European Open Science Cloud: the road ahead

Karel Luyben
President EOSC Association

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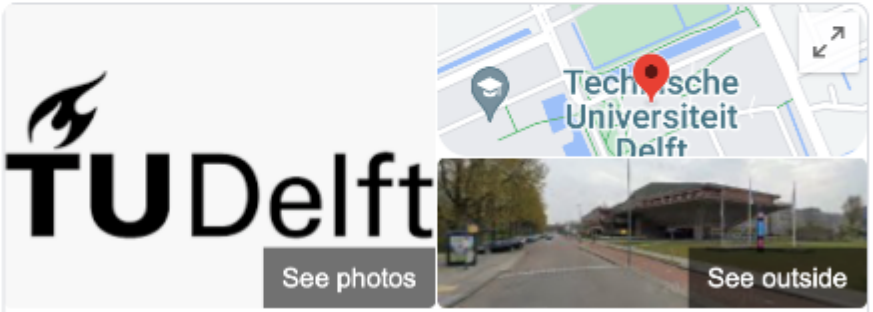

Delft University of Technology (TU Delft)

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Research institution in Delft, Netherlands

Delft University of Technology, also known as TU Delft, is the oldest and largest Dutch public technical university, located in Delft, Netherlands. As of 2022 it is ranked by QS World University Rankings among the top 10 engineering and technology universities in the world. Wikipedia

Address: Mekelweg 5, 2628 CD Delft, Netherlands

Phone: +31 15 278 9111

Undergraduate tuition and fees: 2,060 EUR, International tuition 10,384 EUR (2018 – 19)

Total enrollment: 24,703 (2018)

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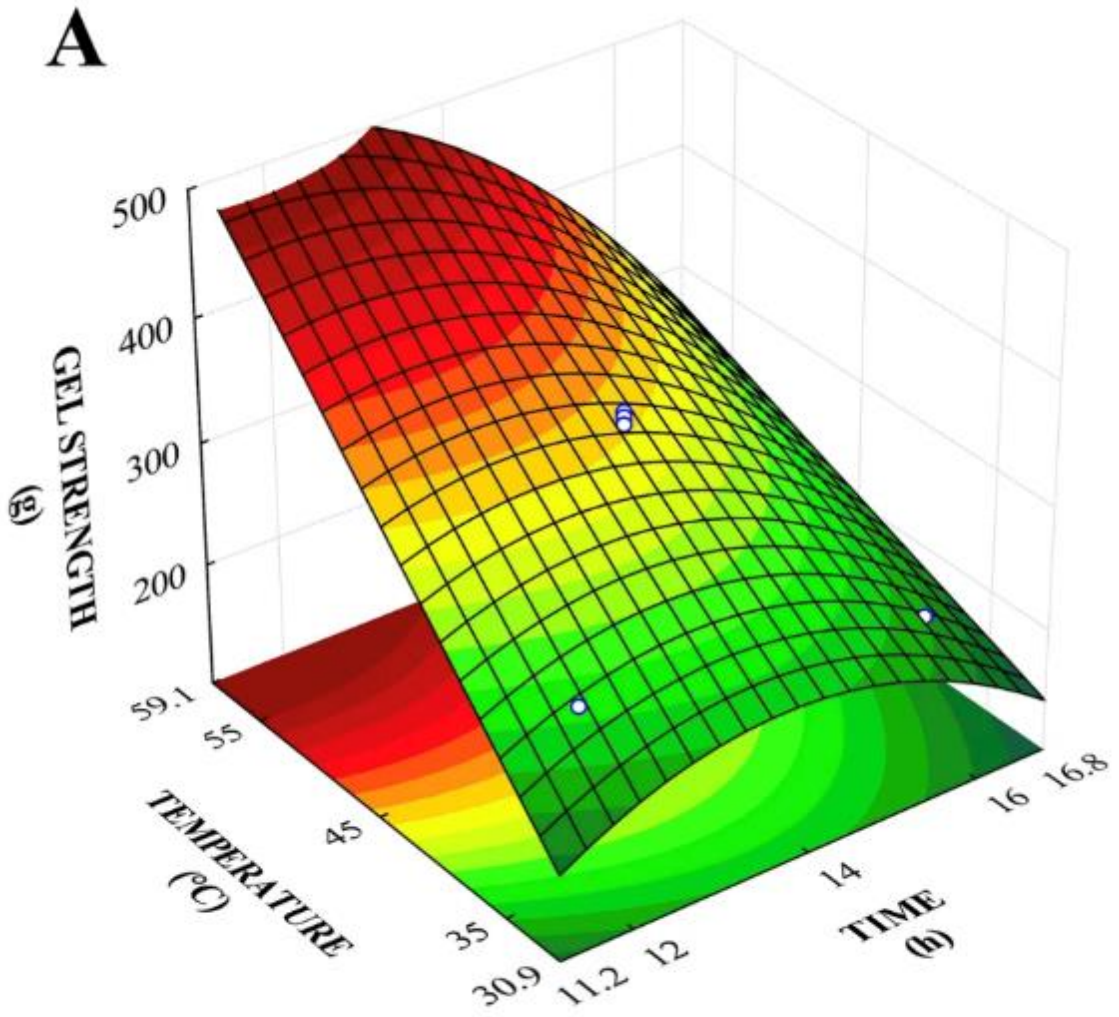

