



EOSC Strategic Implementation Roadmap 2018-2020

May 2018

European Commission
DG Research and Innovation
RTD.A2. Open Data Policy and Science Cloud

This presentation's aim is **to introduce, illustrate and update with the latest developments the information** presented in the **Staff Working Document SWD(2018) 83** published on **14.3.2018**.

Please note that the information and views set out in this presentation **do not necessarily reflect the official opinion of the European Union**.

Neither the European Union institutions and bodies nor any person acting on their behalf may be held responsible for the use which may be made of the information contained therein.

The consultation with the Member States is based solely on the text of the Staff Working Document.

Contents

A. From Vision to Action

B. Current situation: analysis per country and by key discipline


C. Stakeholder consultation

D. Possible models for the EOSC

E. EOSC 'federated' model: six lines of action of the implementation Roadmap

F. Costs and financing of the EOSC: preliminary reflections

A. What the Communication on a ‘European Cloud Initiative’ of April 2016 announces

Actions	Timeline	
The Commission will work with global policy and research partners to foster cooperation and to create a level playing field in scientific data sharing and data-driven science.	As of 2016	OECD, RDA, G7
The Commission will use the Horizon 2020 Work Programmes to provide funding to integrate and consolidate e-infrastructure platforms, to federate existing research infrastructures and scientific clouds and to support the development of cloud-based services for Open Science .	As of 2016	WP2018-20
The Commission will make open research data the default option, while ensuring opt-outs, for all new projects of the Horizon 2020 programme.	As of 2017	 01.01.2017
The Commission will review the 2012 Commission Recommendation on access to and preservation of scientific information ⁴¹ to encourage scientific data sharing and the creation of incentive schemes, rewards systems and education and training programmes for researchers and businesses to share data, in close relation with the DSM 'Free flow of data' initiative.	As of 2017	DSM data package April 2018
The Commission will work with Member States to connect the priority European research infrastructures ⁴² to the European Open Science Cloud.	As of 2017	WP2018-20
Together with stakeholders and relevant global initiatives, the Commission will work towards an Action Plan for scientific data interoperability , including 'meta-data', specifications and certification.	By end 2017	FAIR Action Plan

A. After the EOSC Vision has been adopted and embraced by the relevant stakeholders, it is now time for action

From Vision

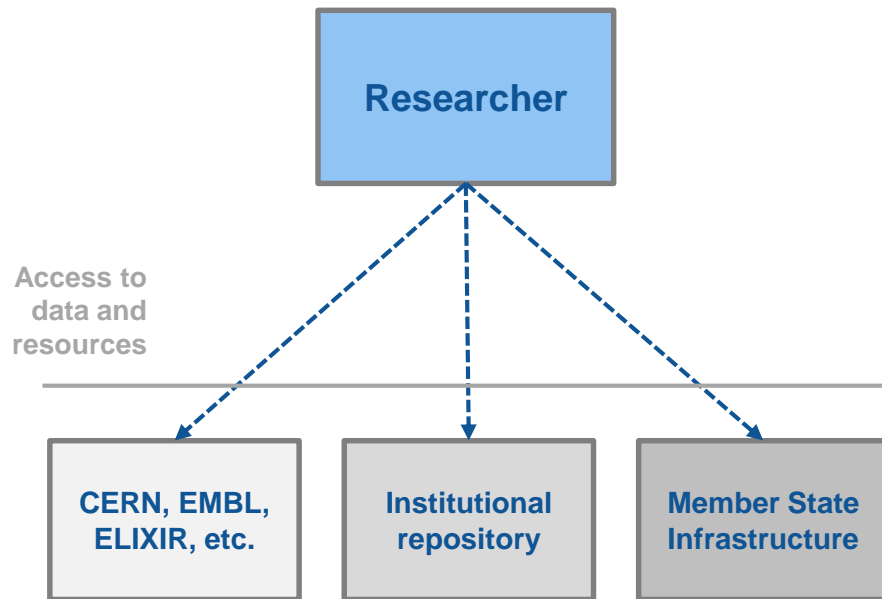
- EOSC will provide **1.7m EU researchers an environment with free**, open services for data storage, management, analysis and re-use across disciplines.
- EOSC will **JOIN existing and emerging horizontal and thematic data infrastructures**, bridging today's fragmentation and ad-hoc solutions.
- EOSC will **add value** (scale, data-driven science, inter-disciplinarity, faster innovation) **and leverage past infrastructure investment** (10b per year by MS, two decades EU investment).

Vision endorsed by the EP, by the EESC and the CoR, by the G7 and copied, literally, by a host of nations globally: Japan, Canada and China.

... to Action

- Vision is now as clear to external stakeholders as it is internally.
- Single online platform where all European researchers will be able to:
 - Find, access and re-use data produced by other scientists.
 - Deposit, analyse and share data they have been paid to produce.
- Initially (until 2020), the EOSC will build on existing investments, no/little fresh money is needed
- The Commission provides top-up money to set up and organise the federation and to start creating common European resources.

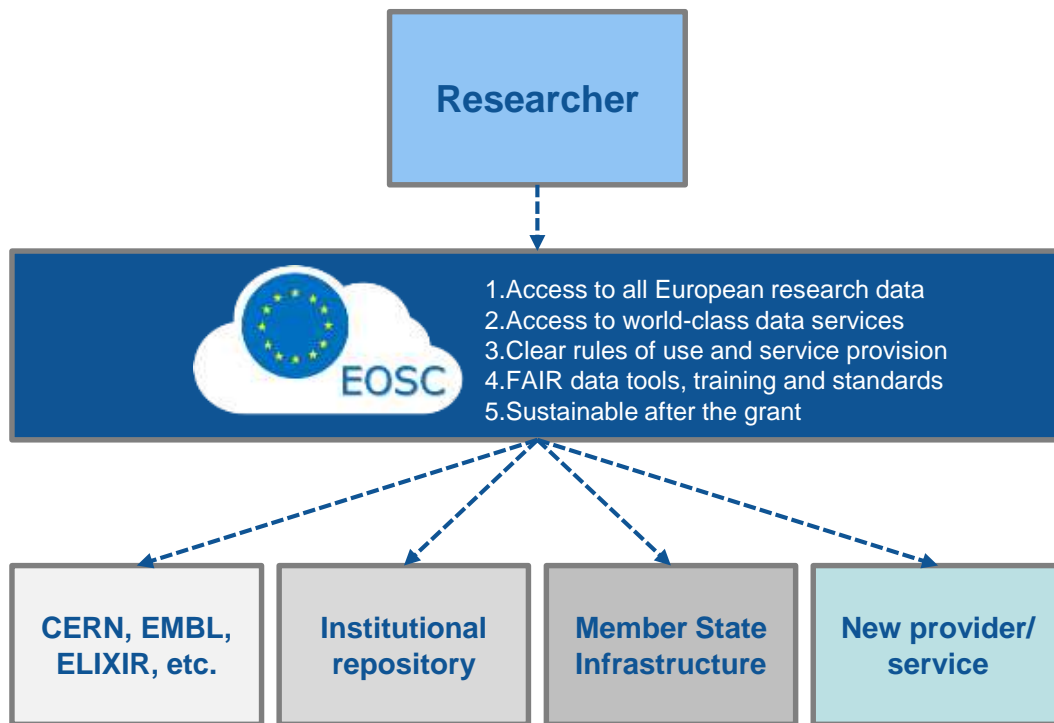
A. European researchers face data fragmentation and unequal access to quality information sets



- Fragmented access (across scientific domains, countries and governance models; varying access policies)
- Limited cross-disciplinary access to data sets (i.e. interdisciplinary research)
- Non-interoperable services and data
- Closed data

Limited and limiting access for an ordinary European researcher

A. The EOSC will allow for universal access to data and a new level playing field for EU researchers



- Easy access through a universal access point for ALL European researchers
- Cross-disciplinary access to data unleashes potential of interdisciplinary research
- Services and data are interoperable (FAIR data)
- Data funded with public money is in principle open (as open as possible, as closed as necessary)
- EOSC will help increase recognition of data intensive research and data science

