Open Science to deliver on the grand challenges

ICA Rectors and Deans Forum

October 22nd, 2021

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Directorate-General for Research and Innovation
European Commission

Open Science at the EC

- **Open Science** means **sharing knowledge and tools as early as possible**, not only **between researchers** and **between disciplines**, but also with **society at large**.
- Open Science improves the **quality**, **efficiency** and **creativity** of research and the **trust by society in science**. In particular, OS is beneficial for science, scientists and funders, e.g.:
  - tackles the reproducibility crisis;
  - faster response to societal challenges e.g. Coronavirus, Ebola;
  - access to and sharing results yields higher impact through collaborations;
  - generates new research findings and decreases inequalities;
  - large opportunity costs of non-FAIR data—€10.2bn/year (source: Cost-benefit analysis of FAIR research data, 2017).
- The Commission acts as **policy maker** (propose legislation and encourage MS), a **funder** (we set requirements to our projects) and a **capacity builder** (we fund 'enabling' projects).

Main challenges and priorities for Open Science

Improve the practice of research and innovation

- Openly accessible scholarly publications
- Early sharing of research outputs; open methods and resources
- All digital outputs FAIR, RDM
- Reproducible results
- Societal engagement & responsibility

Develop proper enablers

- Rewards and incentives to adopt Open Science practices, with responsible use of metrics
- Appropriate skills and education, including for research integrity
- Open Research Infrastructures including the European Open Science Cloud (EOSC)
- Legal & regulatory environment for data and copyright

Involving all the actors *Engaging internationally*

Changing research culture

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A new ERA for R&I

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ERA Communication: A New ERA for R&I

Communication on a new European Research Area for Research and Innovation (September 2020)

Deepening the ERA

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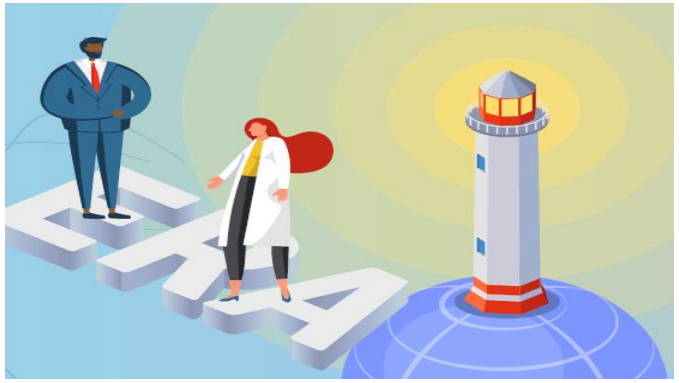
- ensure a **European Open Science Cloud** that is offering findable, accessible, interoperable and reusable research data and services (Web of FAIR); and
- incentivise open science practices by improving the **research assessment system**.

Citizen Engagement

The Commission will: (Action 13)

- Organise with Member States and stakeholders Europe-wide **citizen science campaigns** to raise awareness and networking, crowdsourcing platforms and pan-European hackathons, in particular in the context of Horizon Europe Missions. The Commission will develop with Member States best practices to open up science and innovation to citizens and youth.



European Commission

European Open Science Cloud

What is EOSC?