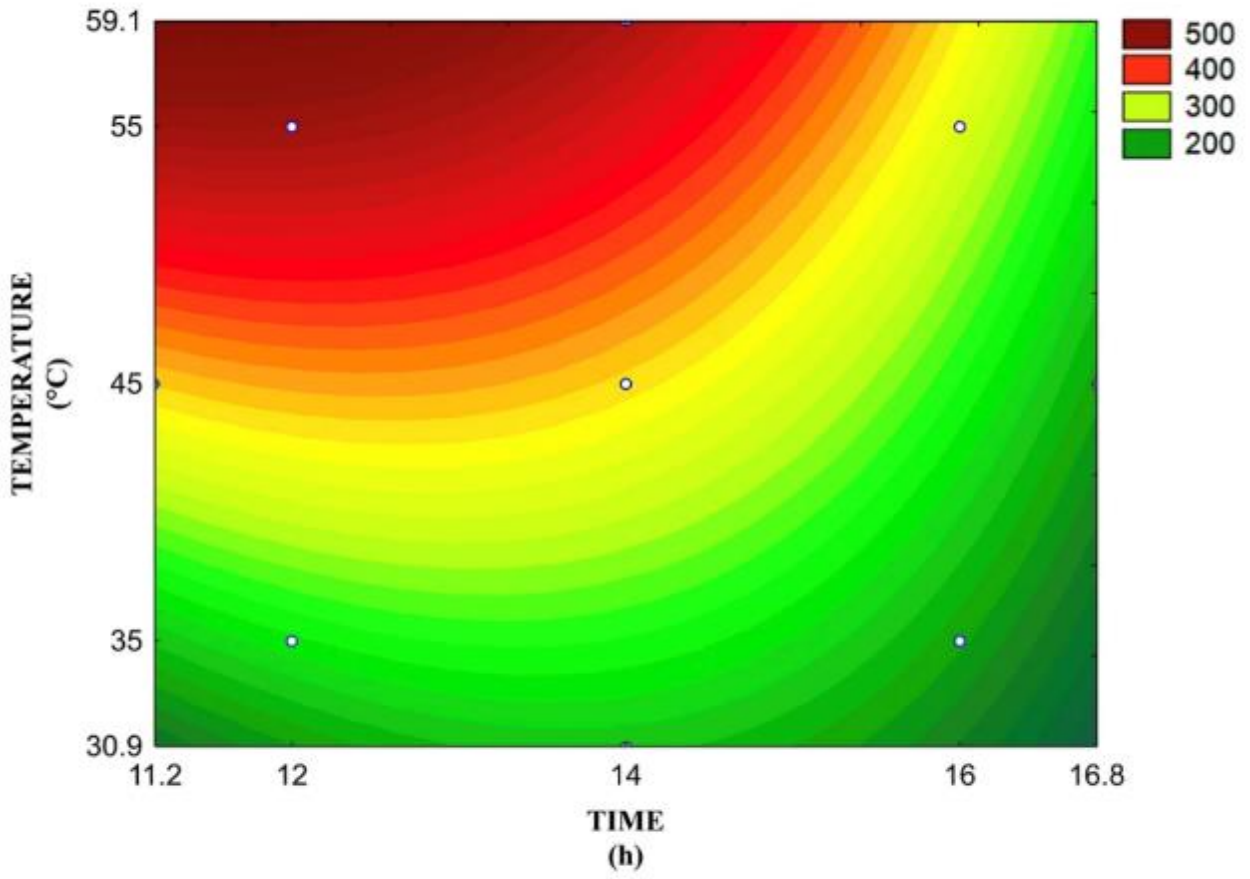

Wouldn't it be great if we all could find a relevant dataset for our work as easy through the 'Web of FAIR data' as we can find many things through an adequate search engine?