Seamless environment and enabling interdisciplinary research

A. An environment to foster data-intensive innovation

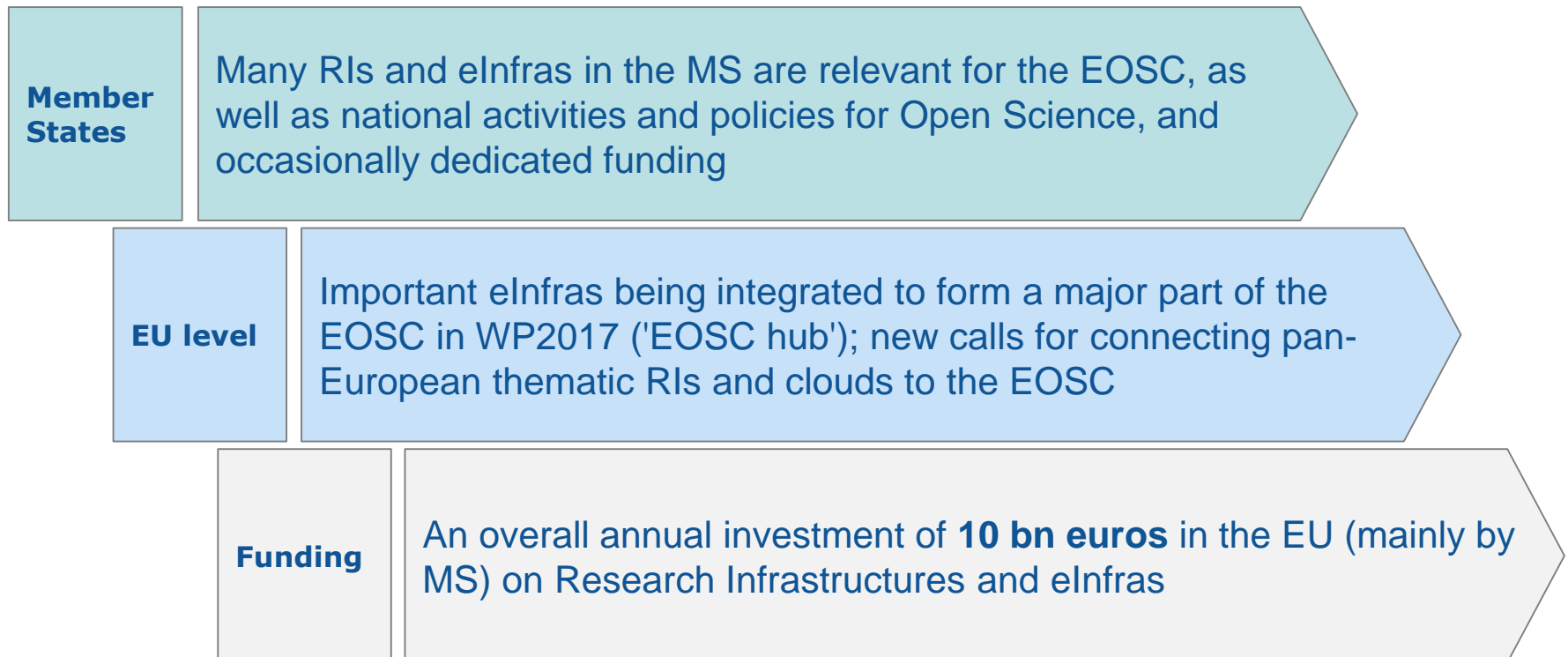


- Enables Europe to:
 - tap into the wealth of data it produces,
 - increase data-based innovation
 - increase data intelligence and spin offs
- Speeds up innovation by opening up the knowledge to 21 million companies

Contents

- A. From Vision to Action
- B. Current situation: analysis per country and by key discipline**
- C. Stakeholder consultation
- D. Possible models for the EOSC
- E. EOSC 'federated' model: six lines of action of the implementation Roadmap
- F. Costs and financing of the EOSC: preliminary reflections

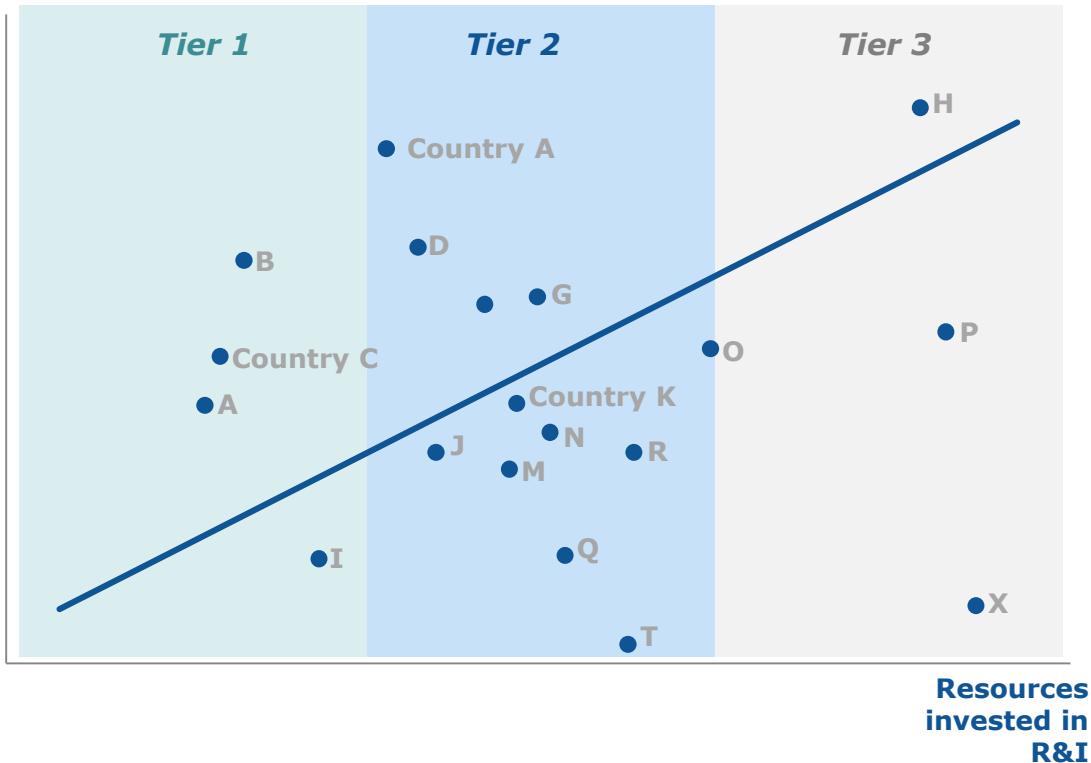
B. Many data infrastructures to federate and varying levels of activities and infrastructures among Member States



B. Since each MS starting point is different a customized implementation strategy shall be adopted

EOSC
Readiness

Conceptual



The EC should – e.g. via the H2020 Policy Support Facility - support each MS to self-assess its starting position and the implications for the EOSC implementation roadmap.

B. The Netherlands has made significant progress over the last years to become EOSC ready

Illustrative

Policy and strategy

- Initiated the Go Fair initiative, now driving Go Fair together with Germany and France (several other MS are ready to join).
- Universities and major research organisations/funders have signed the Berlin Declaration since 2005.
- Feb 2017: National Open Science Plan was published and website launched.
- Feb 2018: National Open Science Coordinator appointed.

National facilities & EU participation in RI

- Diverse and well established national Research Infrastructures, host and member of numerous pan-European Research Infrastructures on the ESFRI roadmap and very strong participation in main European e-Infrastructures.

Funders and funding streams

- 1st flow - research universities: around €1,8 billion
- 2nd flow - NWO (national funder of scientific research): around €680 million
- 3rd flow - for research universities: around €1,1 billion (including €300 million from EU)

eInfras information

- Member/delegate of GEANT, EGI Council, PRACE, EUDAT, e-IRG
- National Research and Education Network, national portal for OA publications, Dutch Data Network and RDNL providing major data repositories
- Has an OpenAIRE national OA desk.

B. Germany has made significant progress over the last years to become EOSC ready

Illustrative

Policy and strategy

- Driving Go Fair together with The Netherlands.
- The BMBF released its Open Access Strategy entitled "Open Access in Germany" in September 2016 which contains a clear commitment to the principles of open access and open science.
- DFG, the main research funder, has tied open access into its funding policy.

National facilities & EU participation in RI

- Diverse and well established national Research Infrastructures, host and member of numerous pan-European Research Infrastructures on the ESFRI roadmap and very strong participation in main European e-Infrastructures.

Funders and funding streams

- Germany has a federal system with shared funding responsibilities between federal and state governments.
- Together they fund about one third of all R&D expenditure in Germany.
- DFG provides the main source of project funding for university research. It acts similarly to a research council in that most of its funds are competitively awarded following a process of peer review of applications.

eInfras information

- Member/delegate of GEANT, EGI Council, PRACE, EUDAT, e-IRG
- National Research and Education Network, Registry of Research Data Repositories (re3data.org), a national research data infrastructure (NFDI).
- Has an OpenAIRE national OA desk.

B. Italy has made significant progress over the last years to become EOSC ready

Illustrative

Policy and strategy

- National Research Plan 2015-20: Importance of enabling Open Science through RI, including adoption of a national policy for storage, open access, verifiability and reuse of research data and outputs.

National facilities & EU participation in RI

- Diverse and well established national Research Infrastructures: mapping and prioritization of National Research Infrastructures has taken place with 97 national RIs. National Roadmap for Research Infrastructures developed in 2011 and revised in 2017.
- Host and member of numerous pan-European Research Infrastructures on the ESFRI roadmap

Funders and funding streams

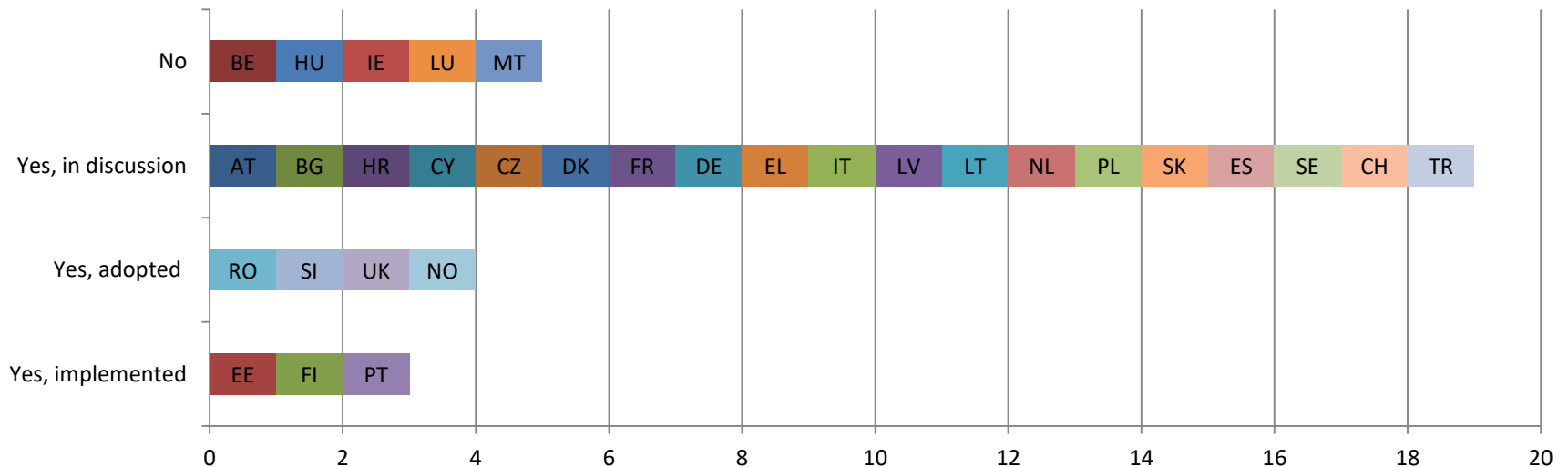
- Budget allocated for Research Infrastructures for 2015-2017 is €342,9 million

eInfras information

- Member/delegate of GEANT, EGI Council, PRACE, EUDAT, e-IRG
- National Research and Education Network and CINECA providing horizontal services for Universities
- Has an OpenAIRE national OA desk.