EUROPEAN OPEN SCIENCE CLOUD

A process

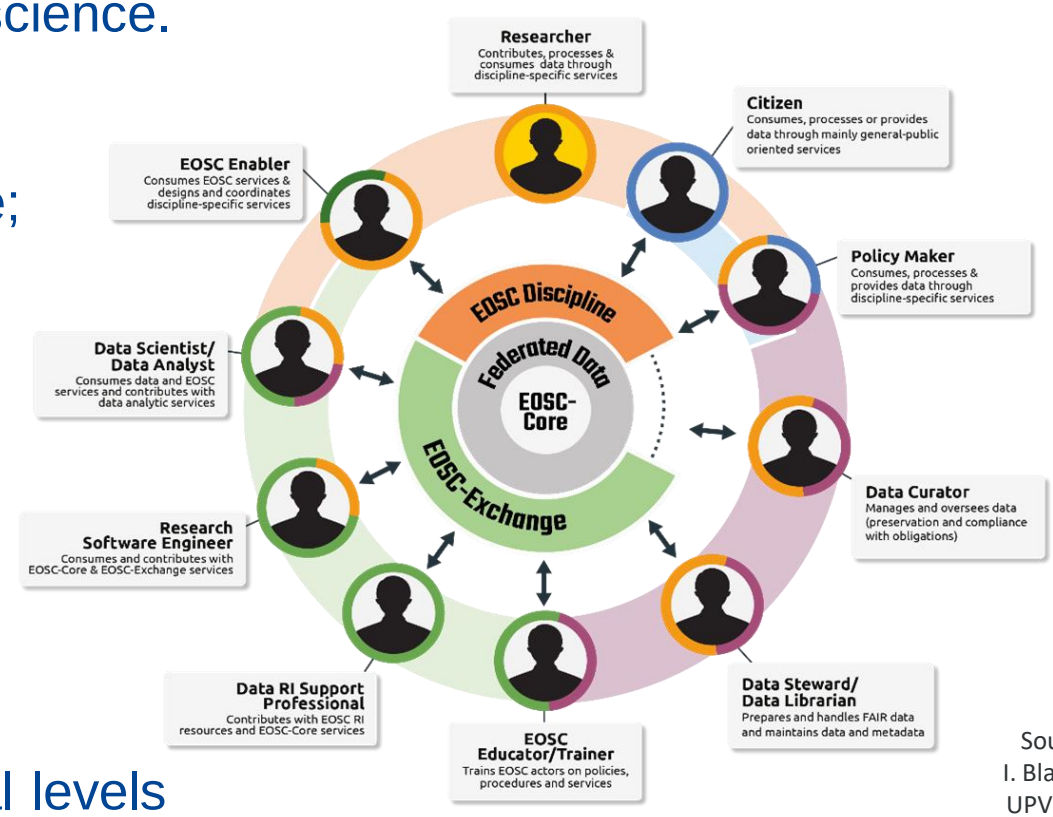
- To accelerate Open Science, FAIR data management and use of digital methods and services
- To stimulate co-operation in science and research, new insights and innovations, higher research productivity and improved reproducibility in science.

An open, trusted, federated infrastructure

- To access existing Research Infrastructures in Europe;
- To enable circa 2 million European researchers to store, share, process, analyse, and reuse research digital objects (e.g. data, publications and software)

An evolving ecosystem

- Bringing together the European Commission, the governments and the many R&I stakeholders involved in the European Research Area
- Co-created across European, national and institutional levels



Source:
I. Blanquer
UPV, 2020

EOSC in the European Data Strategy

(February 2020)

The EU will create a single market for data by:

- Setting clear and fair rules on access and re-use of data;
- Investing in next generation standards, tools and infrastructures to store and process data;
- Joining forces in European cloud capacity;
- **Pooling European data in key sectors, with EU-wide common and interoperable data spaces;**
- Giving users rights, tools and skills to stay in full control of their data.

"***EOSC*** *is the basis for a science, research and innovation data space that will bring together data resulting from research and deployment programmes and will be connected and fully articulated with the sectoral data spaces.*"
(European Data Strategy, COM(2020) 66 final)

Launch of the EOSC European Partnership

- 14 June: **Adoption by Commission decision of the MoUs** of all new co-programmed partnerships (including the EOSC partnership)
- 23 June: **Launch ceremony at the R&I Days** for the 11 new co-programmed European Partnerships (including the EOSC partnership)
- **EOSC MoU has now entered into force**:
  - Contractual arrangement between the Union represented by the Commission and the other partners than the Union represented by the EOSC Association
  - Duration: 2021 – end of 2030
  - Cumulated investment of about EUR 1 billion until 2027

FAIR and open data in action:
The European COVID-19 Data Platform

20 April 2020, launch of the European COVID-19 Platform

"*The platform is an important part in the building of the EOSC*".