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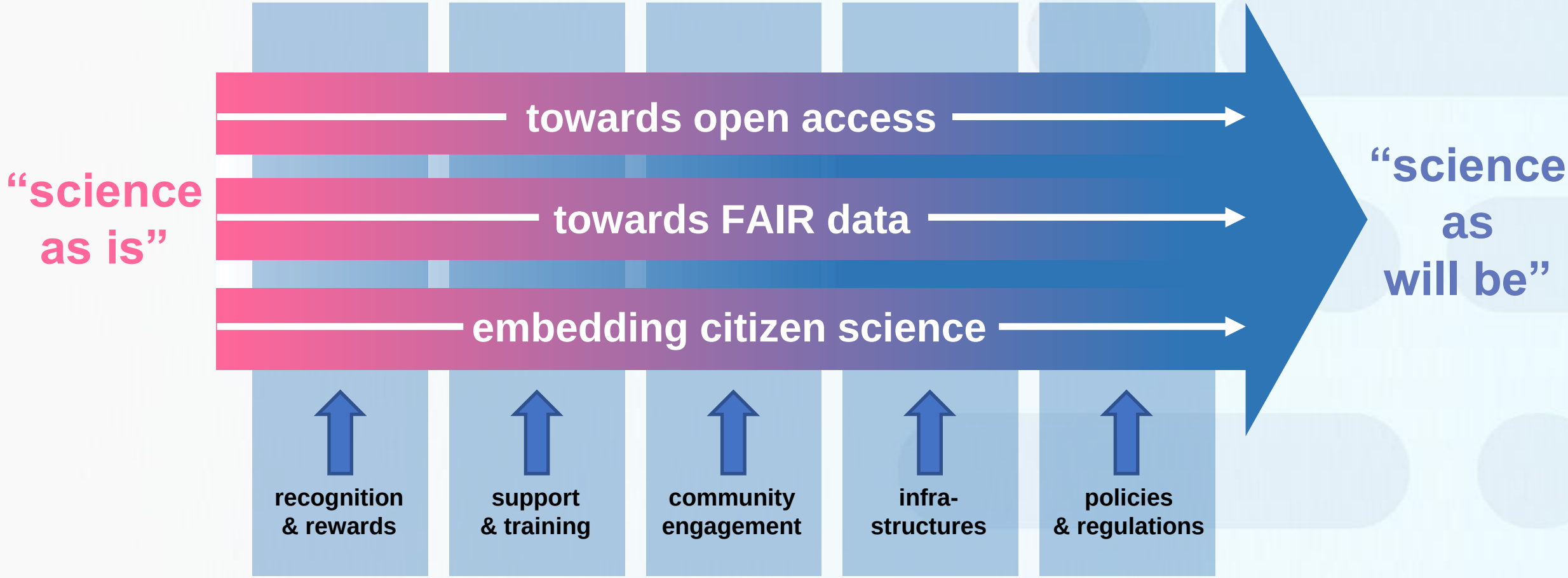
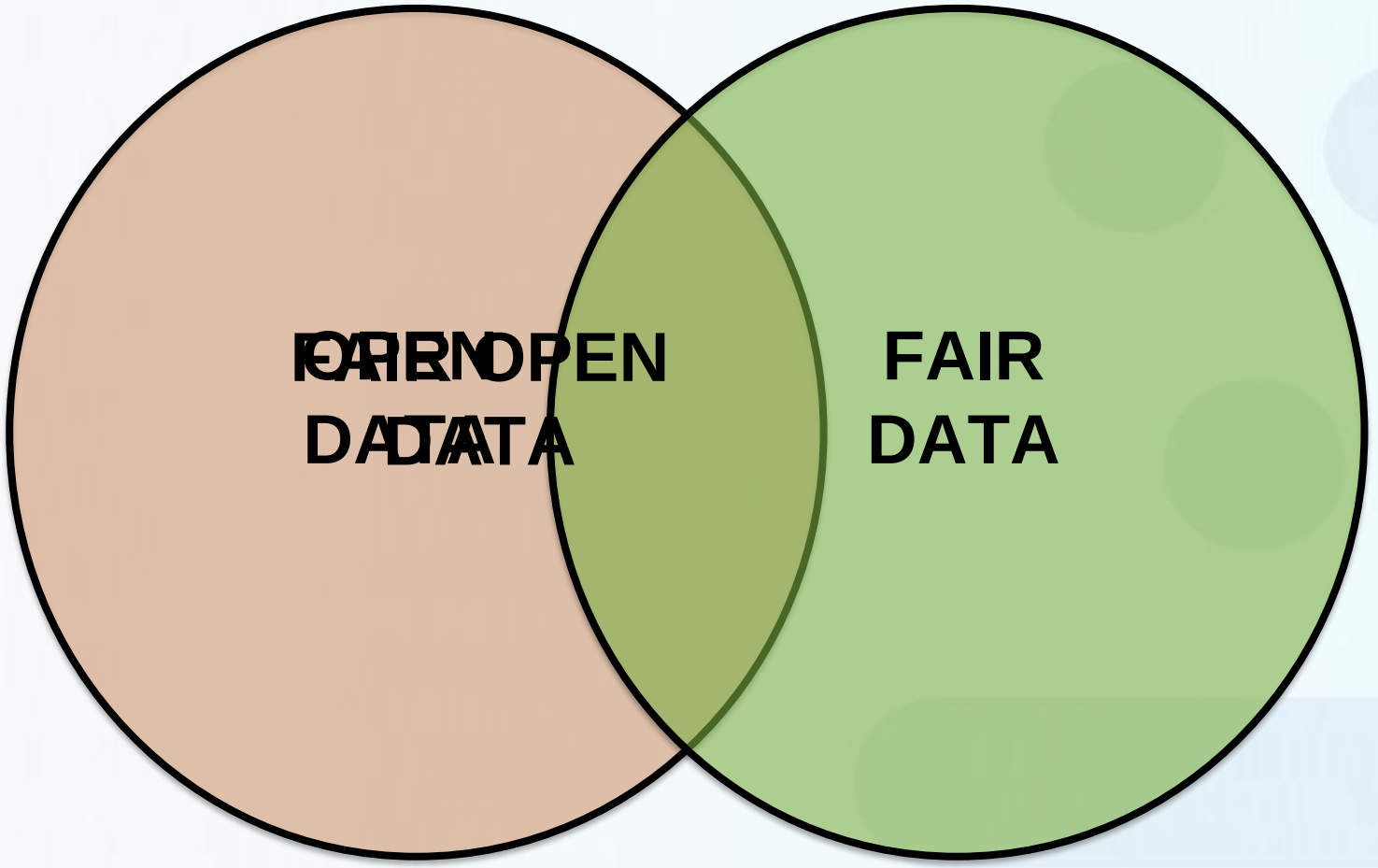
Open Science