B. Member States are already working on services and policies to enable OS! (1/2)

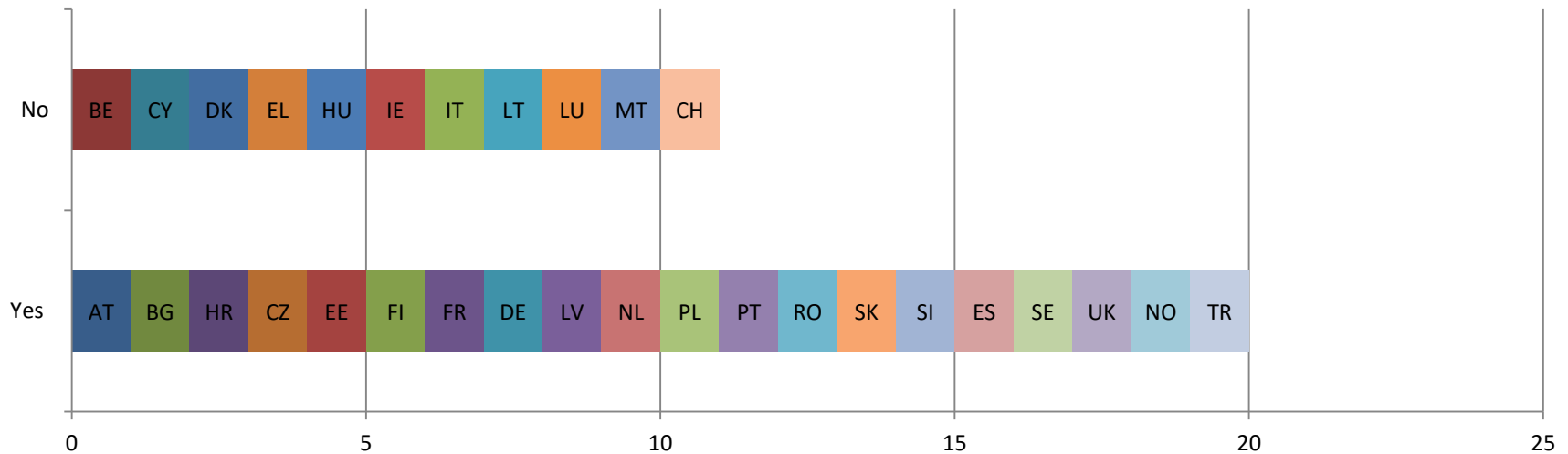
Policies or overall strategies to support scientific data infrastructures for dissemination are defined at the national level?



Source: National Points of Reference for Open Access, 2017 reporting exercise, work in progress, RTD. A2

B. Member States are already working on services and policies to enable OS! (2/2)

Are further measures, projects or other incentives at national level (e.g. national funding) in place to develop cloud services and ensure interoperability of existing e-infrastructures?



Source: National Points of Reference for Open Access, 2017 reporting exercise, work in progress, RTD. A2

B. Significant current European investments in RIs (thematic and eInfras)

	Landmarks			Projects		
	Number	Capital Value (M€)	Operational Budget (M€/y)	Number	Construction Costs (M€)	Operational Budget (M€/y)
Energy	1	1000	NA	4	245	112
Environment	5	257	84	5	619	101
Health & Food	6	1261.5	207	8	320.7	21.55
Physical Sciences & Engineering	11	8346	NA	3	589	32
Social & Cultural Innovation	5	114.3	32.5	1	4	5
eInfras	1	500	120	0	0	0
	29	11478.8	443.5	21	1777.7	271.55

Source: ESFRI roadmap 2016

Amounts are minimum, for some projects and landmarks information on capital or annual operation costs are missing

B. Current European support to EOSC

- Total EU investment in eInfras and other research data infrastructures amounts to hundreds of million euros.
- The EC has been a main source of funding through FP7 and Horizon 2020.
- In addition, most of the ESFRI landmarks (29) and projects (21) include substantive and growing support to data stewardship and preservation – which, while often triggered by EU grants, is mostly funded by MS (80%).

B. ELIXIR is an important thematic RI

- **Structure:** A distributed research infrastructure for biological research data (medicine; agriculture; bio-industries; environment). It connects national bioinformatics centres and EMBL-EBI.
- **Members:** 20 MS/AC + EMBL (BE, CH, CZ, DE, DK, EE, ES, FI, FR, HU, IE, IL, IT, LU, NL, NO, PT, SE, SI, UK). EL towards Membership.
- **Organization:** Established formally as EMBL Special Project through a European Consortium Agreement between participating MS and EMBL, which hosts ELIXIR. ELIXIR is based on a 'Hub and Nodes' model. The Elixir Hub is the central coordinating organization (supervised by the ELIXIR Board; under the leadership of the ELIXIR Director). It provides administrative and technical services to ELIXIR and is part of EMBL. The Nodes are national or international research institutes entering into a Collaboration Agreement with the EMBL to provide services with a European dimension that have an added value for ELIXIR.
- **Funding:** Funded through contributions of the participating MS. It also benefits of EU funds through its participation to various H2020 projects. 19

B. ... which provides a large range of services

- **Data:** core data resources (data standards; long-term preservation of core data resources; providing access to data; promoting data management)
- **Tools:** Services & connectors to drive access and exploitation of data
- **Compute:** Access, Exchange & Compute data in a cloud environment
- **Standards:** Integration and interoperability of data and services
- **Training:** Professional skills for managing and exploiting data

<https://www.elixir-europe.org/services>

B. CERN is a frontrunner in digital science

- The **European Organization for Nuclear Research** was founded as an International Organisation in 1954; it is governed by a Council of 22 member states who pay an annual contribution.
- CERN instruments produce **huge volumes of data** and is a **frontrunner in digital science, open access for publications and open data**.
- CERN **data centre** hosts around **10,000 dual-CPU servers** with approximately 300,000 processor cores (plus 100,000 processor cores and around 100 PB (petabytes) of disk space at Wigner data centre in Budapest).
- **Worldwide LHC Computing Grid** (WLCG) with 170 computing centres in 42 countries.
- CERN **stores more than 100PB of physics data** from the Large Hadron Collider (LHC), and **produces roughly 25PB** per year when the LHC is running.
- It is estimated that the computing capacity required in 2025 would be around 50-100 times higher than today. The data storage needs are expected to be in the order of exabytes by that time.

B. ... which is hosting or cooperating with key players

- **CERN – SKA Big Data Cooperation Agreement** addressing joint challenges in approaching Exascale computing and data storage
- **UNOSAT** has been hosted at CERN since 2001. UNOSAT benefits from CERN's IT infrastructure whenever the situation requires, allowing the UN to be at the forefront of satellite-analysis technology. Specialists in geographic information systems (GIS) and in the analysis of satellite data
- CERN hosts **ZENODO**, a catch-all repository for EC funded research. ZENODO helps researchers receive credit by making the research results citable.

Contents

- A. From Vision to Action
- B. Current situation: analysis per country and by key discipline
- C. Stakeholder consultation**
- D. Possible models for the EOSC
- E. EOSC 'federated' model: six lines of action of the implementation Roadmap
- F. Costs and financing of the EOSC: preliminary reflections

C. Stakeholders consultation (1) EU institutions

The **Union institutions** called on the Commission, supported by an inclusive process involving all relevant stakeholders, to:

- present an **implementation roadmap** with clear timelines, actions and budget, including the resources available through Horizon 2020 and within its proposal for FP9;
- explore an appropriate **governance structure**, based on existing initiatives and their sustainability;
- define an **architecture** that ensures information security and personal data protection.