President U. von der Leyen

- The European Commission launched on 20 April 2020 the **European COVID-19 Data Platform** together with EMBL-EBI, ELIXIR, and other partners, as part of the ERAvsCORONA action plan supported by the Member States.
- The Platform is a thematic priority pilot to realise the **EOSC vision** and to showcase the added value of **FAIR data sharing** to advance science and benefit researchers
- It responds to the need to capitalise on the quick and wide **sharing**, **re-use**, **processing** of and **access** to **data** and **metadata** on the SARS-CoV-2, and the related COVID-19 disease.
- A very strong focus is placed on ensuring that data and metadata on this Platform are as **open** and as **FAIR** as possible.
- More than **6.000.000 records** of diverse data types available in Open Access, as well as sensitive data under controlled access

European COVID-19 Data Platform: https://www.covid19dataportal.org/

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Key facts about the project

Total budget	€12 million
Organisations	53
Countries	19
Duration	36 months

BY-COVID is funded by the European Union's Horizon Europe research and innovation programme under grant agreement number 101046203.

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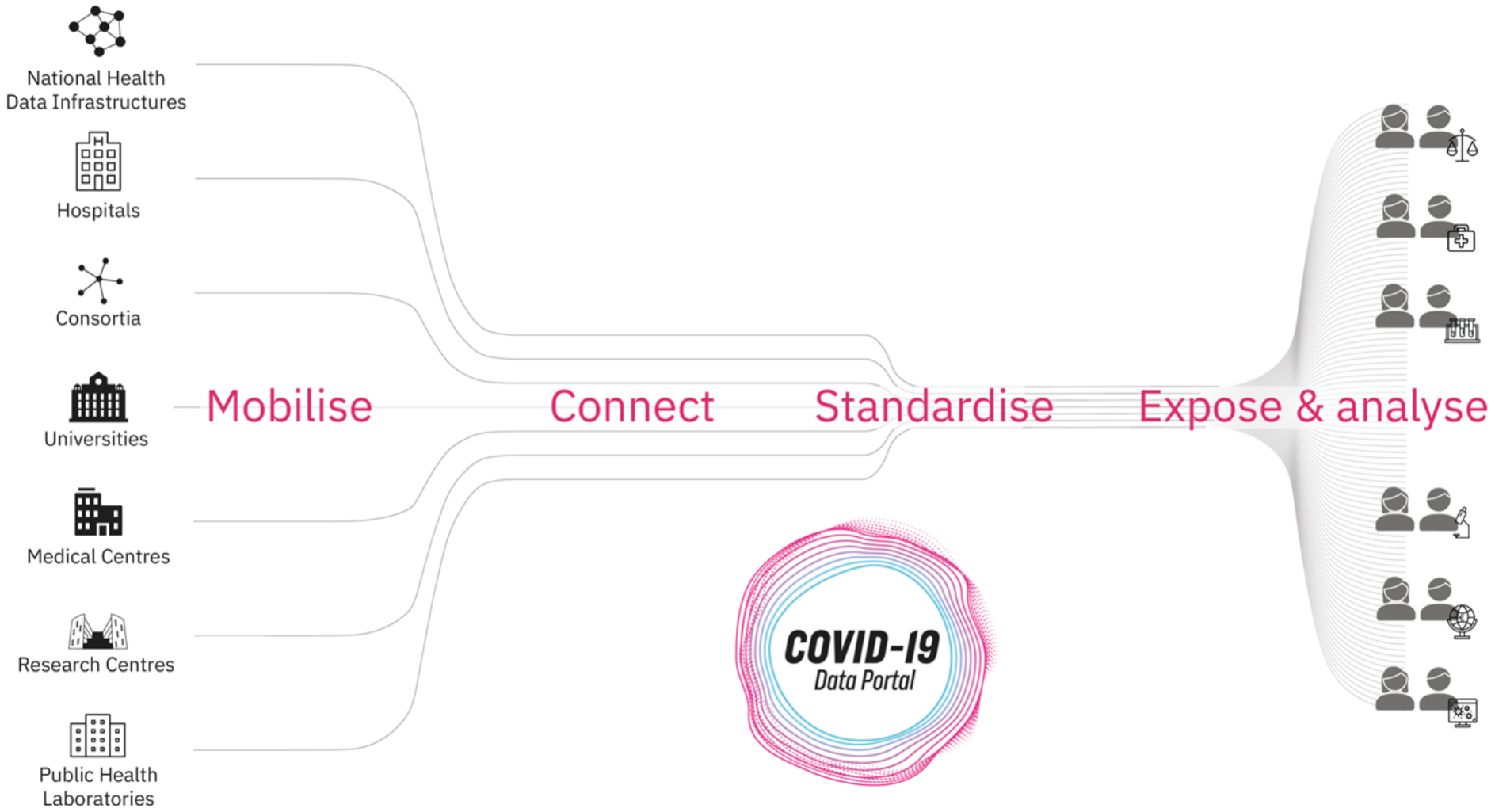
BY-COVID Objectives

