)	M (if "y_n" = y)	Y	Adoption date of the Data Protection Policy.	ISO8601: YYYY-MM-DD (e.g. 2018-12-24)	-	-	-	
Data Protection Policy URL	R (if "y_n" = y)	M (if "y_n" = y)	Y	URL to dedicated website with copy of the Data Protection Policy.	URL	-	-	-	
Data Protection Policy PID	M (if "y_n" = y)	M (if "y_n" = y)	Y	Persistent identifier for the organisation's or service provider's data protection policy.	PID value (automatically assigned)				
Information on collected user data	M	R	N	Clear list of the data which a service collects from its users, including explanation of the purpose of data collection as well as how it contributes to service provision / improvement.	Free text	2.7	-	-	
GDPR support	R	R	N	Description of the user support, tools, and (if applicable) service features to ensure compliance with GDPR (e.g. data protection by design and default).	Free text	2.7	-	-	

Property	Mandatory (M) / recommended (R) / optional (O)		Machine readable (Y/N)	Description	Value type	Rule of Participation crosswalk	eInfraCentral cross-walk		Cross-walk to EOSCpilot Final Policy Recommendation on implementing action
	Use case 1	Use case 2					Property	Entity	
GDPR support URL	M	M	Y	URL of dedicated website with description of the user support, tools, and (if applicable) service features to ensure compliance with GDPR.	URL	2.7	-	-	
Data Protection Officer	O	M	Y	Statement whether the organisation or service provider has appointed a Data Protection Officer.	Controlled values: yes (y); no (n); not applicable (n_a)				SA 8.1
Data Protection Officer name	O	M (if "/data_officer_y_n" = y)	Y	Name of the Data Protection Officer	Free text				SA 8.1
Data Protection Officer email	O	M (if "/data_officer_y_n" = y)	Y	Email address of the organisation's Data Protection Officer.	Email address				SA 8.1

Table 20 details the non-policy metadata entities which are used to record details on the stakeholders and resources, as well as their assessment outcomes, in relation to which policy-specific metadata is recorded. This table does not contain a crosswalk column for the EOSCpilot Policy Recommendations because none of the proposed entities and subsumed properties directly result from or relate to the Policy Recommendations. However, to document all submitted metadata correctly in relation to a specific stakeholder and resource(s), these entities will still be required as part of the Policy Registry's use case 2.

Table 20: Administrative, non-policy metadata for Open Science Policy Registry

Property	Mandatory (M) / recommended (R) / optional (O)		Machine readable? (Y/N)	Description	Value type	Rule of Participation crosswalk	eInfraCentral cross-walk	
	Use case 1	Use case 2					Property	Entity
Entity: OS Resource								
Resource PID	M	M	Y	Persistent identifier for the resource about which policy information is being submitted.	EOSC-internal persistent identifier	-	-	-
Resource type	M	M	Y	Short description of resource type, i.e. publications, dataset, software, service, others	Controlled values: software; publication; dataset; service; other	-	-	-
Resource name	M	M	N	Name or title of the resource for which policy information is being submitted.	Free text / string	-	-	-
Resource URL	M	M	Y	URL where the resource can be found.	URL	-	-	-
Resource provider name	M	M	N	Name of the provider of the resource.	Free text / string	-	-	-
Entity: Service								
Service Function	M	R	N	Short description of the main functions which a service provides to users.	Free text / string; 1000 characters.	1	Basic Service Information	Service Description