C. Stakeholders consultation (2) stakeholders

HL Expert Group on the EOSC advice:

- need for a federated model with clear **Rules of Engagement** for the access & services
- frame the EOSC as the EU contribution to a future global **Internet of FAIR Data and Services** underpinned by open protocols

EOSC Summit (12 June 2017) outcome:

- the *EOSC Declaration* (26 October) with 33 high level statements covering all areas of implementation of the EOSC: FAIR, architecture, services and governance (70+ signatories so far = 'coalition of doers')
- need for a stakeholder-driven, federated model of implementation

C. Stakeholders consultation (2) stakeholders

Key European e-Infrastructures position papers

- support for the principles in the EOSC Declaration

Consultation on the Long Term Sustainability of ESFRI infrastructures

- interoperability, common services, policies and open data obligations as top requirements to improve data management, better exploiting data and facilitating reuse of research data

C. Stakeholders consultation (4) Studies and reports

Main take-outs support a strong need for:

- Need a policy lead in the initial stage (strategic orientations and long-term public funding)
- Need a multi-layer & multi-stakeholder governance framework with clear institutional, operational and scientific advisory roles
- Need a clear business model
- Importance of the definition of the initial services
- Importance of cost optimisation via synergies

Sources:

- *Study on the appropriate governance of the EOSC commissioned by the EC;*
- *Report on EOSC governance by Science|Business;*
- *Report on the governance aspects of the EOSC by the Open Science Policy Platform;*
- *Two OECD reports on coordination and financing of research data infrastructures;*
- *EOSCpilot deliverable on a Draft Governance Framework for the EOSC;*
- *Review of the governance model proposed for the GO-FAIR initiative.*

Stakeholders meetings: EOSC Summit 2017



EOSC SUMMIT
12 June 2017 - Brussels
Charlemagne building Sicco Masholt Room

European Open Science Cloud
New Research & Innovation Opportunities

EOSC

<http://ec.europa.eu/research/openscience/eosc>
#EOSC

The poster features a central cloud icon with 'EOSC' written inside, surrounded by various icons representing research, data, and technology, all connected by lines. The background is dark blue with glowing light effects.

- **1** panel discussion
- **5** sessions
 - Data culture & data stewardship
 - FAIR Data principles
 - Research data infrastructures and services
 - Funding & governance
 - HPC, big data and super connectivity
- **4** Input papers

Stakeholders meetings: 2nd EOOSC Summit

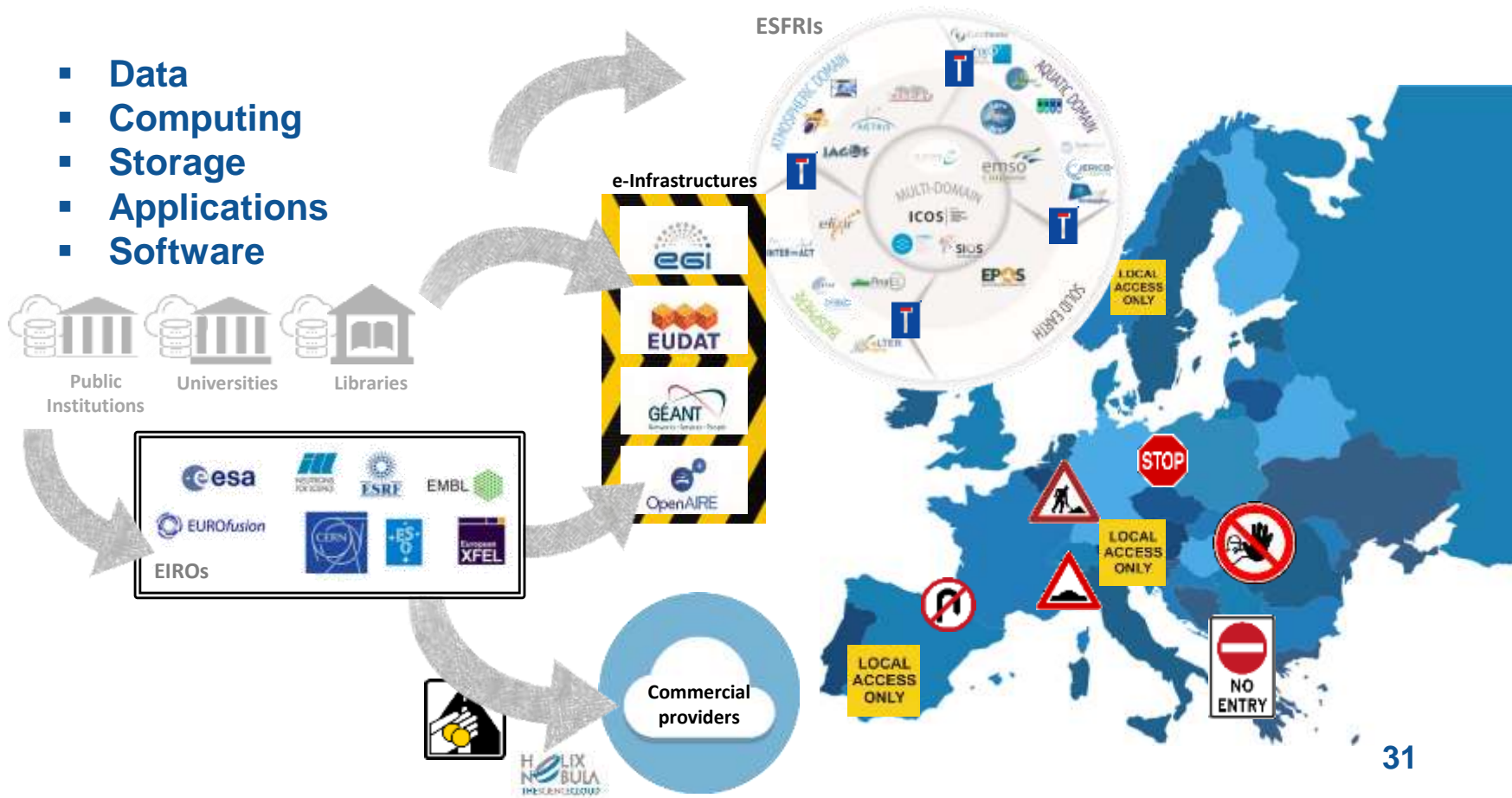
- **11 June 2018, Brussels**
- Meeting of the '**coalition of doers**' demonstrating a continued and consolidated support in building up EOOSC, and to reflect on achievements and progress one year later.
- Launch of the **consultation** on the **Draft Rules of Participation of EOOSC** and **Draft FAIR Data Action Plan**

Contents

- A. From Vision to Action
- B. Current situation: analysis per country and by key discipline
- C. Stakeholder consultation
- D. Possible models for the EOSC**
- E. EOSC 'federated' model: six lines of action of the implementation Roadmap
- F. Costs and financing of the EOSC: preliminary reflections

D. Under the current model, fragmentation and uneven access to information would prevail

- Data
- Computing
- Storage
- Applications
- Software



D. Federated Model

A pan-European federation of data infrastructures built around a federating core and providing access to a wide range of publicly funded services supplied at national, regional and institutional levels, and to complementary commercial services.

1. Federating existing resources (data infrastructures) under guidance of a common governance framework.
2. Offering a universal entry point ('EOSC portal') but not exclusive of other access channels.
3. Developing common specifications and tools to make data FAIR, solutions to ensure legal compliance (in part. GDPR and cybersecurity laws), adoption of existing or new schemes to certify data repositories and service providers as FAIR-compliant.
4. Providing non-discriminatory access to common core services and to building blocks for developing new, added value services.
5. Agreeing on possible mechanisms for cost recovery on cross-border access and facilitating joint procurement, integration of services as well as development of new services.
6. Ensuring long term sustainability of the federating core via the governance framework.
7. Identifying duplications and monitoring actual use, to foster economies of scale/scope.

