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D2.5: Open Science policies and resource provisioning in the Nordic and Baltic countries (second report):

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Status	Draft
Version	1.0
Date	26/02/2021

Document identifier:	
Deliverable lead	SNIC
Related work package	WP4
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Due date	31/03/2021
Actual submission date	26/02/2021
Reviewed by	Liisi Lembinen, University of Tartu, and Pirjo Kontkanen, University of Helsinki
Approved by	
Dissemination level	Public

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Website	Https://www.eosc-nordic.eu/
Call	H2020-INFRAEOSC-2018-3
Project Number	857652
Start date of Project	01/09/2019
Duration	36 months
License	Creative Commons CC-BY 4.0
Keywords	

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Executive summary

For this deliverable the authors have surveyed and described any policy and similar documentation such as written guidelines, policies et.al. relating to specific focus areas. The focus areas chosen are policy implemented incentives for FAIR, policies for Open Science (OS) training / training for making data FAIR, policies for making other research objects FAIR and policies facilitating cross border research. The countries in the scope of the deliverable are Denmark, Estonia, Finland, Norway, Latvia, Lithuania and Sweden.

Regarding policy implemented incentives for FAIR, the countries have taken different approaches. Policy implemented incentives are either in the form of national policies or law. Policies may be authored by different organisations, both organisations with national mandates, such as funders, and organisations with a subnational mandate, such as Higher Education Institutions (HEI:s). This also illuminates that different stakeholders are involved, ranging from ministries, and funders to HEI:s and libraries.

Policies for (OS) training/training for making data FAIR, or policies that involve OS training, are available in some countries. In countries where neither policies or training is available, there is awareness of the importance of policies for OS training/training for making data FAIR, which is reflected in some draft policies. OS training is provided by HEI:s in a majority of countries inventoried. A difference between the countries inventoried is that in some countries policy is set at a national level, in others, policies are set in addition to, or only at the subnational level.

Most countries inventoried do not have policies in place for making other research objects FAIR. A conclusion, as has also been highlighted by other reports[1], is that making other research objects FAIR is an area in need of focus in order to ensure transparency, reproducibility, and reusability of research.

One country inventoried has a policy that mentions facilitation of cross border research in the sense that national e-infrastructure is promoted to international users. The remainder of the inventoried countries have national policies, regarding access to resources, which focuses on researchers with national affiliation access to services. A conclusion is that in the Nordic and Baltic region, facilitation of cross border research is not a focus in policies, but policies rather have a national scope.

[1] https://www.nature.com/articles/sdata201618

1. Purpose and scope of the deliverable

The aim of this deliverable is to provide a second assessment of the status of OS policies and provisioning of infrastructure resources in the Nordic and Baltic countries, as well as a roadmap on how the Nordic and Baltic countries can align with EOSC.

This deliverable as such is a follow up of the first deliverable in the series regarding Open Science and resource provisioning, *D 2.1 Open Science policies and resource provisioning in the Nordic and Baltic countries.* In the first deliverable, submitted in February 2020, the following observations were made: within Nordic and Baltic region, maturity in regard to implementation of Open Science ranges from countries having laws in place governing the implementation of Open Science to countries being in the early stages of adopting national strategies and plans for the implementation of Open Science. The study showed that in countries where a national OS policy has yet to be established, some HEI:s and funders have established Open Access policies and to a lesser extent Open Data policies.[2]

The previous deliverable showed, in regard to resource provisioning and access policies, that national HPC facilities were not available in some Baltic countries. Access to resources was discovered to be solely for academic use. Regarding resource provisioning policies, the previous study showed that principles throughout the Nordics and Baltics differ, ranging from access requiring technical and scientific review to access being granted on demand.[3]

This deliverable builds on the D 2.1 deliverable, referred to above, and aims to add to the existing body of knowledge via inventories of focus areas related to OS/FAIR and resource provisioning policies. This deliverable is also to consider EOSC developments and deliver a roadmap in which the findings are put into relation to EOSC. This deliverable will as such relate the findings to relevant EOSC policies and recommendations. This may entail policies such EOSC Rules of Participation (RoP) which, as published guidelines, deals with both Open Science and resource provisioning within the frame of EOSC.[4] It may also entail outputs such as EU´s Open Science Policy[5] with the ambitions: The EOSC is a trusted, virtual, federated environment that cuts across borders and scientific disciplines to store, share, process and reuse research digital objects (like publications, data, and software) that are Findable, Accessible, Interoperable and Reusable (FAIR). EOSC brings together institutional, national and European stakeholders, initiatives and infrastructures.

[2] https://www.eosc-nordic.eu/kh-material/testimateriaali/
[3] https://www.eosc-nordic.eu/kh-material/testimateriaali/
[4] https://op.europa.eu/en/publication-detail/-/publication/a96d6233-554e-11eb-b59f-01aa75ed71a1/language-en/format-PDF/source-184432576
[5] https://ec.europa.eu/info/research-and-innovation/strategy/goals-research-and-innovation-policy/open-science_en#tracking-open-research-trends-open-science-monitor

2. Methodology

The EOSC-Nordic work package 2 project group, consisting of participants from the organizations SNIC, CSC, UEF, FMI, SIGMA2, UT/ETAIS, DeiC, UICE, RTU, and NORDUnet, have during September 2020 - February 2021 conducted desktop studies to compile the materials that form this deliverable. The focus of this deliverable has been identified by both the authors of this deliverable, stakeholders within the EOSC-Nordic project, OS stakeholders in the Nordics and Baltics, as well as in reports by EOSC projects, and requirements set out in the EOSC-Nordic project plan.

2.1. Focus areas

In this deliverable inventories will be provided for specific focus areas. The focus areas chosen are:

- policy implemented incentives for FAIR
- policies for Open Science (OS) training / training for making data FAIR
- policies for making other research objects (incl. software and methodology) FAIR
- policies facilitating cross border research

In relation to the adoption of FAIR, three areas were identified as suitable focus areas. First focus area is policy implemented incentives for FAIR. FAIR in Practice Task Force of the EOSC FAIR Working Group, has set Six Recommendations for Implementation of FAIR Practice[6]. One of the recommendations is *Reward and recognise improvements of FAIR practice.* Following a dialogue in our working group and between work packages, it was decided that this deliverable would be suitable for a mapping of policy implemented incentives for FAIR.

The FAIRsFAIR project aims to supply practical solutions for the use of the FAIR data principles throughout the research data life cycle[7]. Within the project a series of practical recommendations for policy enhancement to support the realisation of a FAIR ecosystem has been prepared[8]. One of the recommendations highlights the need for training: *"Researchers and data stewards should receive practical guidance on how to implement FAIR within different domains – particularly with regard to data description using appropriate metadata standards, data tags and ontologies. A commitment is needed from all stakeholders to support and meet training needs relating to Open Science."* As such policies for OS training / training for making data FAIR was chosen as a focus area for which this deliverable is able to add value in form of a mapping.

FAIR for other research objects has been identified by the FAIR in Practice Task Force of the EOSC FAIR Working Group, as an area for which there is a need for further studies. Regarding FAIR for other

[6] https://ec.europa.eu/info/sites/info/files/research_and_innovation/ki0120580enn.pdf
[7] https://www.fairsfair.eu/the-project
[8] https://zenodo.org/record/3686901#.YBwU-nmxU2w

research objects, the report *Six Recommendations for implementation of FAIR practice*[9] asserts that, in order to ensure widespread benefits of the EOSC, improvements in FAIR practices are necessary. One of the recommendations is *Develop and monitor adequate policies for FAIR data and research objects*. Policies for making other research objects (incl. software and methodology) FAIR was identified as a focus area that needs further studies.

Lastly, regarding resource provisioning policies, the focus in this deliverable is on incentives for cross border collaborations. Aforementioned aspects, Open Science, including FAIR, and access to e-infrastructure, are aspects that are at the core of EOSC, as highlighted in the RoP. As mentioned also in EU´s Open Science policy[10] EOSC will enable researchers across disciplines and countries to store, curate and share data. The last focus area in this document was chosen from the need to identify gaps in policies for facilitating cross border research.

Throughout this deliverable inventories for each focus area are provided per inventoried country, in which policies, guidelines et.al. related to the focus areas are addressed.

[9] https://ec.europa.eu/info/sites/info/files/research_and_innovation/ki0120580enn.pdf
[10] https://ec.europa.eu/info/research-and-innovation/strategy/goals-research-and-innovation-policy/open-science_en#tracking-open-research-trends-open-science-monitor

3. Open Science policies

3.1. Update on state of Open Science

As described in section 2.1. this deliverable mainly focuses on focus areas related to Open Science/FAIR policies and policies facilitating cross border research. As required by the deliverable description, the deliverable also provides an update for the deliverable D 2.1, which presents an overview of the state of Open Science policies in the Nordics and Baltic region. As such, this section provides an update and an overview of news related to the state of open science policies in the Nordics and Baltics. Specifically changes after February 2020 are provided, as February 2020 was the submission date for the previous report.