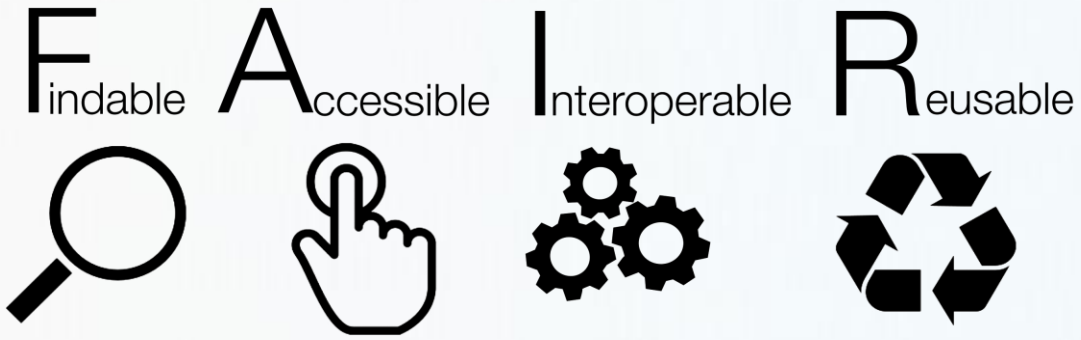
OPEN DATA and/or FAIR DATA



FAIR ≡
Findable
Accessible
Interoperable
Reusable

Towards “as FAIR as possible” and “as open as possible”

What is FAIR?



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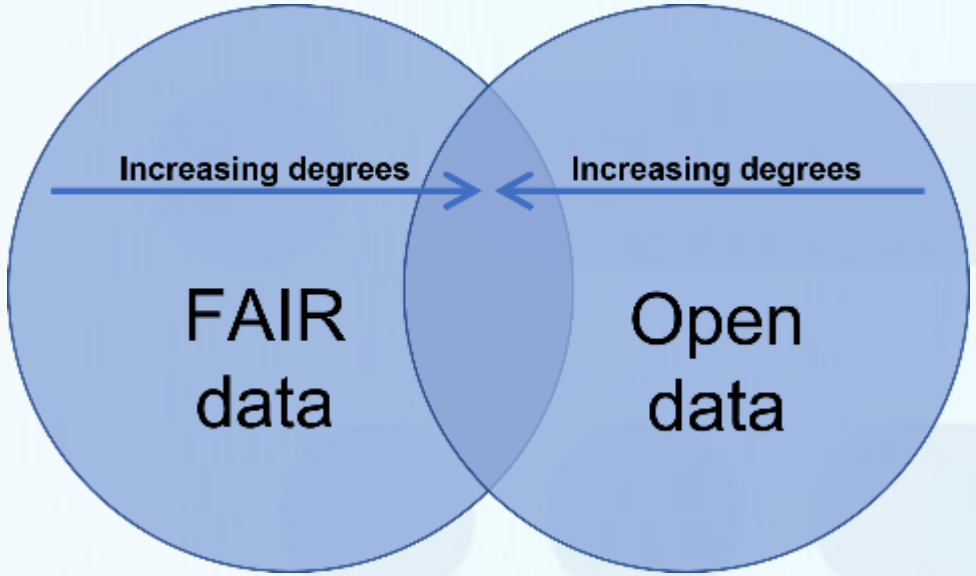

Image CC-BY by European Commission FAIR data expert group

- **FAIR ≠ Open**
- **FAIR ensures data can be found, understood and reused**
- **Data can be shared under restrictions & still be FAIR**

"As open as possible, as restricted as necessary"

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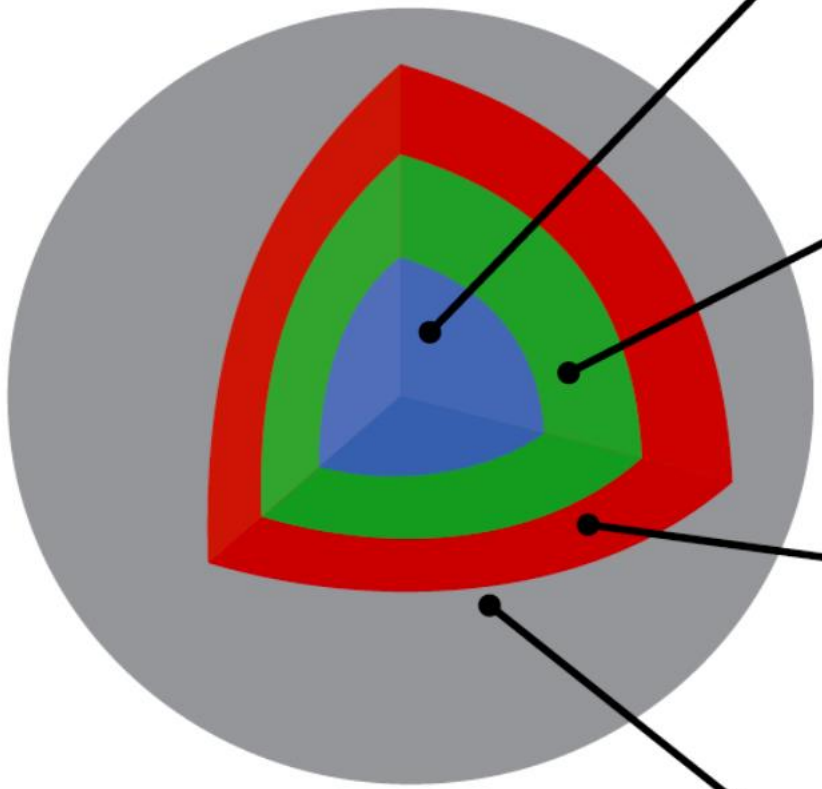

DIGITAL OBJECT

Data, code and other research outputs

At its most basic level, data or code is a bitstream or binary sequence. For this to have meaning and to be FAIR, it needs to be represented in standard formats and be accompanied by Persistent Identifiers (PIDs), metadata and documentation. These layers of meaning enrich the object and enable reuse.