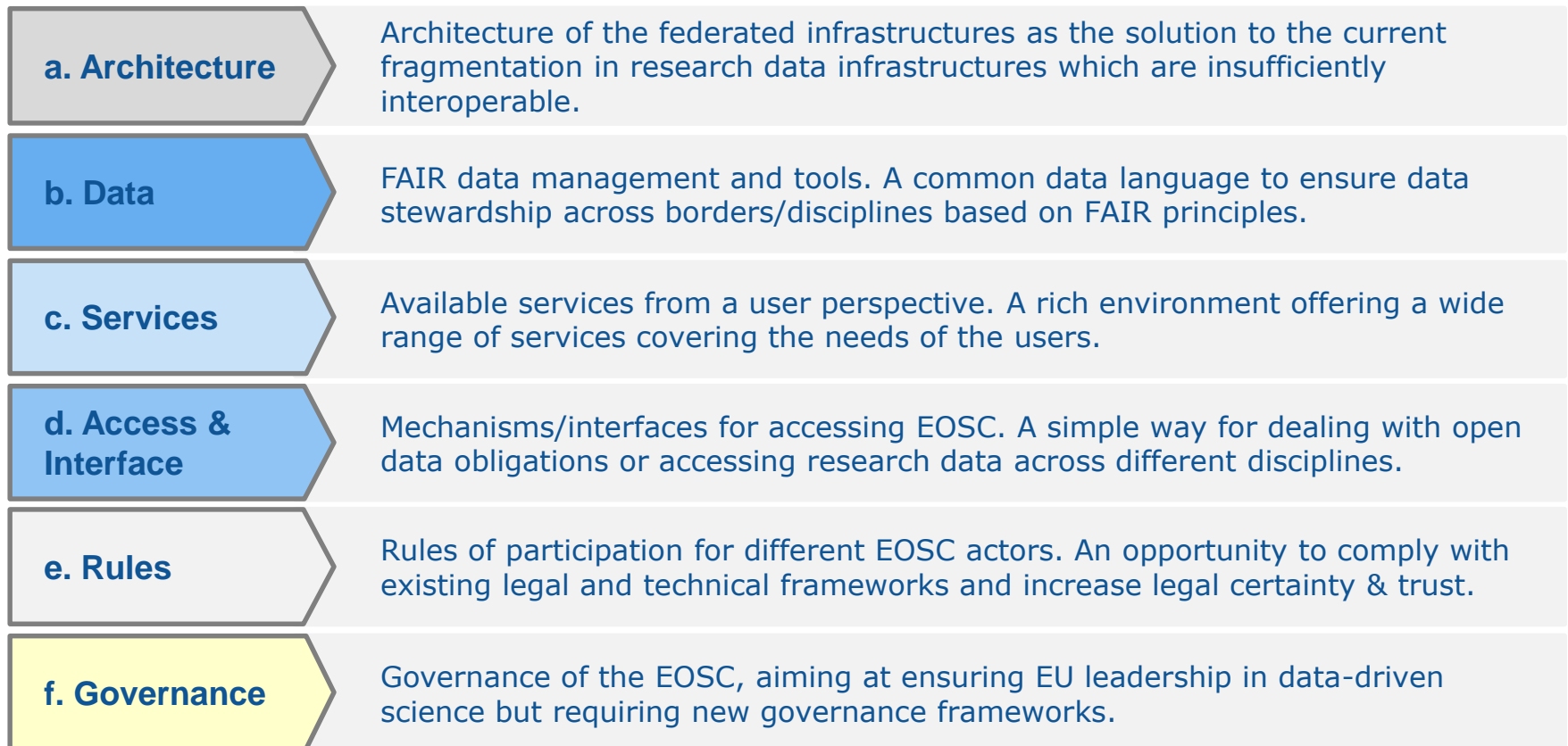
D. Differences between EOSC models

	Current model	Federated	Centralized model
Resources	Fragmentation of resources and access to them	Integrated access to federated resources for ALL researchers	Access to a single data device (storage; single supercomputer?) for ALL researchers
Services	Varying quality of services currently	Service standards for all federated resources	Centrally decided standards
Interoperability	Varying levels of interoperability standards	Common standards for all federated resources	Centrally decided interoperability standards
Governance	Fragmented across 100+ institutions	Layered governance for EOSC participants – balanced stakeholders, MS, EC - with specific rules	Single body, centralized governance set up by EC
Costs & time to implement	Baseline	Marginally higher than baseline	Substantially higher than baseline
MS and stakeholder acceptance	Low	High	Extremely low

Contents

- A. From Vision to Action
- B. Current situation: analysis per country and by key discipline
- C. Stakeholder consultation
- D. Possible models for the EOSC
- E. EOSC 'federated' model: six lines of action of the implementation Roadmap**
- F. Costs and financing of the EOSC: preliminary reflections

E. The 6 lines of action of the EOSC model





(a) EOSC Model - Architecture of the federated infrastructure

- A **pan-European federation of data infrastructures** built around a federating core and providing access to a wide range of publicly funded services supplied at national, regional and institutional levels, and to complementary commercial services.
- It would essentially comprise **a federating core and a variety of federated research data infrastructures** committed to providing services as part of the EOSC.
- The **federating core** is understood to be constituted by EOSC shared resources and by a compliance framework including notably the Rules of Participation. The Horizon 2020 Work Programme foresees developing the initial shared resources around the EOSC-hub project, the EOSC Portal and a catalogue of data infrastructures and services.
- The **progressive federation** over time of existing service providers in the EOSC would provide a single, coherent access channel to EOSC services at European level that meets researchers' needs for data sharing, management and computing.



(a) EOSC Model - Architecture: main actions

- 1. Organise and operationalise** the components of **the EOSC federating core** (e.g. **EOSC shared resources, EOSC platform, compliance framework**), to facilitate, monitor and regulate as appropriate day-to-day transactions across the federation.
- 2. Survey national, horizontal and thematic data infrastructures** (e.g. research data repositories, service providers, scientific networks, RI and eInfras) to establish their interest, willingness and ability to join the development phase of the EOSC.
- 3. Define the requirements for EOSC components and FAIR-accredited/certified data infrastructures**, based on the adherence to the EOSC Rules of Participation.
- 4. Establish and update** the **registry of federated data infrastructures** to monitor and enforce compliance of the rules and commons through e.g. the FAIR accreditation/certification scheme.

Building on: "EOSC Hub", "OpenAIRE", "FREYA" and "EOSC pilot" projects; MERIL and RICH projects.



(a) EOSC Model - Architecture: the federating core

To develop **shared resources** as part of the **federating core**. In the initial phase, Horizon 2020 projects, notably the EOSC-hub, would provide an access channel complementing the access mechanisms in use at different data infrastructures.

A **portfolio of H2020 funded projects** will **provide horizontal services** such as a portal, authentication and authorisation and security services, allowing users to access the computing, data and services of pan-European and disciplinary research data infrastructures, which already federate data infrastructures at the European level.

A **catalogue of EOSC services**, including both thematic and generic services – for data storage, management and analytics, simulation and visualisation, distributed computing, etc. will help researchers to discover, select and use the services they need.



(a) EOSC Model - Architecture: federated data infrastructures

To connect to the core a large number of *research data infrastructures, in the context of EOSC shared resources and by a compliance framework including notably the Rules of Participation.

The hub would relay the resources and the services of data infrastructures funded at EU, national and regional level. Services and resources might be both generic and thematic-specific.

The progressive federation over time of existing service providers in the EOSC would provide a single, coherent access channel to EOSC services at European level that meets researchers' needs for data sharing, management and computing.

*NOTE: This terminology is widely understood; it has been discussed for the preparation of OECD reports, FRASCATI manual, EOSCPilot deliverables. Specifically, research data infrastructures refer both to international research data networks and to research data repositories.



(a) EOSC Model - Architecture: process of federation (principles)

The process of federation of resources would be implemented gradually, based on simple guidelines consistent with existing good practices:

- data infrastructures would enter the federation on a voluntary basis based on the commitment of resources and on the capacity to comply with its rules; minimum commitments would be set in the Rules of Participation;
- data infrastructures would define the extent of their own involvement in the federation, in terms of the data sets and services they would contribute to the EOSC; their commitment would be limited to these;
- data infrastructures would continue to follow their own rules outside of their specific commitments to the EOSC;
- data infrastructures would operate in the EOSC according to FAIR data principles and seek to become FAIR-accredited/certified entities;
- the structuring of the EOSC federation would occur flexibly, in response to actual needs and requests; i.e. data infrastructures that already have the capacity, commitment and added value to facilitate/coordinate EOSC operations at a geographical or thematic level could seek to become EOSC federated centres;
- the federation would entail as few constraints as needed to deliver the expected EOSC services.



(a) EOSC Model - Architecture: examples of federation resources

- Connection of ESFRI projects to the EOSC (INFRAEOSC-04-2018), WP 2018-2020
- Federation of WP 2018-2020 activities on food security, sustainable agriculture and forestry, marine, maritime and inland water research and the bio-economy; two topics, one each for developing and building cloud services on food data and ocean data, in such a way that they can be eventually federated into the EOSC.
- Connecting activities in health, in WP 2018-2020 the Health Research and Innovation Cloud (HRIC), which aims to structure first and later establish a thematic cloud for health-related research, in strict relation with the EOSC.
- Federation of Copernicus's Data and Information Access Services (DIAS), which provide access, tools and processing capabilities for scientists and innovators to exploit this data. DIAS are operated by the industry and will offer additional services in the EOSC under commercial conditions.

(a) Milestones for EOSC architecture (SWD and interim steps)

- Q4 2018** Prototype of the EOSC hub (by EOSC hub project)
- Q2 2019** Minimal requirements for becoming an EOSC federated centre or a FAIR-accredited/certified data infrastructure
- Launch of a wide survey of European data infrastructures, including RIs and eInfras (by EC)
- Q4 2019** Initial list of eligible and interested data infrastructures
- Initial EOSC federating core in place**
- Q4 2019** **Registry of data infrastructures of the EOSC (initial)**
- Q2 2020** **Preliminary connection of most infrastructures and services to the EOSC**



(a) EOSC architecture timeline

Actions	Before EOSC Governance established				Under EOSC Governance framework							
	Q1 2018	Q2 2018	Q3 2018	Q4 2018	Q1 2019	Q2 2019	Q3 2019	Q4 2019	Q1 2020	Q2 2020	Q3 2020	Q4 2020
Organise and operationalise the different components of the EOSC federating core												
Survey national, horizontal and thematic data infrastructures												
Define the requirements for EOSC nodes and FAIR-accredited/certified data infrastructures												
Establish and update the registry of the federated data infrastructures												

(b) EOSC model: Data

Need to develop **EOSC shared resources** (FAIR data tools, specifications, catalogues and standards, and services) to be used by all researchers, implemented by all data infrastructures and mandated by research funders; covering all FAIR aspects.

The process for defining shared resources across disciplines and countries should be **staged, iterative and flexible**: (1) take stock and collect current tools/practices, (2) analyse and streamline, and (3) agree, catalogue, certify and implement as part of the EOSC Shared resources and EOSC rules.

Its success will depend on the **combination with other measures**:

- ✓ Developing a better **culture of research data management** and practical skills among scientists and innovators, including incentives, rewards and curricula
- ✓ Stimulating the demand for FAIR data through consistent **FAIR data mandates and incentives** by research funders and institutions

(b) EOSC model/Data: Main actions

1. Work towards a **FAIR Data Action Plan**
2. Propose a **European Framework for FAIR Research Data** in line with the existing European Interoperability Framework
3. Analyse the **legal landscape** concerning data reusability
4. Develop a **FAIR Data accreditation/certification** scheme
5. Establish a cross-disciplinary **Persistent Unique Identifier** policy
6. Develop a **Catalogue of data standards**

Building on: "FREYA", "OpenAIRE", "RDA Europe", "eInfraCentral", "EOSC Hub" projects and other EOSC-related projects

(b) EOSC model/Data: FAIR Data Action Plan

Objectives:

- To identify, prioritise and promote high-value actions until 2020 to **operationalise the FAIR data principles** and to allow researchers to share and reuse research data across disciplines and borders.

Scope:

- To cover not only data but also data-related algorithms, tools, protocols and other kinds of **digital research objects**.
- To be technology and implementation **neutral**.