Updates are provided per country. Participants were asked to describe for their countries any policies, guidelines etc. related to open science. Documents in scope were records available via organisations relevant for the specific national contexts.

Denmark

How to support FAIR data management was addressed by a Data Management Task force set up through DeIC, who in November 2020, published their report on a national data management strategy.

Estonia

Currently Estonia does not have an active Open Science Policy; however, the Ministry of Education and Science has been actively developing Open Science Framework for Estonia[11] (working document, in Estonian). The document is in the final stage. The Framework will be published as the appendix of Estonian R&D, Innovation and Entrepreneurship Development Plan for 2021-2035[12].

The National strategy "Estonia 2035" (in Estonian) clearly states developing open science in Estonia: "*Improving the wider availability and use of research results (including the development of open science) and support the development of a knowledge-based in society, including citizen science.*"[13].

[11] https://www.hm.ee/sites/default/files/eesti_avatud_teaduse_raamistik_16112020.pdf
[12] https://www.hm.ee/sites/default/files/2_taie_arengukava_eelnou_lisad_29.10.2020.pdf
[13] riigi_pikaajaline_arengustrateegia_eesti_2035_eelnou_uldosa.pdf (riigikantselei.ee)

Finland

The working group appointed by the Expert panel on Open Data has, in cooperation with the National Open Science and Research Steering Group, drafted principles for the Policy on Open Access to Research Materials and Methods and a policy component on Open Access to Research Data[14]. This draft is the first part of the national Policy on Open Access to Research Materials and Methods for the Finnish higher education and research community, and it further defines the national objective for open research materials and methods mentioned in the Finnish Declaration of Open Science and Research 2020–2025.[15] The policy will be supplemented with a policy component on open research methods in 2021-2022.

Norway

In December 2017, the Ministry of Research and Education published the new *National Strategy on access to and sharing of research data*[16]. The strategy aims at establishing the basic principles for the management and curation of publicly funded research data, and therefore building the foundation for facilitating the reuse of data for advancement of knowledge and for the benefit of the society in its whole.

The strategy stems from three basic principles, namely (i) Research data must be as open as possible, as closed as necessary; (ii) Research data should be managed and curated to take full advantage of their potential; (iii) Decisions concerning archiving and management of -research data must be taken within the research community. Change in the underlying culture, increased competence, data management plans, better technical infrastructure, improved national coordination among subject fields and sustainable funding models are the identified requirements in the process of establishing the above-mentioned principles as a national practice.

The strategy also highlights the need to facilitate the reuse of data from Statistics Norway in research and identify concrete measures to facilitate the processes of accessing and consuming statistical data. Similarly, the link of public registries data and Statistics Norway data with the health data is envisioned in connection with the Health Data Program. The program started in 2017 under the Directorate of e-Health to improve the utilization of Norwegian health data from health registries, population-based surveys and research biobanks.

In early 2020 the Norwegian Council of Research finalised the Open Science Policy[17] after an extensive consultation round of several stakeholders. The Research Council's Policy for Open Science is based on

[14] https://avointiede.fi/en/news/draft-policy-component-open-access-research-data-now-open-comments
[15] https://avointiede.fi/fi/julistus
[16] https://www.regjeringen.no/en/dokumenter/national-strategy-on-access-to-and-sharing-of-research-data/id2582412/

[17] https://www.forskningsradet.no/en/Adviser-research-policy/open-science/policy-for-open-science/

the principle that research and innovation processes are to be "as open as possible, as closed as necessary". To embrace the various aspects of open science, the policy has three main objectives:

i) to contribute to a well-functioning science system; ii) to contribute to sustainable societal development; iii) to strengthen the public trust in science. The policy clarifies the Research Council's role in promoting open science through a list of measures. The measures are:

- knowledge about and competence in open science
- testing of open science and innovation in projects
- access to and reuse of scientific results
- data infrastructures for handling and making research data accessible
- career development and research assessment
- transparency in research funding processes
- responsible research and innovation
- openness in innovation processes
- rights to research results
- research as the premise for societal development
- involvement of users and the general public in research and innovation processes through user participation and citizen science.

Research Institutes and Universities are assigned to build the knowledge and define policies and procedures for data management (including the adoption of the Data Management Plans as an integral part of the project management). The definition of such policies and the implementation of them in the different institutions has gone therefore at different pace.

The UiT Arctic University of Norway was the first publishing and a policy for Open Access and a policy for Research Data Management[18], covering two essential parts of Open Science. The University of Oslo (UiO) published an Open Science policy in 2018, which was later updated in May 14 2020[19]. The University of Oslo's policy aims at making research data openly available, but exceptions can be made for data that cannot and should not be made available. The Norwegian University of Science and Technology NTNU have published policies on Open Science and guidelines[20] based on open access to data on 2018 for an horizon 2018-2025, while the University of Bergen has recently updated it Open Science policy (Sept. 2020)[21]. Policies for Open Access can also be found in the Oslo Metropolitan School[22].

[18] https://intranett.uit.no/Content/532111/Principles%20and%20guidelines%20for%20research%20management%20at%20UiT_010917.pdf

[19] https://www.uio.no/english/for-employees/support/research/research-data-management/policies-and-guidelines/index.html

[20] https://innsida.ntnu.no/c/wiki/get_page_attachment?p_l_id=22780&nodeId=24646&title=NTNU+Open+Data&fileName=NTNU%20Open%20Data_Policy.pdf

[21] https://www.uib.no/en/foremployees/142184/university-bergen-policy-open-science

[22] https://ansatt.oslomet.no/en/open-access-policy

Latvia

The Ministry of Education and Science of Latvia (IZM) initiated development of Open Science Roadmap for Latvia and there has been an activity reviewing the current state and elaborating recommendations for development. Document[23] (in Latvian) has been published on June 4th, 2020 and now is used in the ongoing development of a political document – The Latvian National Open Science Strategy. It is planned that Open Science development in Latvia will be based on 3 pillars: Open Access, FAIR data and Citizen Science. The strategy is likely to be approved in Q2, 2021.

Lithuania

During 2020 Lithuania's legislation system regarding Open Science or Open Access publishing did not change.

Sweden

During 2020 the National Library (KB) made available, in English, an inquiry into the needs for financial and technical support in order to enable Swedish scholarly journals to transition into Open Access. Furthermore, KB was in 2020 tasked by the Swedish government to establish a national platform for Swedish scholarly open access journals.[24] KB also compiled and published information regarding Swedish HEI:s expenditures related to scientific publications and publishing scientific publications available via Open Access during 2018.[25] Additionally, in the Swedish research bill Open Access is a focus area, as the government mandated scientific publications financed by public funds to be subject to open access starting in 2021. Further, Swedish Research Council (VR) has launched a national Data management plan tool.[26] Lastly, the mandates of KB and VR are to be further developed, in order to accelerate the conversion to an Open Science system.[27]

[23] https://www.izm.gov.lv/sites/izm/files/petijums-atverta_zinatne_21_2.pdf
[24] https://www.kb.se/samverkan-och-utveckling/nytt-fran-kb/nyheter-samverkan-och-utveckling/2020-10-28-financial-and-technical-support-for-open-access-scholarly-journals.html
[25] https://www.kb.se/samverkan-och-utveckling/nytt-fran-kb/nyheter-samverkan-och-utveckling/2020-02-26-totala-utgifter-for-vetenskaplig-publicering-2018.html
[26] https://www.vr.se/aktuellt/nyheter/nyhetsarkiv/2020-11-27-digitalt-verktyg-for-datahanteringsplaner-nu-tillgangligt.html
[27] https://www.regeringen.se/4af915/contentassets/da8732af87a14b689658dadcfb2d3777/forskning-frihet-framtid--kunskap-och-innovation-for-sverige.pdf

3.2. Policy implemented incentives for FAIR

The following inventory is provided per country. Participating representatives were asked to describe any policy/similar such as written guidelines, management policies et.al. relating to policy implemented incentives for FAIR. Documents in scope were documents /similar available via the organisations are relevant for the specific national context.

Denmark

As mentioned in the previous report, FAIR is an integral part of the Danish National Strategy for collaboration on E-infrastructure from 2018. Two task forces have been set up in accordance with the overall strategy - one on scientific merit and the other on FAIR data management.

The taskforce on scientific merit delivered a report in 2019. The task was to give recommendations on how scientists could advance their careers not only through peer-reviews and publications in order to ensure that other valuable aspects of science are not under-prioritized - among others specifically on sharing of data. “Lack of transparency and access to data creates structural problems in science, amongst others with reproducibility, testing, reusability and use of data”. However, the report does not mention FAIR specifically nor does it address the issues it acknowledged. The recommendation given is that in order to support and strengthen strong research environments university management shall give merit and acknowledge *to a higher degree* the width of significant input to research results - for example development of datasets, programming, modelling, knowledge sharing.