IDENTIFIERS

Persistent and unique (PIDs)

Digital Objects should be assigned a unique and persistent identifier such as a DOI or URN. This enables stable links to the object and supports citation and reuse to be tracked. Identifiers should also be applied to other related concepts such as the data authors (ORCIDs), projects (RAIDs), funders and associated research resources (RRIDs).

STANDARDS & CODE

Open, documented formats

Digital Objects should be represented in common and ideally open file formats. This enables others to reuse them as the format is in widespread use and software is available to read the files. Open and well-documented formats are easier to preserve. Data also need to be accompanied by the code use to process and analyse the data.

METADATA

Contextual documentation

In order for Digital Objects to be assessable and reusable, they should be accompanied by sufficient metadata and documentation. Basic metadata will enable data discovery, but much richer information and provenance is required to understand how, why, when and by whom the objects were created. To enable the broadest reuse, they should be accompanied by a plurality of relevant attributes and a clear and accessible usage license.

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The Vision

Building the EOSC ecosystem collaboratively with all stakeholders through the EOSC Partnership

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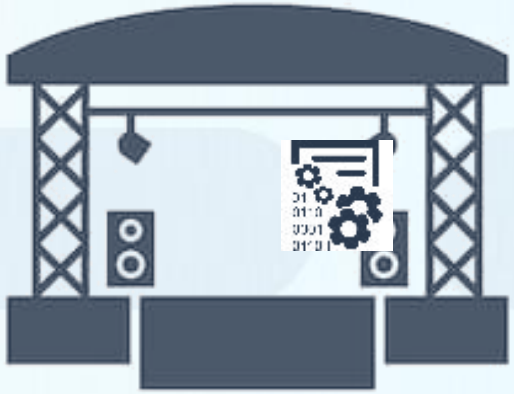
"A web of scientific insight"

- Web of FAIR Data and related Services
- Federation of relevant existing and future data sources
- Virtual space where science producers and consumers come together
- An open-ended range of content and services
- Meeting all European data requirements
- In interaction with other regions of the world



Twinning the data- to the e-infrastructures

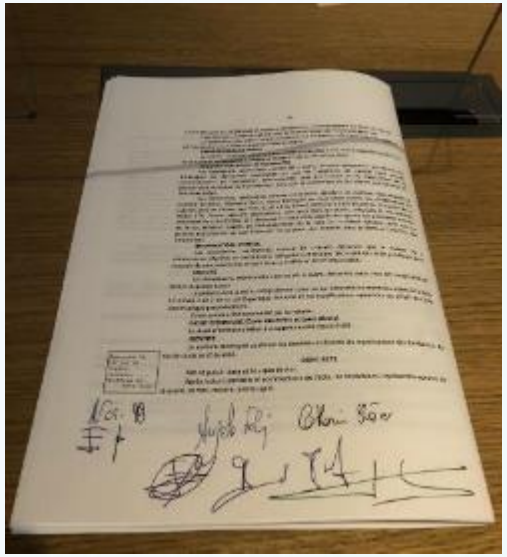
EOSC is a data-infrastructure and could be seen as a twin sister (or brother) of the European e-infra-structure organi-sations (yin/yang). The last offering the store, compute and connect services used by EOSC to offer the servicing of data and creating interoperability. The combination forms the EOSC-ecosystem

Guiding principles for EOSC

The overarching principle for developing EOSC is that research has to be at the centre of the EOSC initiative.

- **Multi-stakeholderism**
  EOSC will succeed if and only if it follows a multi-stakeholder approach;
- **Openness**
  EOSC will ensure research artefacts be ‘as open as possible, as restricted as necessary’;
- **FAIR principles**
  EOSC research artefacts need to be findable, accessible, interoperable and reusable;
- **Federation of infrastructures**
  EOSC will federate existing and upcoming data- and e-infrastructures;
- **Machine-actionable**
  EOSC will strike the right balance between machines and people in delivering the services that will serve the needs of European scientists.