Process:

- FAIR Data Expert Group will draft the FAIR Data Action Plan and consult with stakeholders.
- Involvement of organisations active in the practical implementation of the FAIR data principles at European and global level (e.g. RDA, CODATA, WDS, GO-FAIR) via dedicated events and consultations (e.g. June 2018 EOSC Summit).

(b) EOSC model/Data: EU framework for FAIR research data

Objectives:

- To emphasise on how FAIR data principles should apply in practice.
- To define a set of basic FAIR data guidelines in the form of recommendations, as a commonly agreed approach to the implementation of the FAIR Data Action Plan.

Scope:

- Developed as a generic framework.
- To provide guidance on how to design and update national and/or discipline specific FAIR-related policies via tailoring and customization at national and/or discipline level.

Process:

- Open and collaborative.
- Inspired and aligned with the European Interoperability Framework.

(b) EOSC model/Data: Data legal landscape

Objectives:

- To screen existing legislations to identify: a) **barriers** to the implementation of the FAIR data principles (e.g. sectorial or geographical restrictions, different and vague data licence models, etc.), b) **opportunities** to comply in a simple, clear and harmonised way to the applicable legal frameworks.

Scope:

- To analyse the different applicable legal frameworks (e.g. **GDPR, Free flow of data initiative and copyright laws**), policy implementation plans and strategies.

Process:

- The Executive Board (and FAIR Data WG) will propose and steer this action.

(b) EOSC model/Data: FAIR Data certification scheme

Objectives:

- To develop an **accreditation/certification scheme for FAIR data infrastructures**, together with all relevant support (e.g. technical, organisational, legal training and capacity building).

Scope:

- To cover research **data repositories, service providers, datasets and other types of digital research objects**.
- To cover the **4 individual FAIR principles**.

Process:

- to be elaborated progressively, taking into account the level of maturity of the individual FAIR principles & building on existing work at discipline/MS level.
- The Executive Board (and FAIR Data WG) will steer this action on the basis of the work of **INFRAEOSC-05**.

(b) EOSC model/Data: FAIR Data Persistent Unique Identifier

Objectives:

- To establish a common, cross-disciplinary and cross-border **policy for the management of EOSC persistent unique identifiers**, guaranteeing long-term persistence, resolvability and quality of all types of digital research objects.
- To propose a **governance/mechanism for overseeing and coordinating the implementation** of the persistent URI policy.

Scope:

- To address the issues of changing namespaces, synonyms (duplicates), lack of service guarantees etc.

Process:

- The Executive Board (and FAIR Data WG) will steer this action.

(b) EOSC model/Data: Catalogue of FAIR data standards

Objectives:

- To create and maintain a machine-readable **catalogue of recommended data standards** for FAIR research data.
- To propose a **governance/mechanism for overseeing and coordinating the development** of the catalogue of data standards.

Scope:

- To be used within and across disciplines and borders

Process:

- The Executive Board (and FAIR Data WG) will steer this action.

(b) EOSC model/Data: Milestones (**SWD** and interim steps)

- | | |
|---------|---|
| Q3 2018 | FAIR Data Action Plan including proposal for a European Framework for FAIR Research Data |
| Q2 2019 | European Framework for FAIR Research Data
FAIR Data Legal landscaping |
| Q4 2019 | FAIR Data accreditation/certification scheme
FAIR Data Persistent Unique Identifier policy
Initial Catalogue of data standards |
| Q2 2020 | Catalogue of data standards |

(b) Timeline for Data actions

	Before EOSC Governance established				Under EOSC Governance framework							
Actions	Q1 2018	Q2 2018	Q3 2018	Q4 2018	Q1 2019	Q2 2019	Q3 2019	Q4 2019	Q1 2020	Q2 2020	Q3 2020	Q4 2020
Propose a European Framework for FAIR Research Data in line with the existing European Interoperability Framework												
Analyse the legal landscape concerning data reusability												
Develop a FAIR Data accreditation/certification scheme												
Establish a cross-disciplinary Persistent Unique Identifier policy												
Develop a Catalogue of data standards												

(c) EOSC model/ services for European researchers

A researcher will find five types of services in the EOSC:

1. Identification and authentication, and an access point and routing system towards the resources of the EOSC
2. A protected & personalised work environment/space (e.g. logbook, settings, compliance record and pending issues)
3. Access to relevant information (e.g. status of EOSC, list of infrastructures, policy-related information, compliance framework) and specific guidelines (e.g. how to make data FAIR, certify a repository or service, procure joint services)
4. Services to find, access, store, re-use and analyse (e.g. analytics, data merge/fusion, mining) the data generated by others, catalogued appropriately
5. Services to make their own data FAIR, to store them and ensure long-term preservation

Researchers would NOT have to pay for most services under 1, 2, 3 & 4, but may need co-funding via a grant or other mechanism for services under 4 & 5 (especially when big data is involved, customization required or great computation power).

(c) EOSC model/services: main actions

- 1. Survey user communities** to identify their current and potential needs in terms of data services.
- 2. Collect, assess and document services** currently provided by e-Infrastructures and RIs.
- 3. Define an initial catalogue of services** to be provided via the EOSC.
- 4. Define delivery model(s) for services**, and **identify actors and resources** needed.
- 5. Map offer against demand**, identifying **gaps**, i.e. needs that are partly or not covered at all.
- 6. Monitor and assess service use, review/adapt delivery model**, call for integration of new services.
- 7. Prototype and test new services.**

Building on: eInfraCentral, OpenAIRE advance and EOSC-hub projects

(c) EOSC services: milestones (SWD + interim steps)

- | | |
|----------------|--|
| Q4 2018 | Initial EOSC Catalogue of services accessible & prototype EOSC Portal accessible |
| Q1 2019 | First (initial) user needs report - annual updates with growing coverage of scientific communities

Service offer initial report and annual updates with expanding coverage of eInfras and RI services |
| Q2 2019 | Initial EOSC Catalogue of datasets accessible

EOSC service delivery model(s)

Identification of service gaps |
| Q4 2019 | Updated EOSC Catalogue of services & EOSC Portal

Monitoring (regular) and annual assessment of services used |
| Q4 2020 | Definition/specification of new services |

(c) A timeline for the EOSC Services

Actions	Q1 2018	Q2 2018	Q3 2018	Q4 2018	Q1 2019	Q2 2019	Q3 2019	Q4 2019	Q1 2020	Q2 2020	Q3 2020	Q4 2020
Survey user communities	[Green shaded area]			X				X				X
Collect, assess and document services				X					X			
Define an initial catalogue of services						X	[Light blue shaded area]					
Define delivery model(s) for services; identify actors and resources needed.												
Map offer against demand, identifying gaps	[Light blue shaded area]											
Monitor and assess service use												
Prototype and test new services	[Light blue shaded area]											

(d) EOSC model/access & interface

A user should have the choice between different entry points for accessing EOSC services, for practical reasons and to ensure a smooth transition from legacy systems. These different entry points to the EOSC should be similar but not equivalent, all consisting of:

- a **web-based user interface** / front-end, tailored to the specific needs and context of particular user communities, including individual data infrastructures. These entry points would need to comply with a set of minimum requirements.
- a **common platform (building on the "EOSC Hub" project and further developed in the INFRAEOSC 2020 call)** or back-end, offerings access to all EOSC shared resources (cf. data pillar) and to the full range of EOSC services via machine-to-machine interfaces.

By default, EOSC services should be accessible via the EOSC portal, which should act as a universal entry point for all potential users via a full-fledged user interface, irrespective of geographic location or scientific affiliation.

(d)EOSC model/ access & interface: main actions

EOSC platform:

1: Define the **specification of a common metadata for datasets** to facilitate data findability, cross-reference and interoperability between data catalogues across disciplines/MS, supported by the "EOSC Hub" and INFRAEOSC projects; the capacity to describe a dataset using this common metadata will be a prerequisite for being referenced in the EOSC catalogue of datasets.

2: Define the **specification of a common metadata for services** to facilitate service findability, cross-reference and interoperability between service catalogues across disciplines/MS, supported by the "e-InfraCentral" and "EOSC Hub" projects; the capacity to describe a service using this common metadata will be a prerequisite for applying to the EOSC catalogue of services.

4: Develop the **beta-version of the EOSC platform**.

EOSC portal:

5: Develop the **EOSC portal** offering access to the full range of EOSC services based on the EOSC Hub, eInfraCentral and the INFRAEOSC-06(a) projects.

(d) EOSC a model/access & interface: common metadata specifications & catalogues

- **Objectives:**
 - To agree on common, minimal, rigorous and machine-readable metadata specifications for the description of: a) services and b) datasets, federated to the EOSC.
 - To make generic and thematic services available on a common federated catalogue of services.
 - To make European research datasets available on a common federated catalogue of datasets.
- "eInfraCentral" and "EOSC Hub" projects, with the support of the "EOSCpilot" project, will develop the common specification for the description of EOSC services and the EOSC service catalogue.
- "EOSC Hub", with the support of "EOSCpilot" and other projects via INFRAEOSC (if needed), will develop the common specification for the description of EOSC datasets and the EOSC data catalogue.
- Organisations active on the practical implementation of the FAIR principles at European and global level (e.g. RDA, GO-FAIR, CODATA) will be involved and used as forums to reach consensus.
- The EU Rolling Plan for ICT Standardisation will be taken into account as an instrument for the development of missing specifications.