How to support FAIR data management was addressed by the Data Management Task force who in November 2020 published their report on a national data management strategy. The key principles driving the national FAIR data management policy supported by the universities and DeIC is:

- Data Management shall support FAIR principles and reuse of data
    - Minimally datasets must be identifiable through PID and metadata
    - Valuable datasets must be made openly available, unless specific reasons not to do so exists. Metadata must always be made openly available
- Relevance and weighing of individual FAIR principles varies and must be defined within the different fields according to international standards
- It must be possible to preserve all kinds of research objects and file formats in the short and long term.
    - Data deemed to have future value must be stored and made accessible in a technically and organizationally secure data infrastructure.
    - Particularly valuable datasets must be identified and managed with long term preservation in mind

    - In the event that available datasets are being deleted, the PID shall continue to be available along with metadata on the data and their deletion.
- Data life cycle data management
    - Methods and tools shall be available and ensure that data and documentation is recorded and stored continuously
    - Licencing conditions shall be available either in human or machine-readable formats
- Relevant RI and tools must be offered to all scientists independent of research field and institutional affiliation
    - Data storage and access to data must be open to all scientists
    - Data in relevant repositories shall constitute the requirement of research institutions obligations towards the National Archive.
    - Technical tools shall enable data access in open and standardised formats and shall not be hindered by licensed software.
- Needed skills and competences shall be available regardless of field or institutional affiliation
    - Scientists need not be data management experts, but will be supported in the data management work
    - Knowledge on data management and FAIR shall be accessible for all scientists at all research performing institutions.

Estonia

Estonia has not implemented a national Open Access/Open Science policy yet. However, in 2015, Open Science Expert Group was initiated by the Estonian Research Council to support drafting a national Open Science policy by complying principles and recommendations for the development of national open science policy (2016).[28] From the end of 2019, the Ministry of Education and Research in Estonia has started to develop a Roadmap for an Open Science Policy Framework which is expected to result in official policy in 2021. The Framework will be published as the appendix of Estonian R&D, Innovation and Entrepreneurship Development Plan for 2021-2035.
At the same time updating the Organisation of Research and Development Act is underway and Open Science is a part of it.
It is expected that in a few years, this policy can result in the establishment of Estonian Open Science Competence Centre which is a central support system for Open Science implementation in Estonia. The work version of the OS framework requires that all the publicly funded research data should be available based on FAIR principles. In addition, all research conducting institutions need to publish their data based on FAIR principles.
The Estonian Code of Conduct for Research Integrity Agreement, signed in 2017 by Estonian research universities and research institutions require researchers to make sure that their research data could be found and used as easily as possible following FAIR principles.

[28] https://www.etag.ee/wp-content/uploads/2017/03/Open-Science-in-Estonia-Principles-and-Recommendations-final.pdf

Finland

Most higher education institutions have guidelines for considering FAIR principles when opening research data.[29] Finnish National Coordination of Open Science has published A guide to scientific publication channels for responsible material and data policy development, recalling the FAIR principles.[30]

When higher education institutions and research organisations update open science policies, the FAIR principles are usually included in the policy at that time. The data service providers (e.g. CSC[31], FSD[32]) have FAIR principles mentioned in their policies. Most funders, for example Academy of Finland, mention FAIR principles as part of the guidelines for data management plans[33]. The common digital vision of higher education institutes 2030 includes FAIR principles and the needs or open science as one of the drivers[34]. National Fairdata services provided by CSC utilize FAIR principles[35]. The Ministry of Education and Culture is committed to FAIR principles and incorporates them into its own policies and guidance documents[36].

All higher education institutions have guidance for data management planning and generally follow FAIR principles.[37] Under the Finnish National Coordination of Open Science, a working group is working on incentives for Open Science. This work has begun spring 2020 and is still ongoing. There are sub groups for publishing, learning and research data[38] and methods. Incentives are also considered from the perspectives of both the teacher and the researcher. There is a working group on career models and merit-earning methods in the general collective agreement for universities, but the work is just beginning.[39]

Finnish advisory board on research integrity has updated the template for a researcher's curriculum vitae model[40] and now it allows the researcher to highlight the promotion of open science as part of the scientific and societal impact of research.

In Finland, incentives are not taken directly to the policy level, but the state of will is recorded at a more general level. Responsibility for the national coordination of open science has been given to the Federation of Finnish Learned Societies[41], which is responsible for national policy work, and these policy

[29] https://www.eosc-nordic.eu/kh-material/testimateriaali/
[30] https://avointiede.fi/en/policies/declaration-open-science-and-research-2020-2025
[31] https://www.csc.fi/en/data-policy
[32] https://www.fsd.tuni.fi/en/data-archive/documents/fsds-data-management-policy/
[33] https://www.aka.fi/en/research-funding/apply-for-funding/how-to-apply-for-funding/az-index-of-application-guidelines2/data-management-plan/data-management-plan/
[34] https://minedu.fi/en/vision-2030
[35] https://www.fairdata.fi/en/
[36] https://minedu.fi/en/science-and-research
[37] https://www.eosc-nordic.eu/kh-material/testimateriaali/
[38] https://avointiede.fi/en/news/draft-policy-component-open-access-research-data-now-open-comments

[39] https://avointiede.fi/en/policies/policies-open-science-and-research-finland
[40] https://tenk.fi/en/advice-and-materials/template-researchers-curriculum-vitae
[41] https://tsv.fi/en

documents recommend the implementation of incentives. As a funder of higher education institutions and research institutes, various ministries draw up performance agreements with organisations where the promotion of open science can be addressed at a more general level. The funding model for higher education institutions has incentives mainly for publications, and organisations themselves have the autonomy to adjust their own incentives for open science fields.

Latvia

FAIR will be an integral part of the National Open Science Strategy, covering RDM practices and incentives, research infrastructures, skills and monitoring. In the draft version of the Open Science Roadmap document[42]. It is recognized that coordinated actions in introducing data repositories based on FAIR principles is one of priorities. It is planned to build an appropriate e-Infrastructure with data management platforms (DMP) and create a unified service centre to support research institutions and individual researchers.
The Latvian Council of Science will implement standardized research data management procedures for State funded research. To create incentives for researchers and institutions, it is planned to support these actions with appropriate financing with emphasis on the State-of-the-art research projects and international cooperation.
The draft version of the Latvian National Open Science Strategy requires that all the publicly funded research data should be available in Open Access databases based on FAIR principles.

[42] https://www.izm.gov.lv/sites/izm/files/petijums-atverta_zinatne_21_2.pdf

Lithuania

The Research Council of Lithuania is the main institution coordinating Open Access activities of Lithuania. Such a decision was made on the submission of the Ministry of Education and Science and in response to the 2013 request made by the Secretariat of the Lithuanian National Commission for UNESCO to appoint the institution responsible for Open Access to research information.
In 2014, the Research Council of Lithuania became a partner of the international project 'Open Access Policy Alignment Strategies for European Union Researchers'. In Lithuania, the public and private institutions are required by law to make any research results public. Article no. 45 of the Republic of Lithuania the Law of on Science and Studies incentivizes usage of public funds from the state budget to include as the outcome a produced results (deliverables) to be Open Access for general public insofar as it is consistent with the laws regulating intellectual property rights and commercial, state and public service secrecy protection.

Norway

The Board of the Digitalization for Higher Education and Research[43] - consisting of members from the High Education and Research Sector, approved in May 2020 the action plan for the sector which includes the target image and several initiatives related to FAIR research data. The targets are that: i) Researchers make results (publications, data and more) easily retrievable and, as far as possible, available for reuse; ii) Researchers have access to a clear and user-friendly service offering that supports both academic and administrative tasks. The targets shall be achieved by:

- Making available support services that simplify all steps in the research process and ensure that registered information can be reused.
- Making available services to support collaboration: Researchers must be able to collaborate easily and seamlessly with colleagues nationally and internationally, and across disciplines.
- Making research data available: Research data from Norwegian research institutions must follow the FAIR principles (findable, accessible, interactive and reusable).
- Making available common services for storage and calculations: Researchers shall have access to generic storage and computing services.

UNIT[44] - the Norwegian Directorate for ICT and Joint Services in Higher Education & Research has the responsibility to implement the action plan, by launching a concept phase project (Spring 2021) for: i) mapping the existing research infrastructures and services and define guidelines for a service to be considered a national service; ii) mapping the existing services for long-term storage of research data and study the need to supplement these. In January 2021, Unit in collaboration with the higher

[43] https://www.unit.no/en/node/492

[44] https://www.unit.no/en/about-unit

education institutions has presented a proposal for a new Digitization Strategy to the Ministry of Education. The document includes among the proposed topics open access.