Property	Mandatory (M) / recommended (R) / optional (O)		Machine readable? (Y/N)	Description	Value type	Rule of Participation crosswalk	eInfraCentral cross-walk	
	Use case 1	Use case 2					Property	Entity
Service category	M	R	Y	Service categorisation according to eInfraCentral data schema for service category.	List of controlled values: 1. Networking, 2. Compute, 3. Storage, 4. Data, 5. Software, 6. Application, 7. Security, 8. Analytics, 9. Operations, 10. Training, 11. Consulting, 12. Aggregator, 13. Other	-	Basic Service Information	Service Description
Service subcategory	M	R	Y	Service categorisation according to eInfraCentral data schema for service subcategories.	List of controlled values: Direct Connect, Virtual Network, Load Balancer, Application Gateway, VPN Gateway, Exchange, Content Delivery Network, Traffic Manager, API Gateway, Job Execution, Virtual Machine Management, Container Management, Batch Processing, Serverless Applications Repository, Load Balancing, Data, File, Queue, Disk, Archive, Backup, Synchronised, Replicated, Recovery, Mining, Access, Management, Transfer Management, Registration, Persistent Identifiers, Interlinking, Publishing, Discovery Anonymisation, Preservation, Brokering, Annotation, Validation, Platform, Application, Tools, Component, Authentication and Authorisation, Coordination, Certification Authority, Identity ,Attacks protection, Business Analytics, Web Analytics, Learning Analytics, Predictive Analytics, Machine Learning, Accounting, Helpdesk, Monitoring, Analysis, Configuration,	-	Basic Service Information	Service Description

Property	Mandatory (M) / recommended (R) / optional (O)		Machine readable? (Y/N)	Description	Value type	Rule of Participation crosswalk	eInfraCentral cross-walk	
	Use case 1	Use case 2					Property	Entity
					Online Courses, Inhouse Courses, Open Registration Courses, Platform, Audit and Assessment of IT Management, Audit and Assessment of Information Security, High Performance Computing, Services, Data, Applications, Software, Publications, Services-Data, Services-Applications, Services-Software, ServicesPublications, Data-Applications, Data-Software, Data-Publications, Applications-Software, Applications-Publications, Software-Publications, Services-Data-Applications, Services-Data-Software, Services-Data-Publications, Services-Applications-Software, Services-Applications-Publications, Services-Software-Publications, Services-Software-Applications, Data-Applications-Software, Data-Applications-Publications, Data-Software-Publications, Services-Data-Applications-Software, Services-Data-Applications-Publications, Services-Data-Software-Publications, Services-Software-Publications-Applications, Data-Software-Applications-Publications, Services-Data Applications, Software-Publications, Other			
Maturity	M	R	Y	Describes the maturity of the service, referecing TRL-levels; only allows TRL-7 and higher.	Controlled values: TRL7, TRL8, TRL9	1	Service Classification Information	Service TRL, Service Lifecycle Statis
Operations	R	R	N	Describes details relating to the operations of the service, e.g. accounting info or business continuity plans.	Free text / string; 1000 characters	1	Service Operations Information	

Property	Mandatory (M) / recommended (R) / optional (O)		Machine readable? (Y/N)	Description	Value type	Rule of Participation crosswalk	eInfraCentral cross-walk	
	Use case 1	Use case 2					Property	Entity
EOSC service type	M	R	Y	Describes the EOSC service category which applies to a given service. 1) EOSC core services are services which are funded and managed by the EOSC. Core services ensure the core functionality of the EOSC (e.g. EOSC AAI). 2) EOSC supported services are a class of services which are useful for multiple communities but which are not developed by commercial organisations or communities alone. The EOSC therefore finances and manages "supported services". 3) EOSC service components: These are services that can be combined and built-upon to create user facing services. This includes „raw storage“, cloud platforms, VRE generators etc. 4) End-user services are Services that scientists will use to do research. Services will include data repositories, web platforms, VREs (either generic or discipline specific), compute systems, etc.	Controlled list of values: core service; supported service; service component; end-user service	-	-	-
Service PID	M	M	M	Persistent identifier for the service about which policy information is being submitted.	EOSC-internal persistent identifier			