(d) EOSC model/ access & interface: EOSC portal

▪ Objectives:

- To build a universal entry point (the EOSC portal) to the EOSC service and data gateways, accessible by all potential users via a full-fledged functional/comprehensive user interface, irrespective of geographic location or scientific affiliation.
 - To provide policy-related information such as: a) the mission and vision of the EOSC as a policy action, b) information related to the implementation of the EOSC (roadmap, national initiatives, FAIR action plan implementation), c) information on the governance of EOSC and d) the rules of Participation for all EOSC actors.
 - To provide access to federated services and data catalogues.
- INFRAEOSC-06(a) project, leveraging and integrating outputs from projects such as "eInfraCentral" and "EOSC Hub", will further develop the EOSC portal.

E(d) EOSC model- access & interface: milestones (SWD and interim steps)

- Q4 2018** Specification of a common metadata for datasets
Specification of a common metadata for services (based on "EOSC Hub" project)
Prototype of the EOSC portal accessible (based on "EOSC Hub" and "eInfraCentral" projects)
- Q2 2019** **Initial EOSC catalogue of datasets**
- Q4 2019** **Updated EOSC portal**
- Q2 2020** **Preliminary connection of most data infrastructures and services to the EOSC**

(d) Timeline for EOSC access & interface

Actions	Before EOSC Governance established				Under EOSC Governance framework								
	Q1 2018	Q2 2018	Q3 2018	Q4 2018	Q1 2019	Q2 2019	Q3 2019	Q4 2019	Q1 2020	Q2 2020	Q3 2020	Q4 2020	
Define the specification of a common metadata for datasets													
Define the specification of a common metadata for services													
Develop the beta-version of the EOSC platform													
Develop the EOSC portal offering access to the full range of EOSC services													



(e) EOSC model/ Rules of Participation

- The rules of participation define **the rights, obligations and accountability** of the various EOSC actors (notably data producers, service providers, data/service users) against:
 - agreed tools, specifications, catalogues and standards (**'EOSC shared resources'**) and applicable methodologies (framework for FAIR research data)
 - adopted **principles for regulating transactions** in the EOSC (e.g. financial mechanisms and procedures, agreements/bylaws established by the EOSC governance framework)
 - applicable **legal frameworks** (e.g. GDPR, copyright rules, Data Security and Cybercrime, dispute resolution and redress mechanisms, e-commerce directive)
- However, there is room and need for **differentiating the rules** applicable to **different EOSC actors** depending on their maturity and role and taking into consideration:
 - The **specificities of different scientific disciplines**
 - The **diversity and level of readiness of infrastructures and services** at discipline, MS and EU level (RIs, eInfras) and the differences in their established rules and processes
 - The **variety of service providers and users** that will be involved in the EOSC (e.g. public vs private; horizontal vs specialised)
 - **changing needs and practices** regarding the implementation of the rules, in particular concerning compliance with existing legal frameworks (e.g. GDPR) and emerging ones (e.g. free flow of data)



(e) EOSC model / Rules of Participation (RoP): main actions

- 1. Scope the Rules of Participation**, identifying the **main topics** that should be covered and setting out the **key principles**.
- 2. Draft** the **set of rules** and **consult stakeholders**.
- 3. Mandate** the **Governance** framework to **elaborate further** the draft set of rules.
- 4. Finalise** and **publicise the Rules of Participation**.
- 5. Foster** and **monitor uptake** and **compliance** of (relevant) rules by the various EOSC stakeholders.

Building on: "EOSCpilot", "HLEG EOSC", "EOSC Hub", "OpenAIRE", DG RTD and INFRA EOSC-05(a) projects

(e) EOSC model/ Drafting the Rules of Participation

- Building on the work of the "EOSCpilot", (1) the Rules of Participation (RoP) will be scoped, identifying the main topics that the RoP should cover (e.g. financial mechanisms and procedures, legal aspects, Fair Data principles, interoperability) and setting out the key principles,
- and (2) initial recommendations on RoP will be drafted by the High Level Group for EOSC for scientific users and service providers in the EOSC and consulted with the stakeholders.
- The Governance structure will further elaborate the RoP through a dedicated WG (+stakeholders) and with the support of the INFRA EOSC-05(a) project. This work will take into account the need for differentiating the rules applicable to different EOSC actors depending on their role and taking into consideration the diversity of infrastructures and services and the variety of service providers.



(e) EOSC model: adopting and enforcing Rules of Participation

- The recommendations on RoP will cover a minimum defined set of rules and practices for EOSC participation and function.
- The Executive Board proposes the final RoP to the EOSC Board for adoption.
- The EOSC Board adopts the RoP and publishes & disseminates the final RoP.
- The Governance framework fosters and monitors the uptake and compliance of the (relevant) RoP by the various EOSC stakeholders.

(e) Milestones for EOSC rules (SWD and interim steps)

- Q2 2018** Scoping and guiding principles for the EOSC rules of participation
- Launch of a stakeholder consultation
- Q1 2019** **Initial EOSC rules of participation** (by the Governance structure)
- Q4 2019** **Final EOSC rules** based on the development of the federating core (e.g. shared resources, compliance and governance frameworks)
- Regular monitoring and annual reports on uptake of and compliance with EOSC rules

(e) A timeline for the EOSC Rules of Participation

Actions	Before EOSC Governance established				Under EOSC Governance framework							
	Q1 2018	Q2 2018	Q3 2018	Q4 2018	Q1 2019	Q2 2019	Q3 2019	Q4 2019	Q1 2020	Q2 2020	Q3 2020	Q4 2020
Scope the Rules of Participation	█											
Draft the set of rules and consult stakeholders			█									
Mandate the Governance framework to elaborate further the draft	█			█					█			
Finalise and publicise the Rules of Participation				█			█					
Foster and monitor uptake and compliance	█							█				

(f) EOSC Model: scope of Governance

- **The EOSC governance should support well-defined functions...**
 - **Strategy** e.g. setting long-term orientation and priorities, deciding on compliance
 - **Implementation** e.g. setting budgetary orientations
 - **Monitoring** e.g. setting out KPI
 - **Reporting** on progress

- **... exercised within a clear and bounded remit**, including notably:
 - **European framework for FAIR research data**
 - **EOSC shared resources**
 - **Rules of Participation**
 - **EOSC Portal**

(f) EOSC Model: Governance guiding principles

- **Staged approach in setting governance:**
 - **Phase 1 (<end 2020):** steering and overseeing the initial EOSC development, primarily led by MS and EC, with stakeholders consulted and advising
 - **Phase 2 (>2020):** (following a thorough evaluation) steering and overseeing initial EOSC operations and further development, largely stakeholder-driven, with MS/EC keeping a higher-level oversight role
- **Guiding principles for 1st phase, supported by EOSC Declaration:**
 - Separation between advisory role, decision-making and implementation
 - Stakeholders (mainly) advise, propose and implement, while funders (MS/EC) (mainly) set orientations and endorse proposals,
 - Low intervention cost, light mechanisms, high accountability
- **Any proposal for governance in 2nd phase would be included in FP9 proposal**

(f) EOOSC Model: Governance framework

- **Three layer structure as per consultation:**
 - **EOOSC Board** of MS/AC and EC representatives to ensure effective supervision of EOOSC implementation
 - **Executive Board** of stakeholder representatives to help ensure proper EOOSC implementation and accountability
 - **Stakeholder Forum** to provide input from a wide range of actors

- **Further orientations for the set-up and composition of the Governance framework, to inform the consultation of MS without prejudging possible future decisions by the Council and the Commission**

f) EOSC Model: Governance structure

▪ EOSC Board (MS & EC):

- Sets strategy (initially roadmap) and approves work plan
- Runs a standing search committee for suitable candidates and designates/approves the members of the Executive Board
- Monitors achievements through KPIs
- Meets 1 to 3 times a year
- Ensures coordination with relevant MS/EC initiatives
- Membership:
 - > 1 delegate per EU Member State (and Associated Country)
 - > 2 delegates of the EC (DG RTD and DG CNECT)
 - > Chair and Vice-Chair(s) elected amongst MS/AC delegates

▪ Stakeholders Forum:

- Open to all stakeholders involved in research data management, e.g. scientific/user communities, research institutions, research infrastructures and eInfras
- Provides advice and acts as a sounding board to the Executive Board
- Contributes on a voluntary and need basis to the WGs of the Executive Board
- Membership:
 - > any stakeholder organisation involved in research data stewardship
 - > notably research institutions, research infrastructures and eInfras
 - > no limitations in number
 - > compulsory: having signed up to EOSC Declaration

(f) EOSC Model: Governance framework

- **EOSC Board (Member States, Associated countries & EC) ensures effective supervision of implementation of EOSC implementation, notably:**
 - approves the list of the Executive Board members
 - decides strategic orientations and approves annual work plan
 - assesses the progress of EOSC implementation
 - ensures coordination with relevant MS/EC initiatives
 - discusses new activities to support EOSC, incl. long term sustainability
- **Decisions of EOSC Board are not binding on its members, nor engage their financial responsibility.**

(f) EOSC Model: Governance framework

- **Executive Board (European stakeholder organisations) advises on EOSC implementation and assists with transition beyond 2020, notably:**
 - proposes the strategy and the annual work plan
 - drafts the final and updates the rules of participation
 - helps oversee/steer implementation of agreed work plan with the help of WGs
 - monitors the progress of EOSC implementation
 - proposes how to broaden user base (to public sector & industry)
 - channels input/advice from stakeholders and ensures coordination with relevant stakeholder initiatives

- **Indicatively 10 members including Chair & Vice-Chair, selected following transparent procedure & objective criteria for initial term of 2 years; proceedings fully transparent to manage risk of conflict of interest.**