The Arctic University of Norway UiT was the first Norwegian university to establish an institutional policy for research data management. At that time, the FAIR principles had not gained its current status as a de-facto standard. Nevertheless, the UiT policy includes several FAIR-related incentives. The policy mandates researchers at UiT among other things to write a data management plan (DMP), and to share their data in a trustworthy repository as early as possible. On the other hand, UiT commits to provide the necessary support services to enable researchers to comply with the policy, including an Institutional Archive based on Dataverse. The University of Oslo's rectorate approved recently updated policies and guidelines for research data management, this time including not only principles related to FAIR but also to CARE[45]. The guidelines of the policy demand that the research data shall be made available for re-use at the earliest stage, research project should have a DMP which include also the description of the metadata standard adopted, and finally research data shall be made deposited in archive and made discoverable and reusable through the proper license. UiO has also launched a project in October 2020 to explore technical solutions for providing support for FAIR metadata connected with the storage. The Norwegian University of Science and Technology NTNU demands DMP for every research project. The University of Bergen supports FAIR by offering an institutional research data archive based on DataVerse.

The NORDI[46] project owned by NSD - the Norwegian Center for Research Data - was originally established to modernize the NSD's archive data services and it has been recently restructured to adjust the scope to the national directive as well as the European Union report "Turning FAIR into Reality".

UNINETT Sigma2[47] - the national provider of e-Infrastructure for massive research data and HPC infrastructure - is in alignment with the Research Council's and the Universities' policy, required since 2021 to submit a Data Management Plan to every application for storage resources and has promoted the publication of the data in the Sigma's Open Research Data Archive by not applying cost to the storage used, regardless on the size of the dataset. This has brought an increase of 150% of the archive in the period 2019-2020.

[45] https://www.rd-alliance.org/sites/default/files/CARE%20Principles%20for%20Indigenous%20Data%20Governance_FINAL_Sept%2006%202019.pdf

[46] https://www.nsd.no/en/about-nsd-norwegian-centre-for-research-data/projects/the-nordi-project
[47] https://www.sigma2.no

Sweden

The Swedish national guidelines for the European Research Area contain measures aiming at strengthening the priorities agreed on at EU-level. The guidelines offer an overview of the responsibilities of actors in the research and innovation system. This includes incentives for FAIR. The Research Bill of 2016 provided national direction for Open Science. This included that research products, as far as possible, to the greatest extent possible should make use of and fulfil the FAIR principles. Starting in 2020, publicly funded research publications are to be available via Open Access.[48] Additionally, VR, as a funder, starting in 2019, demands DMP:s for research projects receiving funding[49]. Furthermore, policy implemented incentives for FAIR are found in the VR report *Kriterier för FAIR forskningsdata,* published in 2018, in criteria for review of FAIR compliance for research data that has been funded by public funds[50] and the KB criteria, published in 2019, for review of FAIR compliance of publications funded by public funds.[51] The 2020 Swedish Research Bill states that research data, though EOSC, shall be coordinated to meet the FAIR criteria. A focus area for the VR coordination task for Open Science is national coordination regarding Data Management Plans, and is seen as a key component in realizing the FAIR principles.[52]

3.3. Policies for OS training / training for making data FAIR

This section provides an inventory of policies for OS training and training for making data FAIR.

The inventory is provided per country. Participating representatives were asked to for their countries describe any policy/similar such as written guidelines, management policies et.al. relating to OS training /training of researchers for making data FAIR. Documents in scope were documents /similar available via the organizations which are relevant for producing such for the specific national context such as funders, government agencies, ministries, research societies, and HEI:s, as well as national organizations providing application support, such as e-infrastructures.

Denmark

In Denmark OS training is focused mainly on building support structure for scientists. More and more emphasis is put on a new profession “data stewards” - that is data specialists with integral knowledge of data management issues, methods and technical tools, which can facilitate the data management

[48] https://www.regeringen.se/4a4ba7/contentassets/4565007ced364a2ca2cb5e615585e592/nationell-fardplan-for-det-europeiska-forskningsomradet-20192020.pdf

[49] https://www.vr.se/uppdrag/oppen-vetenskap/oppen-tillgang-till-forskningsdata.html
[50] https://www.vr.se/analys/rapporter/vara-rapporter/2018-12-07-kriterier-for-fair-forskningsdata.html
[51] https://www.kb.se/samverkan-och-utveckling/oppen-tillgang-och-bibsamkonsortiet/oppen-tillgang/fair.html
[52] https://www.regeringen.se/4af915/contentassets/da8732af87a14b689658dadcfb2d3777/forskning-frihet-framtid--kunskap-och-innovation-for-sverige.pdf

processes and make data FAIR. The basic idea is that these persons are available for researchers and may join research projects as would lab technicians, software engineers and librarians. The scope is wide, from a very generic advisory role, to field specific support at the highest academic level, fully integrated into research.

The new DM Strategy of November 2020 stipulates that the universities and DeIC have the responsibility for ensuring that needed competences for FAIR DM is available during the research process. Together they must ensure that the area is developed and coordinated nationally and internationally and that FAIR data stewardship competencies are developed, including development of FAIR data stewardship through targeted training of IT staff and librarians and by offering bachelor- and master programmes for data stewards and specific training modules at Ph.D level focusing on generic and field specific competences.

DeIC is responsible for ensuring critical mass, and coordinating and facilitating sharing of knowledge across different institutions and fields and will set up a national Data Stewardship Competence Centre and each institution will set up local data stewardship front offices.

Estonia

In Estonia, the University of Tartu is offering OS training. UT offers the following courses for Masters and PhD students: Research Data Management; Research Data Management and Publishing which includes RDM and FAIR Data sections[53].

Topics of Open Science and Research Data Management are included in the doctoral elective course Research Integrity: Framework Requirements, Values and Principles of Action.
UT also offers various courses for students connected to data science, for example introduction and methods of data science, data mining. In addition, through the DataCite consortium, training is offered in the largest Estonian research universities.

Training and information materials of Research Data Management and Open Science have been created also by other universities, like TalTech, Tallinn University[54] and University of Life Sciences[55]. UT Library has close contacts with the Estonian Research Council regarding Data Management Plans and evaluation of DMP-s.

Finland

The policy work is managed at the national level by the Federation of Finnish Learned Societies.[56] It provides on one hand strategy and program work and on the other hand it coordinates the efforts of

[53] https://sisu.ut.ee/andmehaldus/home-0?lang=en
[54] http://htk.tlu.ee/xerte34/play.php?template_id=59
[55] http://library.emu.ee/en/research/research-data-management/
[56] https://tsv.fi/en

different actors in their daily work. The Federation of Finnish Learned Societies also hosts the working groups for special areas, including one in open and FAIR data.[57]

At the present a “National policy on open access to research materials and methods: policy component 1 - open access to research data” (here the draft version is being in use from 2020)[58] is being prepared for the Finnish research community the aim being “Research materials and methods are as open as possible and as closed as necessary. Materials are managed appropriately in order to achieve the FAIR principles. Research methods and materials, including research data, are recognised as independent research outputs.” It sets the following principles for opening the research:

1. Research materials are opened only responsibly
2. Researchers have access to data management infrastructures and services, and they are developed in a research-driven manner
3. The researchers’ work in good data management practices and opening of research materials is valued in researcher merit criteria)

The draft document makes recommendations for the training to be organized including the time frame in which they should be in practice. Starting with "By 2022, research organizations provide guidelines, practices and training in data management planning for students, researchers and staff."[59] The schedule for the recommendations will be reviewed again during the spring 2021.

The service providers, especially CSC and Finnish Social Science Data Archive provide help and instruction for the use of the services that support FAIR principles and good data management, for example the Fairdata services[60] and Data Service Portal Aila[61].

The main education and dissemination efforts for FAIR data are conducted at the individual higher education institutions level, especially at the universities. There the libraries have been major actors in providing assistance, help, and education for making FAIR data (e.g. University of Turku[62] and University of Eastern Finland[63].

At the present, the Finnish model is publicly funded and centralized services and the assistance and user education is done both by the service providers and locally in different types of academic and research institutions and there is an ongoing cooperation between these actors.