1. Enable storage, sharing, access, analysis and processing of research data and other digital research objects from outbreak research.
2. Mobilise and expose viral and human infectious disease data from national centres.
3. Link FAIR data and metadata on SARS-CoV-2 and COVID-19.
4. Develop digital tools and data analytics for pandemic and outbreak preparedness, including tracking genomic variations of SARS-CoV-2 and identifying new variants of concern.
5. Contribute to the Horizon Europe European Open Science Cloud (EOSC) Partnership & European Health Data Space (EHDS).

Concept

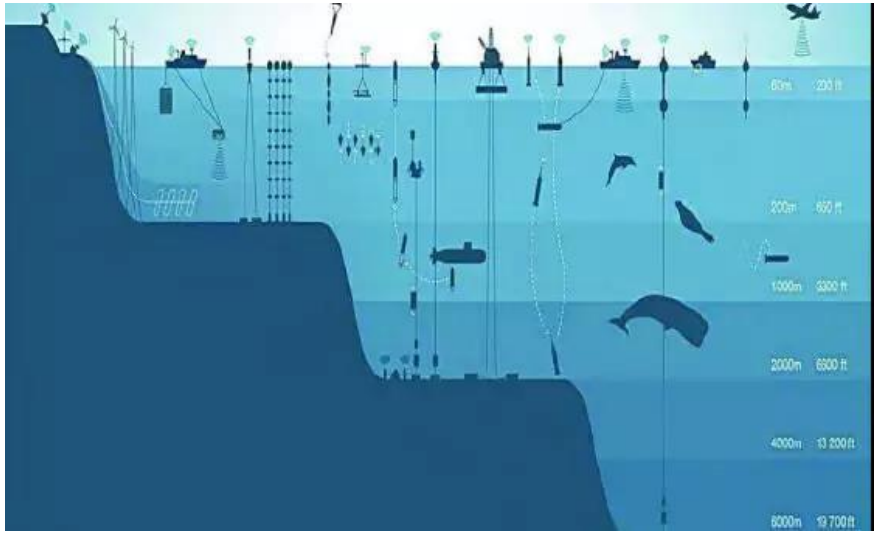

National Health Data Infrastructures
Hospitals
Consortia
Universities
Medical Centres
Research Centres
Public Health Laboratories
Mobilise
Connect
Standardise
Expose & analyse
COVID-19 Data Portal

‘Blue’ global policy

- UN - **Sustainable Development Goals**
  - Climate Action, Life Below Water (Market value of marine/coastal resources and industries: US$ 3 trillion)
- UN - **Decade of Ocean Science** for Sustainable Development (2021-2030)
  - A transparent ocean with open access to data information and technologies
- G7 - **Future of the Oceans** Initiative
  - Promote the improvement of global data sharing infrastructure to address the challenges of […] data
- EU - **Blue Growth strategy**
  - Making these data more interoperable and more available to users can improve the productivity…
- EU - **Green Deal**
  - […] ensure that across the EU, [stakeholders] are able to access data […] to develop instruments to integrate climate change…
- EU - **Digital Twin of the Ocean**
  - AI and analytics, thematic or sectorial models and computing power will transform data into knowledge