Property	Mandatory (M) / recommended (R) / optional (O)		Machine readable? (Y/N)	Description	Value type	Rule of Participation crosswalk	eInfraCentral cross-walk	
	Use case 1	Use case 2					Property	Entity
Entity: Dataset								
Data description and utility	R	R	N	Description of the data (what is it?) and its utility (what is the data - potentially - useful for?).	Free text	2.2	-	-
Data PID	M	M	M	Persistent identifier for the dataset about which policy information is being submitted.	EOSC-internal persistent identifier			
Entity: Publication								
Publication description	O	R	N	Short description (e.g. abstract) of the relevant publication.	Free text / string	-	-	-
Publication PID	M	M	M	Persistent identifier for the publication about which policy information is being submitted.	EOSC-internal persistent identifier			
Entity: Software								
Software description	O	R	N	Short description of the relevant software, including the use case for which it was created and what its main function is.	Free text / string	-	-	-
Software type	O	R	N	Brief explanation of the type of software, e.g. Python Script.	Free text / string	-	-	-
Software PID	M	M	M	Persistent identifier for the publication about which policy information is being submitted.	EOSC-internal persistent identifier			

Property	Mandatory (M) / recommended (R) / optional (O)		Machine readable? (Y/N)	Description	Value type	Rule of Participation crosswalk	eInfraCentral cross-walk	
	Use case 1	Use case 2					Property	Entity
Entity: Stakeholder								
Stakeholder type	M	M	Y	Type of submitting stakeholder.	Controlled values: Research Performing Organisation; Funder; Ministry; Research Infrastructure; Service Provider	-	-	-
Stakeholder name	M	M	N	Name of the submitting stakeholder.	Free text	-	-	-
Stakeholder URL	M	M	Y	URL of website of submitting stakeholder.	URL	-	-	-
Stakeholder contact email	M	M	Y	Contact email for submitting stakeholder (domain name must be equivalent to stakeholder URL (stakeholder/url).	Free text	-	-	-
Stakeholder PID	M	M	M	Persistent identifier for the publication about which policy information is being submitted.	EOSC-internal persistent identifier			
Entity: Service catalogue								
Service catalogue type	M	O	Y	Describes the service catalogue type in which the service is listed.	Controlled list of values: EOSC_service_catalogue; Third_party_catalogue	1	-	-
Third-party service catalogue name	O	O	N	Name of third party catalogue where service is registered.	Free text	1	-	-

Property	Mandatory (M) / recommended (R) / optional (O)		Machine readable? (Y/N)	Description	Value type	Rule of Participation crosswalk	eInfraCentral cross-walk	
	Use case 1	Use case 2					Property	Entity
Third-party service catalogue URL	O	O	Y	URL of third party catalogue where service is listed.	URL	1	-	-
Entity: Data catalogue								
Data catalogue type	M	O	Y	Describes the data catalogue type in which the dataset is listed.	Controlled list of values: EOSC_data_catalogue; Third_party_catalogue	1	-	-
Third-party data catalogue name	O	O	N	Name of third party catalogue where dataset is registered.	Free text	1	-	-
Third-party data catalogue URL	O	O	Y	URL of third party catalogue where dataset is listed.	URL	1	-	-
Entity: Assessment outcome								
Service status level	M	R	Y	Describes the compliance level of the respective service with EOSC Rules of Participation.	Controlled values: compatible; compliant; failed	1	-	-
Open Science Policy Alignment	R	M	Y	Indicator to describe the level of policy alignment in the area of open science.	Controlled values: full (green), partly (yellow), no alignment (red), no assessment possible (white)	-	-	-
Data Protection Policy Alignment	R	M	Y	Indicator to describe the level of policy alignment in the area of data protection.	Controlled values: full (green), partly (yellow), no alignment (red), no assessment possible (white)	-	-	-
Procurement Policy Alignment	R	M	Y	Indicator to describe the level of policy alignment in the area of procurement.	Controlled values: full (green), partly (yellow), no alignment (red), no assessment possible (white)	-	-	-

Property	Mandatory (M) / recommended (R) / optional (O)		Machine readable? (Y/N)	Description	Value type	Rule of Participation crosswalk	eInfraCentral cross-walk	
	Use case 1	Use case 2					Property	Entity
Ethics Policy Alignment	R	M	Y	Indicator to describe the level of policy alignment in the area of ethics.	Controlled values: full (green), partly (yellow), no alignment (red), no assessment possible (white)	-	-	-