[57] https://avointiede.fi/en/policies/policies-open-science-and-research-finland
[58] https://avointiede.fi/en/news/draft-policy-component-open-access-research-data-now-open-comments
[59] https://avointiede.fi/en/news/draft-policy-component-open-access-research-data-now-open-comments
[60] https://www.fairdata.fi/en/
[61] https://www.fsd.tuni.fi/en/data/#data-service-portal-aila
[62] https://utuguides.fi/researchdata https://libguides.oulu.fi/Researchdata/FAIR_principle
[63] https://www.uef.fi/en/research-data-management

Latvia

The Latvian National Open Science Strategy will require that publications from state financed research projects must be published in Green or Gold Open Access and researchers will be trained on how to use Open Access platforms and tools. Researchers are already allowed to include article processing charges in the research project expenses and will be developed other incentives for researchers.
It is planned to support development of Research Data Management skills at the expert level, as well for "long tail" scientists. The International Open Access week workshop[64] Taming the Research Data wisely: a short introduction of how-to-do" was organized by the National Open Access Desk of Latvia on October 19, 2020. It is planned to develop a training programme for the Data Stewards. The Latvian National Library in collaboration with universities is planning to develop a training course on data management for librarians and researchers.
Additional resources will be planned for upgrading existing data repositories and research information systems to be compliant with FAIR principles.

[64] https://www.openaire.eu/blogs/workshops-on-research-data-management-gained-high-interest-among-different-stakeholders-in-latvia

Lithuania

The working group for open access to research data and the research group under the Lithuanian National Commission for UNESCO distributed their 'Request to the Lithuanian science and higher education institutions on open access to research data', in which they stated having noticed attempts in forming the open access policy, preparing provisions and recommendations for open access to university research papers and results, organising seminars for the science community and disseminating the information on open access and its benefits to the society. As the body of research data, research publications are tracked by the national digital databases. The corresponding maintainers of national systems organize seminars and even public challenges oriented to scientists to learn the benefits of open access to scientific data and learn the flow of information.

Norway

Training offerings for FAIR data in Norway are organised at institutional level and at the time of this writing there is no national coordination for training on FAIR data.

The UiT research data policy mandates UiT to provide guidance and support in the development of DMPs, using basic methods and service for processing, storing, as well as archiving and publishing of research data. Support is also given for defining licenses for access, reuse, and dissemination of the data, and establishing third party agreements and contracts if necessary. The UiO has established a portfolio of research data management courses and training aimed at different groups, organised by the University Library, the University Center for Information technology and Software Carpentry[65]community. Recently the UiO's Digital Scholarship Center (DSC[66]) was established to help researchers to take advantage of digital tools and methods in your research and assist you with navigating the university's complex digital ecosystem. The UiB offers regularly courses for making DMPs[67], while NSD is offering support for DMP[68] through a chat-channel. UNINETT Sigma2 is providing support to create DMP and customise DMP template to institutional/community specific data management policies in easyDMP[69].

[65] https://www.ub.uio.no/english/writing-publishing/dsc/carpentry-uio/index.html
[66] https://www.ub.uio.no/english/writing-publishing/dsc/index.html
[67] https://www.uib.no/en/ub/137940/introduction-data-management-plan-dmp
[68] https://www.nsd.no/en/create-a-data-management-plan
[69] https://easydmp.sigma2.no

Sweden

Training for and policies related to OS and making data FAIR are touched on in the VR report on criteria for FAIR criteria for research data. The report concludes that previous reports, authored by non-Swedish actors, highlights the need for training.[70] Furthermore, the Swedish national Data service (SND) provides overviews of the FAIR principles related to data.[71] Additionally, the SND Data Access Units (DAU), distributed across Swedish HEI:s in the SND consortium, provides some local support via staff, both domain experts and generalists.[72] Additionally, the 2020 Swedish research bill states that HEI libraries play a significant part in facilitating the transition towards open science via providing support and service.[73]

Lastly, individual Swedish HEI:s may offer training via internal organizations catering to both the specific HEI requirements, and national requirements, both policies, and organisational requirements, such as for SND, relating to support for FAIR. An example of HEI policies and training is the Uppsala University (UU) internal organization for FAIR, *"FAIRdriktning – Hantering av forskningsdata",* which aims to serve as a UU wide function, a data office to support research needs for knowledge of handling of research data, coordinate regarding offers for resources and be a system for management /handling of research data, as well as conveying knowledge regarding demands related to research data that various stakeholders have placed on UU.[74]

3.4. Policies for making other research objects FAIR

FAIR for other research objects has been identified by the FAIR in Practice Task Force of the European Open Science Cloud FAIR Working Group, as an area for which there is a need for further studies[75], as such an inventory of policies for FAIR for other research objects have been performed. The inventory is provided per inventoried country.

Participating representatives were asked to for their countries describe any policy/similar such as written guidelines, management policies et.al. relating to making other research objects, as software and methodology, FAIR. Documents in scope were documents /similar available via the organisations which are relevant for producing such for the specific national context such as funders, government agencies, ministries, research societies, and HEIs, but also national organisations providing application support, such as e-infrastructures.

[70] https://www.vr.se/download/18.ad27632166e0b1efab1cdc/1555322024158/Kriterier-FAIR-forskningsdata_VR_2018.pdf
[71] https://dhb.snd.gu.se/wiki/FAIR-principerna
[72] https://snd.gu.se/en/node/1312
[73] https://www.regeringen.se/4af915/contentassets/da8732af87a14b689658dadcfb2d3777/forskning-frihet-framtid--kunskap-och-innovation-for-sverige.pdf
[74] https://mp.uu.se/documents/432512/286809324/Projektdirektiv+UFV+2018-2313+FAIRdrikning+Forskningsdata.pdf/800e2215-b64f-4d5e-0864-43e9448d5f2c
[75] https://ec.europa.eu/info/sites/info/files/research_and_innovation/ki0120580enn.pdf

Denmark

In the Danish Data Management Strategy, it is clearly stated that methods and tools should be available, must enable proper data and documentation is collected and stored continuously. Licensing for reuse must be available as part of the metadata in either human- or machine-readable format. Technical platforms must make it possible to retrieve data in an open and standardised format and may not be hindered through the use of licences software.

Estonia

Software and codes have not been officially regulated in Estonia. In general, researchers involved in developing software or codes are required to use digital object licencing. Universities are in the process of developing regulations on both commercial and open usage of software and code. Copyright Act is implemented when it comes to rights of software and other digital objects.

Finland

In June 2019, the Finnish Government published its Programme titled "A participatory and knowledgeable Finland – a socially, economically and ecologically sustainable society"[76]. The country strives to achieve the best public administration in the world from a democratic as well as information management policy perspective. The Programme is to enhance the use of open-source software in public information systems and highlights open source, open data, and open interfaces. The use of open source software is promoted as a priority by public administrations.

This programme applies largely to all the public administrations, including 12 publicly funded research institutes attached to ministries in seven administrative sectors, but not to universities, which fall into different categories. However, the open-source software recommendations within the programme do not refer specifically to research, nor do they mention the obligation of being FAIR.

Although the majority of the higher education institutions, research institutes, funding agencies acknowledge the importance of open-source software as part of Open Science and provide information and even recommendations for using and making their software open source, very few provide a policy for that (FMI[77], CSC[78]).

It is clear that the adoption of policies and FAIR practices for software and other research objects in Finland lags behind open data and open access; still the number of software repositories and their content suggest that open software is a common routine among Finnish research community.

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[76] http://julkaisut.valtioneuvosto.fi/bitstream/handle/10024/161664/Inclusive%20and%20competent%20Finland_2019_WEB.pdf?sequence=7&isAllowed=y

[77] https://en.ilmatieteenlaitos.fi/open-source-code

[78] https://www.csc.fi/en/open-source-policy

Moreover, the fact that the software is associated with metadata and persistent identifiers shows that this kind of research output is findable, accessible, and reusable. In conclusion, the practice of opening software and methods is broadly enforced in the research culture but not regulated.

Latvia

Response from Latvia on these challenges will not be elaborated in detail and currently are not in focus. Open Science and Open Access principles will be based mainly on *OECD Principles and Guidelines for Access to Research Data from Public Funding*[79].

Lithuania

Software or digital libraries are a part of research data and have requirements to be published according to Open Access strategy. However, no specific policies are mentioned for computer code as it is partially regulated with the laws on intellectual properties.

Norway

At the time of this writing there isn't a national policy or guideline for making digital objects FAIR, although this might be possibly seen as one of the potential outcomes of the implementation of the action plan approved by the Digitalization Board (see above).

Mature communities such as for example the NorDataNet[80] within the climate community have de-facto already best practice regarding sharing and reusing digital objects. In 2019, The Norwegian Research Council has financed the BioMedData[81], a project focused on FAIR management and sharing of molecular life science data, and includes collaboration with 10 national data generating infrastructures, coordinated by ELIXIR Norway and the University of Bergen through its Computational Biology Unit.

Software is included in research data as largely defined in the UiT research data policy; cf. section 3: "Research data is defined as all registrations, notes, and reporting which are produced or arise in the course of research, and which are regarded as being of scientific interest and/or scientific potential. The format of these may include, but is not limited to, numbers, text, source code, photographs, films, and sound." Being part of the CodeRefinery project[82], UiT offers training for their students and employees to advance the FAIRness of software management and development practices. The UiO is also disseminating and promoting approaches for FAIRization of digital object by being part of the Code Refinery and hosting and supporting actively the Carpentry community[83].