History of a partnership



Initial EOSC Governance

2019-2020

EOSC Association AISBL

29-07-2020

Co-programmed EOSC Partnership

23-06-2021

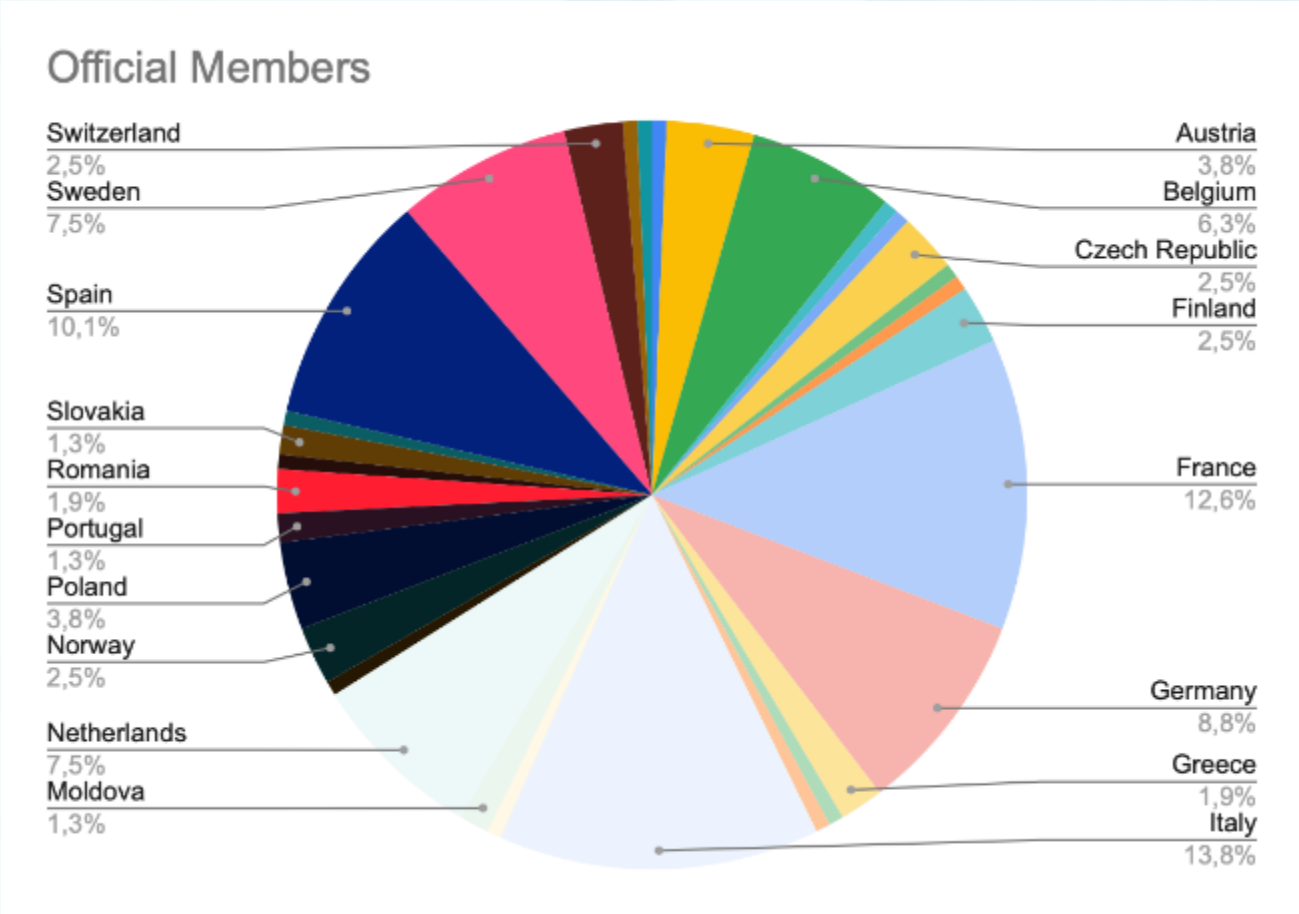
EOSC Association

An Exciting Journey

EOSC Association: Milestones

- Four founding members (CESAER, GEANT, GARR, CSIC)
- Was incorporated as AISBL on 29th July 2020
- Obtained Royal Decree on 11th September 2020
- First General Assembly on 17-12-2020 elected President and Board; GA#2 mid 2021, GA#3 end 2021, GA#4 May 2022
- Research Performing; Research Funding and Service Proving organisations
- Now >160 members and >75 observers (58% - 8% - 34%) (middle 2022)
- A European Co-programmed Partnership, between the EC and the EOSC Association, MoU signed mid 2021
- Joining the EOSC Association = Joining the EOSC Partnership!

Members EOSC AISBL (May 2022)



Co-programmed EOSC Partnership
mission of EOSC Association AISBL

- To provide a single voice for advocacy and representation for the broader EOSC stakeholder community in Europe
- To promote the alignment of European Union research policy and priorities with activities coordinated by the Association (SRIA)
- To ultimately enable seamless access to data through interoperable services that address the entire research data life cycle, from discovery to storage, management, analysis and re-use across borders and scientific disciplines *(the dream)*

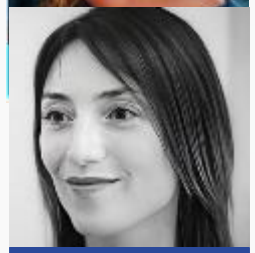
Content of the MoU (I)

- The MoU is established between the Partners
  - ✓ The EU represented by the Commission
  - ✓ The EOSC Association, including its constituent entities (members)
- The MoU is a contractual arrangement, not legally binding
- Scope & objectives
  - ✓ Expected financial and in-kind commitments by the partners
  - ✓ KPI's
- Governance: Partnership Board
  - ✓ Composition: Representatives appointed by the Partners other than the Union, Commission officials and Representatives of the Steering Board
  - ✓ Rules of Procedure of the Partnership Board have been drafted based on a proposal by the Commission
- Duration: from signature date until 31.12.2030

Content of the MoU (II)