Blue economy ecosystem

- The ‘Blue’ ecosystem is very **rich** in terms of the very different **types of data** collected for different purposes:
  - Climate, health, tourism, energy, economic activities at sea
- Yearly data collection **costs** in the EU: **€1.4bn/year** (**€1bn/year** in-situ data—aircraft, ships, gliders, etc.; **€0.4bn/year** remote sensing—satellites, probes, etc.)
- Not starting from scratch: The ‘Blue’ ecosystem is quite mature in terms of **data infrastructure** and federating efforts (e.g. Blue Cloud) exist to minimise fragmentation.



Source: School of Geodesy and Geomatics, Wuhan University

Blue-Cloud
Piloting innovative services for Marine Research & the Blue Economy

EMODnet European Marine Observation and Data Network

ENA European Nucleotide Archive

elixir

WEkEO by COPERNICUS

EcoTaxa 2.0

Copernicus Marine Service

SeaDataNet

ICOS INTEGRATED CARBON OBSERVATION SYSTEM

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The Blue Cloud Roadmap to 2030

Blue-Cloud
Piloting innovative services for Marine Research & the Blue Economy

- **Blue-Cloud** is an initiative to **federate and pilot innovative services** for Marine Research & the Blue Economy and an **aggregator for 'blue' stakeholders**.
- As part of its deliverables, the project will produce in 2022, **the Blue Cloud Roadmap to 2030**.
- It will be a policy document laying out the future **strategic integration** of the **marine community** to EOSC along 4 key pillars:
  - **Uses and applications**: Development of use cases to deliver science-based solutions to address policy needs.
  - **Thriving community**: Promotion of Open Science, and the encouragement of wide and open sharing.
  - **FAIR and open ocean data**: Mainstreaming of the FAIR principles across many data generators and data consumers.
  - **Federation of blue data infras**: Promotion of interoperability standards to facilitate cross-disciplinary data use across different sectors linked to Oceans.

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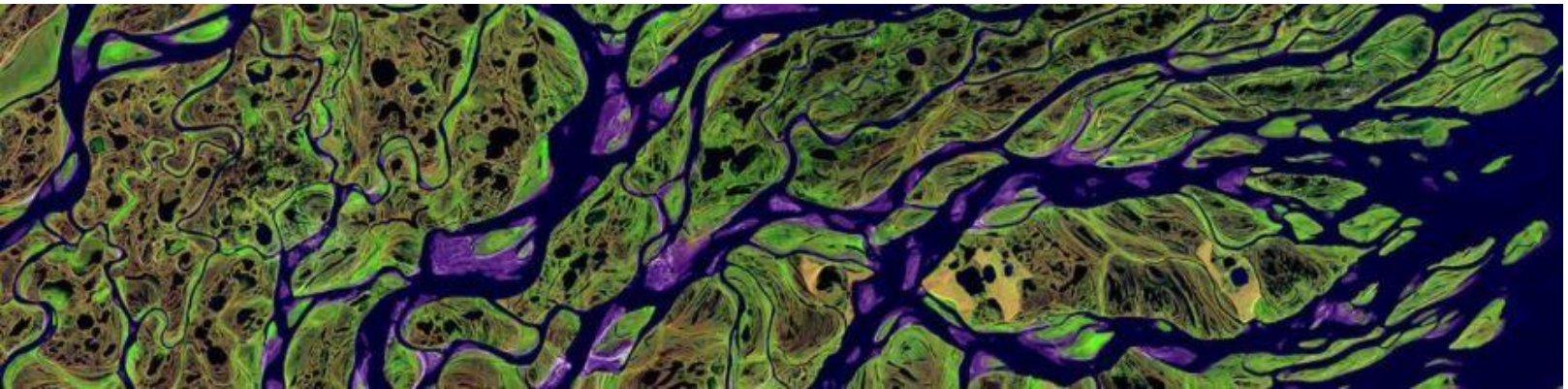
GEOSS

- The GEO community is creating a Global Earth Observation System of Systems (GEOSS) to better integrate observing systems and share data by connecting existing infrastructures using common standards.
- There are more than **400 million open data** resources in GEOSS from more than 150 national and regional providers such as NASA and ESA; international organizations such as WMO and the commercial sector such as Digital Globe.