Sweden

The Swedish Research Bill of 2016 stated that *research products* shall to the greatest extent possible make use of and fulfil the FAIR principles.[84] While not explicitly pointing to software, the scope of the

[79] https://www.oecd.org/sti/inno/38500813.pdf
[80] https://www.nordatanet.no/nb/taxonomy/term/18
[81] https://www.cbu.uib.no/new-funding-to-elixir-norway-on-fair-data-management/
[82] https://coderefinery.org/
[83] https://www.ub.uio.no/english/writing-publishing/dsc/carpentry-uio/index.html
[84] https://www.regeringen.se/4a4ba7/contentassets/4565007ced364a2ca2cb5e615585e592/nationell-fardplan-for-det-europeiska-forskningsomradet-20192020.pdf

policy document *" Nationell färdplan för det europeiska forskningsområdet 2019–2020"* in a broad manner addresses research[85] products[86] which includes among other aspects source codes and the research process Additionally, investigations performed by RDA-Sweden /SND shows that the national initiatives in Sweden are based on a ground-up perspective and are initiated by individual groups.[87] Lastly, the Swedish Research Bill of 2020 states that the shift to an open research system is a major undertaking which entails making as many of the research process phases and tools openly available via the internet. Open Science as a concept is reasoned to include, among other aspects, source code.[88]

[85] https://www.kb.se/samverkan-och-utveckling/oppen-tillgang-och-bibsamkonsortiet/oppen-tillgang/oppen-tillgang-i-eu.html
[86] https://www.regeringen.se/4a4ba7/contentassets/4565007ced364a2ca2cb5e615585e592/nationell-fardplan-for-det-europeiska-forskningsomradet-20192020.pdf
[87] https://snd.gu.se/sites/default/files/2020-09/RDA%20Sweden%20webinar%202020-09-25.pdf
[88] https://www.regeringen.se/4af915/contentassets/da8732af87a14b689658dadcfb2d3777/forskning-frihet-framtid--kunskap-och-innovation-for-sverige.pdf

3.5. Summary /analysis

This section summarizes Chapter 3 and describes similarities and differences for the countries inventoried.

Table 1: Summary /analysis

	Incentives for FAIR			OS TRAINING			SOFTWARE		
	YES	NO	DRAFT	YES	NO	DRAFT	YES	NO	DRAFT
Denmark	N			A	N		N		
Estonia		N		A	N			N	
FInland			N	A		N		N	
Latvia		N				N		N	
Lithuania	N			A	N			N	
Norway		N		A	N			N	
Sweden	N			A/M				N	

Note: N= National level policy A= University/institution/service provider level activity M= mentioned in policy/report at national level

3.5.1. Policy implemented incentives for FAIR

As summarized in Table 1, a similarity between the countries inventoried is that there are national policies, or draft policies, or laws, which can be considered as policy implemented incentives for FAIR in both Denmark, Estonia, Finland, Lithuania, and Sweden.
A difference is that different approaches have been taken by the countries inventoried. Law is used as a regulatory tool in Lithuania, while policy is utilized as a regulatory tool in Finland, Denmark and Sweden. Policies may be authored by different organisations, both those with national mandates, such as ministries and funders, and organisations with a subnational mandate, such as HEIs. This also illustrates that different stakeholders are involved in the countries inventoried, ranging from ministries, and funders to HEIs and libraries.

Related to EOSC, the EOSC FAIR Working group has stated[89] that a balance of penalties and rewards is needed for optimum impact for implementing FAIR practices. Policy requirements and the consequence of not being able to get funding without complying can be seen as penalties and should not be the only motivation to implement FAIR. Rewards for data sharing should also be in place. *"Reward and recognise improvements of FAIR practice" [recommendation 5 in Six Recommendations for Implementation of FAIR*

[89] https://op.europa.eu/en/publication-detail/-/publication/4630fa57-1348-11eb-9a54-01aa75ed71a1/language-en/format-PDF/source-166584930

Practice]. [90]It is expected that the academic reward is in balance with the effort made in sharing the data.

3.5.2. Policies for OS training / training for making data FAIR

As summarized in Table 1, a similarity is that policies for OS training, or policies that involve OS training, are very few at national level. In Sweden it is mentioned at national level and in Finland and Latvia there is awareness of the importance of OS training, and national drafts include provisions for this. Furthermore, a similarity is that training is provided HEIs in a majority of countries inventoried, and by e-infrastructures in some countries. In many countries there are policies at the subnational level.

Related to EOSC, based on an analysis of the data policy landscape in 2019[91], FAIRsFAIR has prepared a series of practical recommendations for policy enhancement to support the realisation of a FAIR ecosystem.[92] First recommendation mentioned "*Provide practical guidance to researchers and data stewards on how to implement FAIR within different domains"* and goes on with *"Commitments are needed from all stakeholders to support and meet training needs relating to Open Science".*

3.5.3. Policies for making other research objects, as Software and Methodology, FAIR

As summarized in Table 1, a similarity between the countries is that a majority of countries inventoried do not have policies in place for making other research objects, software or methodologies FAIR. A conclusion for this specific item, as also has been highlighted by FAIRsFAIR Synchronisation Force[93] is that making other research objects FAIR is an area in need of development in the Nordic and Baltic region.

Related to EOSC, in the original FAIR principles paper *"The FAIR Guiding Principles for scientific data management and stewardship"*[94], the authors state that the FAIR principles apply not only to 'data' in the conventional sense, but also to the algorithms, tools, and workflows that led to that data. All scholarly digital research objects benefit from application of these principles, since all components of the research process must be available to ensure transparency, reproducibility, and reusability.

As reported in the Second Report of the FAIRsFAIR Synchronisation Force[95] "The way in which FAIR is applied to software, and the development of any related guidelines and metrics, needs further work and clear recommendations."

[90] https://op.europa.eu/en/publication-detail/-/publication/4630fa57-1348-11eb-9a54-01aa75ed71a1/language-en/format-PDF/source-166584930
[91] https://zenodo.org/record/3558173#.YB1Pn3mxU2w
[92] https://zenodo.org/record/3686901#.YBwU-nmxU2w (s 7)
[93] https://doi.org/10.5281/ZENODO.3953979
[94] https://www.nature.com/articles/sdata201618
[95] https://doi.org/10.5281/ZENODO.3953979

Recommendation number 4, in Six Recommendations for Implementation of FAIR Practice[96] by EOSC FAIR Working group is stated as "Translate FAIR guidelines for other digital objects." According to the document, it is clear that adoption of FAIR practice for other research objects lags behind research data, and that both funder and publisher mandates will have a key role in improving FAIR practice. The group has identified an important measure related to this would be a requirement to share code as a prerequisite for publication.

The EOSC RoP makes the case that the EOSC FAIR principles shall apply to *"Individual research objects, such as datasets, publications, software, etc., or repositories of research objects,"*[97] as such both having policies in place, and providing training will be important in facilitating this aim.

4. Resource provisioning policies

4.1. Policy facilitation of cross border research

The previous deliverable, D 2.1, provided an overview of the state of resource provisioning policies, focusing on High Performance Computing (HPC), in the Nordic and Baltic region.
The group of writers for this deliverable involves stakeholders in the form of personnel from e-infrastructure providers, and personnel working with resource provisioning policies in the Nordic and Baltic countries. These authors have chosen to focus on facilitation of cross border research, such as resource provisioning policies. This due to that the facilitation of the aims of EOSC, such as defined in the EOSC Rules of Participation[98], entails facilitation of cross border research.

The inventory is provided per country. Participating representatives were asked to for their countries describe any policy/similar such as written guidelines, management policies et.al. relating to facilitation of cross border research. Documents in scope were documents /similar available via the organisations which are relevant for producing such for the specific national context such as funders, government agencies, ministries, research societies, and e-infrastructure providers.

Denmark

Access to nationally funded RI is in general terms open to scientists who are employed by Danish research institutions, including foreign nationals. This is a grant requirement for any project funded through the Danish Research Infrastructure Pot under the Ministry of Science and Education. Most grants are dependent on substantial co-fund from the consortium that applies for funding. No single

[96] https://op.europa.eu/en/publication-detail/-/publication/4630fa57-1348-11eb-9a54-01aa75ed71a1/language-en/format-PDF/source-166584930
[97] EOSC rules of participation - Publications Office of the EU (europa.eu)
[98] https://op.europa.eu/en/publication-detail/-/publication/a96d6233-554e-11eb-b59f-01aa75ed71a1/language-en/format-PDF/source-184432576

institution can apply. In order to be defined as national RI, at least two and preferably more institutions must be part of the consortia. On the other hand, no researcher from a Danish institution can be denied access to national RI, regardless of whether or not that researcher's institution is part of the consortium. However, in many cases, access to resources for researchers outside the consortium may be subject to direct pay-per-use cost recovery schemes, or limitations in terms of access to consumable services.