- Activities and commitments of the Commission
  - ✓ Take into account the input and advice from the Partners other than the Union when identifying & defining call topics for R&I activities to be included in the Work Programmes
  - ✓ Contribute through the Work Programmes
- Activities and commitments of the Partners other than the Union
  - ✓ Provide input and advice to the Commission
  - ✓ In-kind contributions in Horizon Europe actions
  - ✓ In-kind contributions in additional activities
  - ✓ Investments in operational activities
- Openness and Transparency, Dissemination, Coordination
- Monitoring and reporting
  - ✓ The partners will set up and implement an effective reporting and monitoring system, using
  - ✓ A list of Key Performance Indicators

Task Forces in Advisory Groups



Suzanne Dumouchel & Sara Garavelli

Implementation of EOSC

- Rules of Participation compliance monitoring
- PID policy and implementation
- Researcher engagement and adoption

Ignacio Blanquer

Technical challenges on EOSC

- Technical interoperability of data and services
- Infrastructure for quality research software
- AAI Architecture

Metadata and data quality

- Semantic interoperability
- FAIR metrics and data quality

Sarah Jones

Research careers and curricula

- Data stewardship curricula and career paths
- Research careers, recognition and credit
- Upskilling countries to engage in EOSC

Wilhelm Widmark

Sustaining EOSC

- Defining funding models for EOSC
- Long-term data preservation

Bob Jones

Tasks for EOSC Association to see to:

- Develop and govern federating core
- Manage the AAI
- Manage PID policies
- Manage compliance framework
- Manage trusted certification
- Outreach to stakeholders
- Monitor services and transactions
- Manage the ‘EOSC’ trademark(s)
- Contribute to Horizon EU policy

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Grand Challenges for developing EOSC

Technical

- Create in the long run truly broad multidisciplinary interoperability
- For the short term this means: optimal Authentication and Authorisation Infrastructure (AAI); stepwise growing interoperability

Social

- Getting the noses in the same direction
- Combining local and regional initiatives towards a true Open Science Commons with global convergence on standards in support of the implementation

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Implementation steps of EOSC

- EOSC interoperability framework is premised on FAIR principles
- Currently defining a minimum metadata model (and crosswalks) to ease discovery over existing federated research data and metadata
- Need clear, publicly-available definitions for all concepts, metadata and data schemas → challenge is that not all communities apply standards
- Need repositories of semantic artefacts and mapping across these
- Aim for all metadata and measurements to be machine-readable
- Sufficient local compute capacity to handle the request

Strategic Research Innovation Agenda (SRIA) & Multi Annual Roadmap (MAR)

- **SRIA** defines the general framework for future research, development and innovation activities in relation to EOSC
- **Multi-annual roadmap** sets priority activities and outcomes for three implementation levels – European, National, Institutional
- Three **phases** of MAR
  - 2021-2022: initial development for starting a federation of infrastructures
  - **2023-2024: expansion towards a MVE that generates added value**
  - 2025-2027: creating impact from EOSC for practicing Open Science

Structure of the MAR

- According to the three SRIA objectives
  1. Make Open Science the new normal
  2. Adopt standards and tools
  3. Establish a sustainable and federated infrastructure
- Priorities grouped accroding to three levels of implementation (European, National, Institutional)
- Outcomes listed as a whole under each objective
- Clarification text explains the wider context for key points

MAR consultation in March 2022

Image CC-BY by Charles Deluvio
https://unsplash.com/photos/Lks7vei-eAg

Main themes raised

- Need to say more on added value / value proposition
- Terminology confusing (Core, Exchange, onboarding, federation, resources…)
- Extend text on multilingualism
- Several concerns raised about how this will all be funded
- Place more emphasis on national investment / MS role
- Funding models seen as priority needing greater emphasis
- Questions about the role of RSE/data steward and how we fund them
- Minor points to check on implementation approach for AAI, PIDs, EIF etc

Agreed priorities for 2023 - 2024

Technical

- **EOSC-Core creation and onboarding procedures**
- **Interoperability and data search**
- **Data quality**

Involvement

- **Member State engagement**
- **Funding / resourcing models**
- **Skills and the recognition and rewards**

Example: quality of research data

Objective

Explore what are the most relevant quality dimensions considered in different communities and how they can be incorporated in EOSC.

Possible approach

- **Measures are context dependent and defined by research communities.**
- **Quality attributes and dimensions (e.g. accuracy, completeness, conformity) vary within and across disciplines and are closely related to the research subject they are intended to measure.**
- **Identify common measures and align them with the FAIR principles**

Research libraries

- Research libraries are key players in the transition to the ‘new normal’
- In the results with Open Access research libraries have played a major role
- More university libraries could / should be involved in the FAIR digital objects development
- For this they need to be involved data stewardship and skills training development
- They historically have close links with the researchers / research community
- They also need to have close links with e-infrastructure support
- In their position they can support research communities with standards development and skills

Recommendations to research libraries

positioning themselves withing research institutes as

Core partners

to engage with EOSC

create specific EOSC

Working groups

within their networks

Partner

with computing services to provide new services

include

New staff roles

to adress research data management

develop

Training programmes

on research data management

continue to guarantee the

Provision of content

with high quality metadata

DENKSCHETS.NL

Recommendations to the EOSC Association

create a **Clear Advocacy programme**

promote a general **Stakeholder forum** and working group for libraries

Establish a **Close dialogue** with universities

connect **National Representatives** with their national Open Science stakeholders

develop a strategy that ensures **Equitable access** to researchers and resources for all research disciplines

support recruitment of **The Best Talent** to work for organisations that provide services for and within the EOSC