Biodiversity linked & open data

- H2020 project: BiCIKL (abbreviation for Biodiversity Community Integrated Knowledge Library)
- BiCIKL has started creating the first-of-its-kind ***Biodiversity Knowledge Hub***, where researchers will be able to retrieve all possible FAIR data behind an organism of interest, all of it interlinked and all of it machine-readable by means of unique stable identifiers on specimens, genomics, observations, taxonomy and publications.
- Example: Let's say you are doing your research and you run into a specimen that is cited in a publication. Then you see that the specimen is also linked to its digital object in DiSSCo, its occurrence record data in GBIF, the sequences extracted from it in ENA, and the species name it belongs to in Catalogue of Life.

NASA

Transform to Open Science (TOPS)

From 2022 to 2027, TOPS will accelerate the engagement of the scientific community in open science practices through events and activities aimed at:

- Lowering barriers to entry for historically excluded communities
- Better understanding how people use NASA data and code to take advantage of our big data collections
- Increasing opportunities for collaboration while promoting scientific innovation, transparency, and reproducibility.

The TOPS mission is aligned with recommendations from NASA's Strategy for Data Management and Computing for Groundbreaking Science 2019-2024, the National Academies reports on open science, reproducibility, and scientific software, and the 2021 UNESCO draft Recommendation on Open Science synthesis report.

"Within the TOPS mission, NASA is designating 2023 as the Year Of Open Science"

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Are we making progress?

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Is COVID-19 accelerating a long-term shift?

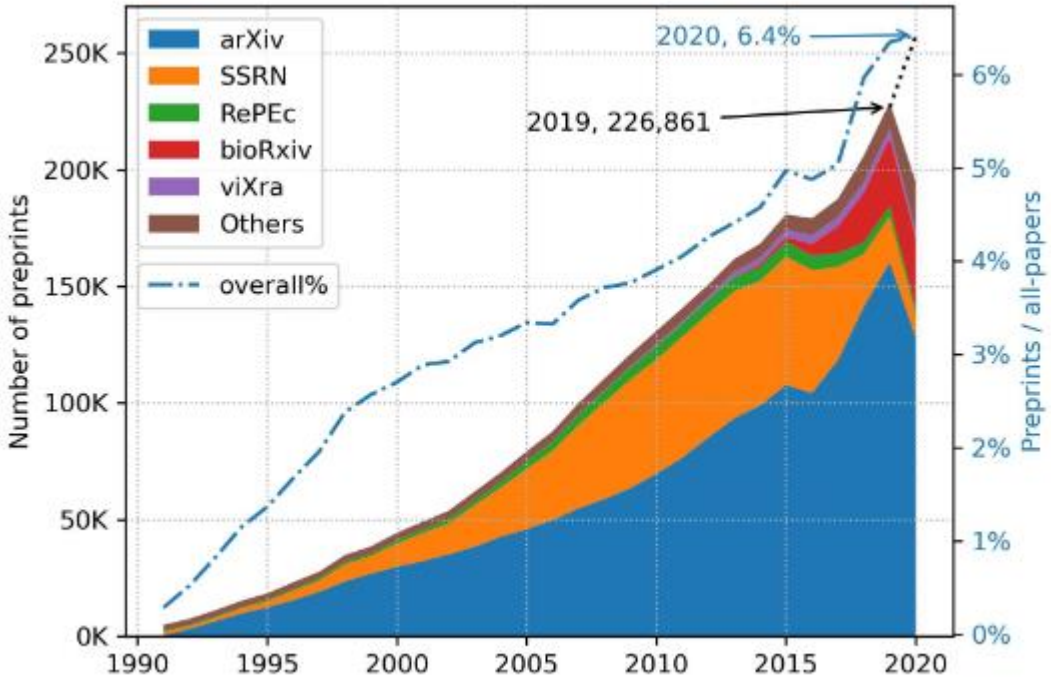
Some positive trends:

- Early and fast share of results through increased use of preprints
- Publishers temporarily opening up some of their publications (although not permanently)

But challenges remain, such as:

- Most open access papers (even COVID-19 ones) do not make their underlying data available without restrictions
- Research data are not fully interoperable and reusable

Annual number of preprints/all-papers rate growth



Source: [arXiv:2102.09066v1]

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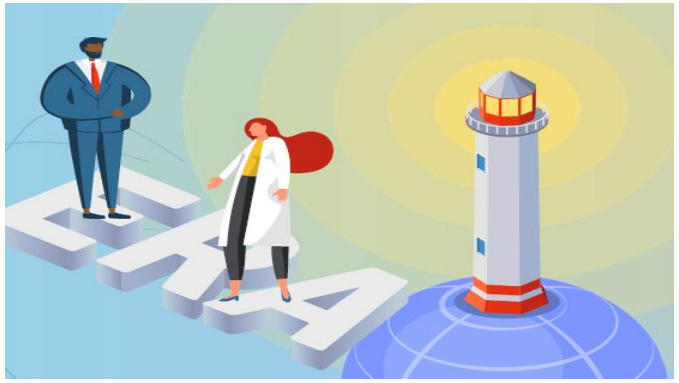

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Improving the research assessment system: Context

- The research process is in (digital) transition
  - Less linear, more collaborative and open, diversity of outputs; team science
- The system currently used to assess research and researchers is not fit for this new reality
  - Rewards quantity and publication venue rather than quality; does not reward sharing, collaboration and outputs other than publications
- A reform is needed to increase the efficiency, impact and social responsibility of research
  - Requires a system and cultural change, involving institutions, funders and researchers
- **Council Conclusions** on ERA (Dec 2020) and on research careers (May 2021) invite the Commission to work with stakeholders to effect this change

Improving the research assessment system: Action

The Commission **is currently consulting** research funders, research performers, policy makers, and other stakeholders, **on how to advance with reforming the research assessment system**.

- A proposed way forward is to **reach an agreement by 2022** (such as a Memorandum of Understanding) **between those willing to reform the current research assessment system**, which would be signed by an increasing number of funders and research performing organisations.
  - Agreement setting commonly agreed objectives, principles and actions, and engaging signatories to translate commitments into effective changes;
  - For a more qualitative assessment of research, researchers and institutions, that considers the value and impact of a diversity of outputs and research cultures, and that incentivizes open collaboration and knowledge and data sharing.

Many remaining questions…

- Providing appropriate incentives and rewards
- A more systemic approach to addressing data interoperability
- Ensuring an adequate legal and regulatory environment for research data and copyright
- Aligning internationally
- …