There is no one-size-fits-all model for cost recovery. The actual business model applied depends a lot on the nature of the RI, the width of the user base and the financial burdens and risks incurred by the host institution(s). In many cases the consortium is motivated to recover costs, by offering services to scientists outside the consortium and in some cases also offering services to industry. When that is the case, the RI tends not to discriminate between Danish and foreign users. This also tends to be the case when a single University gets a grant from a private funder to install and operate large scale RI. Usually there will be mechanisms in place to ensure that not only users from the host institution can get access.

On the other hand, if a consortium exists that includes all Danish universities, access for users not affiliated with a Danish institution tends to be much more restricted. An all-encompassing consortium tends to be quite specific on who gets access, opting in most cases to allow users (from consortium members) free access only limited by the RI's capacity. Since all consortium members wish to maximize the return on their investment, any outside access may be considered a loss of resources - particularly if resources are split into parts equivalent to the individual institution's share of the cost. This very tight resource management tends to be more present with horizontal IT services than field-specific RI. With field-specific RI, in a small country as Denmark, the key stakeholders tend to know and trust one another - and are able to carve out a reasonable consortium agreement with flexible access arrangements. With generic e-infra this does not exist to the same degree, and the concern seems more that a host institution will be in a position to increase skills and competences - or with database infrastructure to be in a position to provide access to interesting collaborators - and thereby attract outside users for scientific collaboration, at the expense of the other consortium members. In those cases, the consortium agreement is very specific about access and service protocol and typically specify that only Danish scientists can be granted access. In most cases this does not prohibit an international project to get access to resources, but only through a Danish PI - to the extent possible, to create a level playing field between the institutions as to cross-border cooperation.

Estonia

According to Estonian Research Council Development Plan 2027 (ETAG), their mission is supporting international research cooperation.[99] ETAG advises and trains researchers, entrepreneurs and other interested parties, and creates opportunities for participating in international research cooperation. In cooperation with ministries, ETAG selects the partnership programmes and research infrastructures that

[99] https://www.etag.ee/wp-content/uploads/2021/01/ETAG-arengukava-2027_eng.pdf

support Estonian researchers' participation, among others ETAG is promoting research cooperation with the Baltic and Nordic countries.
The objective of the 'Estonian Research International Marketing Strategy 2016-2022' is to contribute towards the execution of the 'Estonia is active and visible in terms of international RDI cooperation' sub-objective of the Estonian Research and Development and Innovation Strategy 2014-2020, 'A knowledge-based Estonia' (hereinafter referred to as the RDI strategy). One of the goals of the Marketing strategy is to increase international knowledge of available opportunities in Estonia in terms of open cooperation and research infrastructure.[100]
Most Estonian Research institutions have various international collaboration projects and many nationally important research infrastructure units of the Estonian Research Infrastructures Roadmap are connected to the European Strategy Forum on Research Infrastructures (ESFRI) and other international research infrastructures. [101]
In February, 2020, Estonian Research Council signed the agreement for Estonia to join the Nordic e-Infrastructure Collaboration NeIC, which gives Estonian research infrastructures the possibility to maintain and enhance their competitiveness and do more international cooperation.
In general, access to national and research infrastructure is available for Estonian researchers or foreigners who are working in Estonia. At the end of 2020, UT submitted an application to join EOSC Association which will facilitate international cooperation further.

Finland

The Declaration for Open Science and Research (Finland) 2020 – 2025[102] does not mention facilitating the cross-border research.

The Finnish research community is drafting policies to support the vision and the mission of the Declaration. In the draft policy document of Open access of research data and methods the cross-border research is not mentioned[103].

The Academy of Finland published in January 2020 a Strategy for national research infrastructures in Finland for the years 2020-2030. The objective of the strategy is to promote the quality, competitiveness and renewal of research, to strengthen the broad-based impact of research environments and to increase national and international cooperation[104]. The strategy was drawn up by the Finnish Research Infrastructure Committee and adopted by the Board of the Academy.

[100] Teadusagentuur_dokument_eng.pdf (etag.ee)
[101] https://www.etag.ee/en/funding/infrastructure-funding/estonian-research-infrastructures-roadmap/
[102] https://avointiede.fi/en/policies/declaration-open-science-and-research-2020-2025
[103] https://avointiede.fi/en/news/draft-policy-component-open-access-research-data-now-open-comments
[104] https://www.aka.fi/globalassets/1-tutkimusrahoitus/4-ohjelmat-ja-muut-rahoitusmuodot/4-tutkimusinfrastruktuurit/aka_tik_strategia_2019_en_digi_a.pdf

Many Higher Education Institutions and Research Organisations have international collaboration embedded in their strategy (e.g. University of Helsinki strategy plan[105]).

The right to use national services like (CSC) services is based on users´ affiliation to a Finnish higher education or research institution[106]. For using these services, the researcher usually needs a project and user accounts. For the cross border collaboration, this means, a Finnish partner and a joint project from a Finnish university apply for a user account. Only the Finnish researcher can be granted access. This is also the case if the Finnish researcher wants to use Nordic capacity in a joint project.

Nowadays commercial tools like google docs and google drive are often used in international projects as they are easy to use and do not require any affiliation to Universities for accessing the services. However, the commercial services do not guarantee data protection nor sustainability. Therefore, the policy of availability and usability of national services also for international partners in a controlled manner should be taken into consideration. In this context, the issue of costs and data protection needs to be resolved.

Latvia

Latvia claims to be open for any developments broadening international cross-border collaboration and looking forward to international commonly agreed initiatives and rules. Latvia is involved in ESFRI projects, Horizon Europe programme (2021-2027) and European Partnerships. Latvia has joined EuroHPC, Euroatom and is planning to join the EOSC Association. Support for international cross-border collaboration in research is based on Regulation No. 259[107]

[105] https://www.helsinki.fi/en/university/strategic-plan-2021-2030
[106] https://research.csc.fi/free-of-charge-use-cases
[107] https://likumi.lv/ta/id/274671-atbalsta-pieskirsanas-kartiba-dalibai-starptautiskas-sadarbibas-programmas-petniecibas-un-tehnologiju-joma

Lithuania

The research Council of Lithuania does not directly define policies for an international body or cross border collaborators. From the Law of Science and Studies article 45 it is obvious that international collaborators and bodies participating in state funded projects have the obligation to sign cross border and/or cross-organisational joint venture agreements with the very specific clause regarding publication and the ownership of intellectual property. In many cases it is regulated by the signing parties / organisations.
A very important question for the Lithuania research community is to be able to identify metrics for research impact evaluation in Open Access journals and venues. Currently used commercial sources for research impact evaluation, i.e. Clarivate™ Web of Science, are not incentifying enough research publishing in Open Access journals as it is directly implicating the level of employment at research organisations.

Norway

From the new *National Strategy on access to and sharing of research data:* "The infra-structure in place must lay a foundation for cooperation and knowledge-sharing that extends across countries and sectors. It should be easy for international researchers to find Norwegian data sets." This should happen through the adoption of internationally recognised standards and services. The Strategy also invites the Norwegian Council of Research to continue supporting international collaboration through adequate financing programs.

Norwegian investment and participation in the EOSC and Join Undertaking EuroHPC initiatives is aiming at facilitating international collaboration, through common services for storage, computing and sharing data. Norway is also actively supporting the NEIC – the Nordic e-Infrastructure Collaboration, promoting project such as CodeRefinary.

Sweden

Via the 2020 Swedish Research Bill select research infrastructures are allocated additional funding. Facilitation of cross-border research is mentioned in the context that research infrastructure may increase international collaboration via facilitating contacts with researchers from beyond Sweden.[108] Internationalization is touched upon in the sense that increased funding of national research

[108] https://www.regeringen.se/4af915/contentassets/da8732af87a14b689658dadcfb2d3777/forskning-frihet-framtid--kunskap-och-innovation-for-sverige.pdf

infrastructures may facilitate increased quality of Swedish research, and as such contribute to internationalization.[109]

While not a policy, in a referral regarding internationalization of research VR argues that research is dependent on access to RI:s, and that internationalisation of RI:s is a cost-efficient way to finance, and to facilitate synergies, which a single country does not have the ability to provide and operate. RI:s are viewed as international collaborations, as a consequence of the aim to build international collaboration, which as a consequence facilitates international research collaborations. This applies to some national RI:s, as some national RI:s promote international collaborations, such as MAX IV[110] which is available to international researchers from its member institutions outside of Sweden.[111] Lastly, Swedish research infrastructure, and e-infrastructure, financed by VR, is bound by a set of common boundary conditions. These entail to be openly accessible primarily to researchers, industry and other relevant actors operating in Sweden.[112]

[109] https://www.regeringen.se/4af915/contentassets/da8732af87a14b689658dadcfb2d3777/forskning-frihet-framtid--kunskap-och-innovation-for-sverige.pdf
[110] https://www.vr.se/download/18.514d156f1639984ae07b29d8/1529480527308/En%20strategisk%20agenda%20f%C3%B6r%20internationalisering.%20Delbet%C3%A4nkande%20av%20Utredningen%20om%20%C3%B6kad%20internationalisering%20av%20universitet%20och%20h%C3%B6gskolor
[111] MAX_IV_General_Terms_and_conditions_for_Open_User_Access_2020.pdf
[112] https://www.vr.se/english/mandates/research-infrastructure/what-is-research-infrastructure.html

4.2. Summary /analysis

This section summarizes chapter 4 and describes similarities and differences for the countries inventoried.