Create **Competence Centres** for training in research data management

develop guidelines and a **Service Level Agreement (SLA)** between providers & users

Organize **Events** addressed to specific Stakeholders

Show leadership in research-data management

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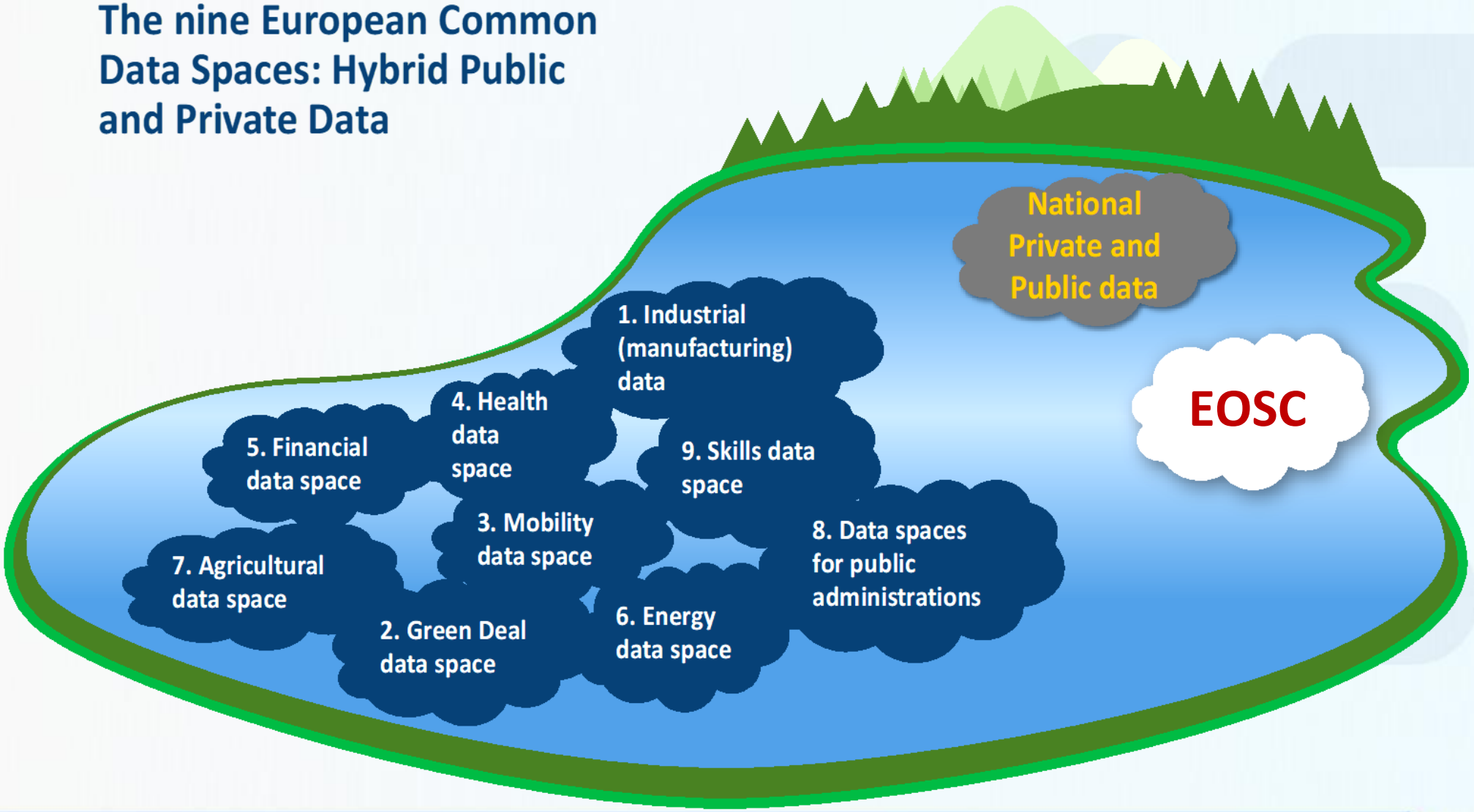
EOSC in wider context

The nine European Common Data Spaces: Hybrid Public and Private Data



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Position of EOSC according to the European Commission

Taken from EC slides

"**EOSC** is the basis for a science, research and innovation data space that will bring together data resulting for research and deployment programmes and will be connected and articulated with the sectoral data spaces"

(European Data Strategy, COM(2020) 66 final)

EOSC on a global stage

- Service providers from third countries can participate in EOSC but have adhere to EOSC Rules of Participation and applicable legislation
- EOSC will work with other regional initiatives towards common goals for Open Science, driving global convergence on standards in support of the implementation of an open science commons

Keep on dreaming

If in 2040 50% of the relevant research data (data, publications and software) would be as FAIR as possible, my dream would come true!
(world-wide ☺)

In other words: When I will be able to fi… …w clicks the diffusion coëfficient of water as function of … … water concentration for the compositions of gel… …ed in, then I will be able to predict the drying beh… …aterial under different conditions in different scal… …-ups of drying equipment, using the computerprogr… …loped. Thus saving a whole lot of time in the developmen… …lots of energy in the application.

Thanks EOSC!

Let’s co-create EOSC

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Thanks

@eoscassociation

info@eosc.eu