Open Science in Horizon Europe

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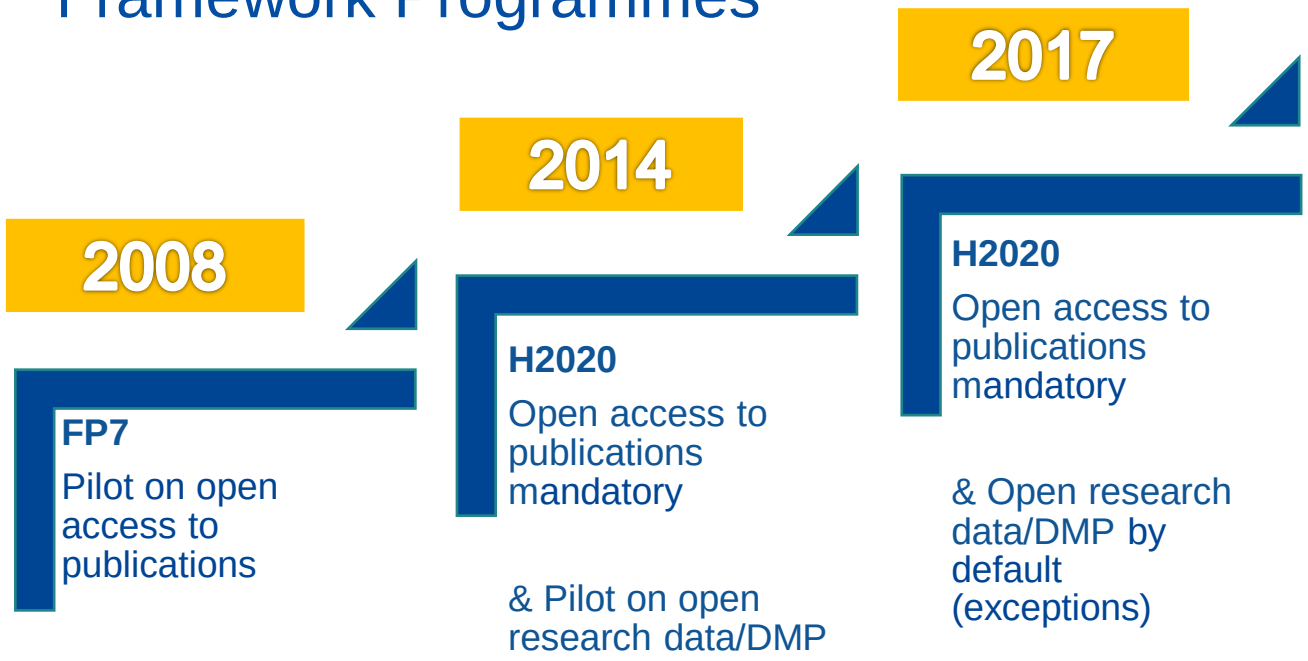
Open Science in Horizon Europe

Evolution of Open Science policies across Framework Programmes



Under **Horizon Europe (2021)**

- Open Science embedded across Horizon Europe
- Strengthening of the open access obligations and focus on responsible research data management in line with the FAIR principles

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Main novelties in Horizon Europe

- **Rationale and scope:** move from open access to open science with a broadened scope of policy; open science comprises open science practices
- **Evaluation:** open science under excellence (not impact); practices beyond mandatory incentivized through evaluation; publications evaluated on basis of qualitative assessment provided (not Journal Impact Factor)
- **Intellectual Property Rights:** requirement to maintain enough rights to meet open access requirements to publications
- **Publications:** Immediate open access (=no embargo); only publication fees in full open access venues are reimbursable (=no hybrids)
- **Research data:** research data management (including data management plans) mandatory for all projects generating and/or reusing data; open access 'as open as possible as closed as necessary'
- **Qualified open access to research outputs:** specific licenses and technical standards for digital objects to enable FAIR; trusted repositories
- **Reproducibility of research:** information for validation of publications and for validation and reuse of data required; access for validation of publications must be provided (while legitimate interests safeguarded)
- **Open science and public emergencies:** immediate open access to all research outputs (non-exclusive licenses under fair and reasonable conditions to the relevant legal entities if open access not possible)

Evaluation of proposals and Open Science

“Excellence” criterion

(methodology)

- Evaluation of the quality of open science practices
- E.g.1 page to describe Open Science practices + 1 page to describe research data/output management [RIA,IA]

“Quality and efficiency of implementation” criterion

(capacity of participants and consortium as a whole + list of achievements)

- Explain expertise/track record on Open Science
- List publications, software, data, etc, relevant to the project with qualitative assessment and, where available, persistent identifiers

Publications are expected to be open access; datasets are expected to be FAIR and ‘as open as possible, as closed as necessary‘. **Significance of publications to be evaluated on the basis of proposers’ qualitative assessment** and not per Journal Impact Factor

Thank you

European Commission