Table 2: Facilitation of cross-border research

Country	**Policy facilitating of cross-border research**
Denmark	Policy does not consider facilitation of cross border research
Estonia	Policy does consider facilitation of cross border research
Finland	National policies do not mention facilitating the cross-border research, most of organisational strategies do
Latvia	Policy does consider facilitation of cross border research
Lithuania	Policy does not consider facilitation of cross border research
Norway	Policy does consider facilitation of cross border research
Sweden	Policy does not consider facilitation of cross border research

As summarized in Table 2, the inventory shows that three of the countries inventoried have policies that mentions facilitation of cross border research. The remainder of the inventoried countries have national policies which focus on researchers with national affiliation access to services. The findings are consistent with the findings in the deliverable D 2.1. which showed that focus in policies f is academic usage for users with national affiliations. A conclusion is, that in the Nordic and Baltic region, facilitation of cross border research is not a focus in policies, rather, policies have a national scope. Regarding facilitation of cross border research outputs from EOSC, such as the EOSC Rules of Participation, it is worth noting the fact that in general policies in place in the Baltic and Nordic region do not focus on openness as the EOSC RoP, but rather concentrate on national service provisioning.

5. Roadmap with EOSC perspective

5.1. Roadmap related to Open Science / FAIR

This section sets the findings of this deliverable into an EOSC perspective. This is done via relating the findings to EOSC policies and recommendations.

In 2015, the Commission proposed to the Competitiveness Council creating an European Open Science Cloud[113]. The aim was to develop a trusted, virtual, federated environment that cuts across borders and scientific disciplines to store, share, process and re-use research digital objects (like publications, data, and software) following the FAIR principles[114].

In this document, we have focused on investigating how FAIR related issues (incentives for FAIR, OS/FAIR training, making other digital objects FAIR) have been considered on the policy level in the Baltic and Nordic region. Because the goal for EOSC is also a federated environment that cuts across borders and scientific disciplines, we concentrated on investigating how cross border research is facilitated through policies in Baltic and Nordic region.

Regarding the policy implemented incentives for FAIR, our investigation shows that there are national policies, or draft policies, or laws, which can be considered as policy implemented incentives for FAIR in many inventoried countries. Policies may be authored by different organisations, both those with national mandates, such as ministries, and organisations with a subnational mandate, such as HEIs. EOSC FAIR Working group has stated[115] that a balance of penalties and rewards is needed for optimum impact for implementing FAIR practices. Attention should still be paid to the development of incentives for FAIR implementation in both national and subnational levels and on how to create incentives for researchers for sharing their research data.

Our study shows that there is awareness of the importance of OS training / training for making data FAIR in many inventoried countries. There are either national policies in place or taking the form of the draft policy in almost every country. Furthermore, there are policies at the subnational level and training is organized by HEIs or e-infras. First recommendation of FAIRsFAIR practical recommendations for policy enhancement to support the realisation of a FAIR ecosystem[116] goes "*Provide practical guidance to researchers and data stewards on how to implement FAIR within different domains" and goes on with "Commitments are needed from all stakeholders to support and meet training needs relating to Open Science".* Our working group sees the need to further develop and harmonize policies for the provision of training in order to increase the skills and knowledge to store, share, process and re-use research digital objects following the FAIR principles.

Most countries inventoried do not have policies in place for making other research objects, incl. software and methodology, FAIR. A conclusion for this specific item, as has also been highlighted by other reports, is that making other research objects FAIR is an area in need of focus in order to ensure transparency, reproducibility, and reusability of research[117].

[113] https://ec.europa.eu/info/research-and-innovation/strategy/goals-research-and-innovation-policy/open-science/european-open-science-cloud-eosc_en
[114] https://www.nature.com/articles/sdata201618
[115] https://op.europa.eu/en/publication-detail/-/publication/4630fa57-1348-11eb-9a54-01aa75ed71a1/language-en/format-PDF/source-166584930
[116] https://zenodo.org/record/3686901#.YCJH9XmxXb1
[117] https://www.nature.com/articles/sdata201618

5.2 Roadmap related to facilitating the cross-border research

EOSC-hub Briefing Paper – Provision of Cross-Border Services – describes challenges involved in provision of publicly funded rivalrous resources across borders in Europe.[118] The paper states that the European research landscape is very fragmented with a large number of actors involved, often providing or consuming services within the boundaries of their thematic areas and national borders. *"The majority of research funding in Europe is provided nationally. Funding sources are varied, complex and involve a large number of different rules, which contributes to suboptimal use of member states' investment in research services, particularly in cases of cross-border service usage. Research use cases could be aided by providing "choreography" of national and European funding schemes and eligibility criteria across borders."*

As our study shows, cross-border research is not yet considered in policies in the Baltic and Nordic region. According to EOSC-hub briefing paper[119] providing special funding schemes and eligibility criteria across borders, could be of help when facing for example cost issues to be solved when using services across borders. Also, the issue of data protection should be solved. As such, there are not only the policies that are lacking, but also the issues of costs and data protection to be aided and solved to move forward with cross border research.

The EOSC-Nordic study Restrictive Policies a Barrier to Cross-Border Open Science – Open Science in the Nordics: Legal Insights[120] finds that in many situations, in many cases, legislation is not a barrier to cross-border data sharing for research.

Lastly, outputs from EOSC, such as the EOSC Rules of Participation, states that *"The principle of openness is central to EOSC. EOSC is as open as possible, and only as closed as necessary. This applies to users, resources, and the RoP themselves."* As such, as previously mentioned, it is worth noting that, in general, policies in place in the Baltic and Nordic region do not focus on openness, but rather concentrate on national service provisioning. As such, a conclusion is that should EOSC involve both consumable service and access to data[121] awareness via dialogue on national level is needed to facilitate understanding of the aims of EOSC among a wider audience.

[118] https://www.eosc-hub.eu/sites/default/files/EOSC-hub%20Briefing%20Paper%20-%20Provision%20of%20Cross-Border%20Services%20-%20final_0.pdf
[119] https://www.eosc-hub.eu/sites/default/files/EOSC-hub%20Briefing%20Paper%20-%20Provision%20of%20Cross-Border%20Services%20-%20final_0.pdf
[120] https://www.eosc-nordic.eu/kh-material/deliverable-2-3-open-science-in-the-nordics-legal-insights/
[121] https://repository.eoscsecretariat.eu/index.php/s/5o9fgqwN4eKoZ9n

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List of abbreviations

CSC	IT Center for Science
CoC	Code of Conduct on Research Integrity,
DAU	Data Access Units
DMP	Data Management Plan
DSC	Digital Scholarship Center
DeiC	Danish e-Infrastructure Cooperation
ETAIS	Estonian Scientific Computing Infrastructure
ETIS	Estonian Research Information System
EOSC	European Open Science Cloud
ESFRI	The European Strategy Forum on Research Infrastructures
EU	European Union (EU)
EUROHPC	The European High-Performance Computing Joint Undertaking
FAIR	Findable, Accessible, Interoperable, Reusable
FMI	Finnish Meteorological institute
FSD	Finnish Social Science Data Archive
GDPR	General Data Protection Regulation
HEI:s	Higher education institutions
IZM	Latvian Ministry of Education and Science
KB	National Library of Sweden
LU	University of Latvia
NeIC	Nordic e-Infrastructure Collaboration
NTNU	The Norwegian University of Science and Technology
NSD	Norwegian center for Research Data
OS	Open Science
RCN	Research Council of Norway
RTU	Riga Technical University
RoP	EOSC Rules Of Participation
SDU	University of Southern Denmark
SNIC	Swedish National infrastructure for computing
SND	Swedish National Dataservice
TENK	Finnish National Board on Research Integrity
UEF	University of Eastern Finland
UT	University of Tartu
UNIT	Norwegian Directorate for ICT and Joint Services in Higher Education & Research
UIO	University of Oslo
VR	Swedish Research Council

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