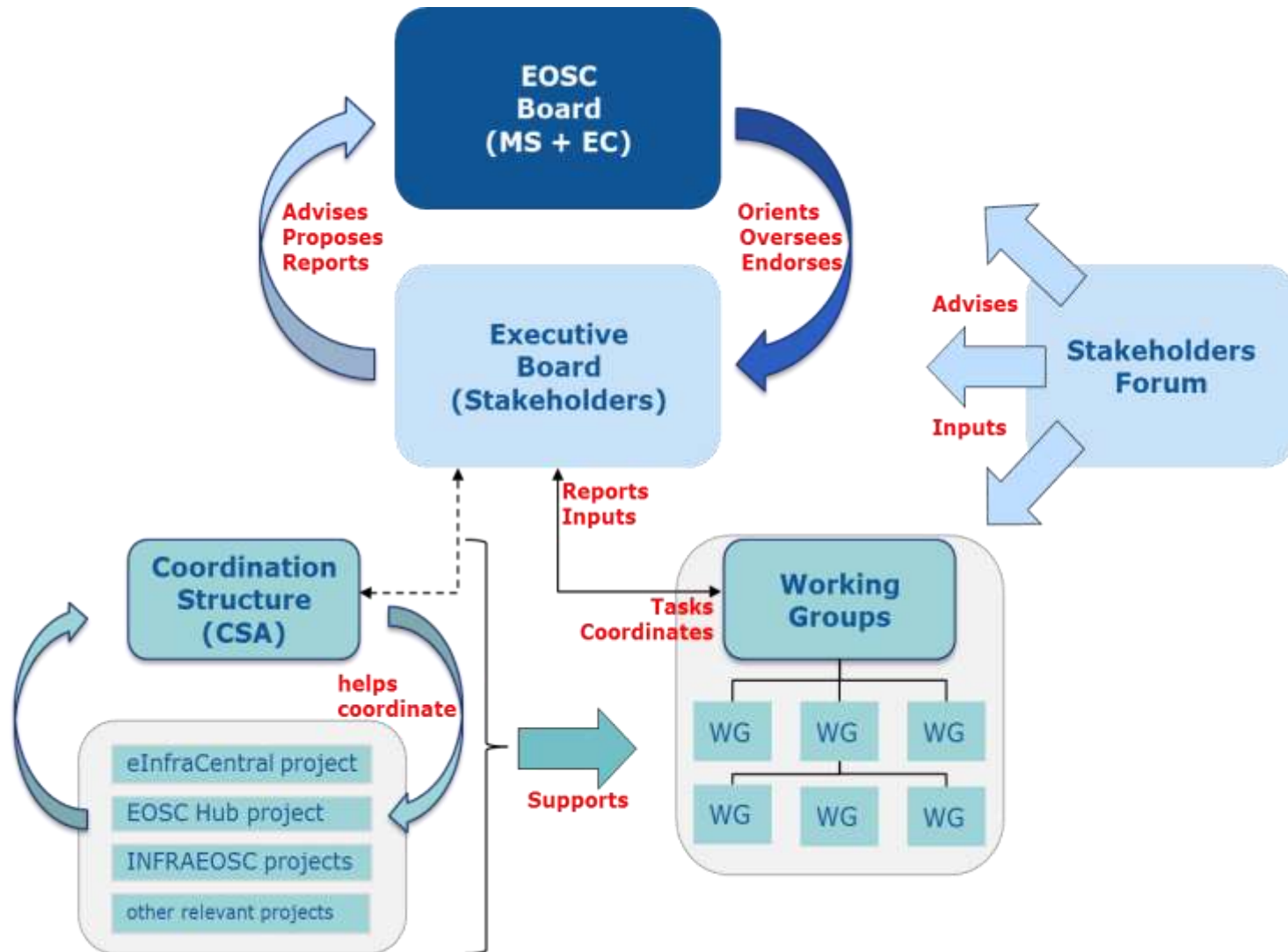
(f) EOSC Model: Governance framework

- **Working Groups set up by the Executive Board could be tasked to:**
 - map the needs of scientific communities
 - channel insight from other research data management initiatives
 - advise on elaboration and implementation of FAIR data action plan
 - identify emerging risks and propose mitigation measures
 - address education and outreach
 - assist the coordination of the EOSC with similar international initiatives

- **Stakeholder Forum (bringing together all stakeholders adhering to EOSC principles, e.g. EOSC Declaration signatories) provides wider input in a consultative role, notably:**
 - gathers intelligence
 - acts as a sounding board

(f) EOSC Model: Governance framework

- **The Coordination Structure to be set up through the Call INFRAEOSC-05 (a) will implement its activities under the steering and supervision of the Executive Board, and will notably:**
 - provide full administrative support to the Executive Board
 - help coordinate all EOSC-relevant activities funded under H2020 and beyond
 - support appropriate coherence/coordination amongst relevant projects
 - bring to the attention of the Executive Board relevant building blocks for the implementation of the EOSC work plan





(f) EOSC Governance: main actions

1. Based on the **governance models proposed by stakeholders** and presented in the roadmap, **consult with Member States** (Council Conclusions);
2. Carry out **preparatory work** in support of the set-up and initial operation of the EOSC governance framework;
3. Formally **set up the EOSC governance framework** and adopt the initial strategy and work plan;
4. The EOSC Board elaborates on **EOSC strategic and financing orientations.**

Building on: "EOSCpilot" and "INFRA EOSC-05(a)" projects

(f) Actions for EOSC Governance: in detail, 1/4

Based on the governance models proposed by stakeholders and presented in the roadmap consult with Member States

The model of governance as emerged from the consultation is inspired by existing models, and takes into consideration the representation in it of all important actors for the sustainability of the EOSC ecosystem.

MS are consulted in the context of the RWP of the Council on the governance, its mission and mandate and the processes on the selection and setup and its initial work plan.

MS approve the setup and mandate of the different components of the governance framework through Council conclusions.

(f) Actions for EOSC Governance: in detail, 2/4

Preparatory work to support the set-up and initial operation of the governance is carried out

The EC, with the support of the EOSC Pilot project, elaborates processes and documents that support the setup and initial phase of the EOSC governance. This includes the procedures for selecting and instituting the Executive Board, through e.g. establishing a standing search committee for suitable candidates (similar to the procedure used for identifying new members of the ERC Scientific Council).

MS and the EC decide the setup and membership of the EOSC Board.

The EC prepares initial documents to be further elaborated by the Governance framework in its initial phase, such as the draft Rules for Participation and draft shared resources.

(f) Actions for EOSC Governance: in detail, 3/4

The EOSC governance is formally set up and initial strategy and work plan are adopted

The EOSC governance is set up as an agreement of the MS at the ministerial level. The EOSC Board is set up first, made up of representatives of MS/AC and the EC; subsequently the Executive Board is set up and approved by the EOSC Board; the Working Groups are set up and members selected by the Executive Board.

Upon its establishment, the EOSC governance further elaborates on the work by the EC and adopts its initial strategy and work plan. The operations of the EOSC governance are supported by EC funding through the call INFRAEOSC 05(a).

(f) Actions for EOSC Governance: in detail, 4/4

The EOSC Board elaborates on the strategic and financing orientations of the EOSC

Shared strategic and financing orientations shape the decisions on the later stage of the EOSC, post-2020. The aim is to reach alignment in strategic planning and funding mechanisms/streams among MS and the EC such that will lead to economies of scale at the pan-European level and will secure the sustainability of core shared services and processes.



(f) EOSC model - governance: milestones (SWD and interim steps)

- March 2018** **SWD including a possible EOSC Governance** model based on consultation results
- May 2018** **Council Conclusions** including on the EOSC Governance
- Q3 2018** Preparatory work in support of the set-up and initial operation of the EOSC governance framework
- Q4 2018** **EOSC Board established**
Executive Board and Stakeholder Forum first meetings
First annual work plan adopted by the Governance structure
- Q3 2020** **Recommendations on future strategic and financial orientation** of the EOSC by the Governance structure

E. A timeline for the EOOSC governance

Actions	Before EOOSC Governance established				Under EOOSC Governance framework								
	Q1 2018	Q2 2018	Q3 2018	Q4 2018	Q1 2019	Q2 2019	Q3 2019	Q4 2019	Q1 2020	Q2 2020	Q3 2020	Q4 2020	
Based on the governance models proposed by stakeholders and presented in the roadmap consult with Member States (Council Conclusions)													
Carry out preparatory work in support of the set-up and initial operation of the EOOSC governance framework													
Formally set up the EOOSC governance framework and adopt the initial strategy and work plan													
The EOOSC Board elaborates on EOOSC strategic and financing orientations													

Contents

- A. From Vision to Action
- B. Current situation: analysis per country and by key discipline
- C. Stakeholder consultation
- D. Possible models for the EOSC
- E. EOSC 'federated' model: six lines of action of the implementation Roadmap
- F. Costs and financing of the EOSC: preliminary reflections**

F. Financing structure of the EOSC Model

- The Value Proposition of the EOSC is to significantly and sustainably improve the quality, efficiency and impact of science (by supporting the full development of open science, data-driven science, interdisciplinary research and open innovation) for a relatively marginal cost compared to past and planned public investments in research.
- This cost comes in the form of an initial investment spread over a limited period in time to transform the current processes, skills and tools for research data management across Europe.
- Starting assumptions:
 - The primary aim of EOSC is **improving science not saving costs**
 - The EOSC is expected to **yield a significant return on investment** and some cost **efficiency gains in the medium- and long-term**, when considering the European science system globally.
 - However, in the short term, developing the EOSC will **imply costs** that need to be estimated and budgeted.
 - The true cost of EOSC must be estimated on the basis of a proper **baseline**, which is the projection of the costs of the current situation (cf section B).

F. Financing structure of the EOSC Model

- Further assumptions:
 - This baseline includes not **only the current and expanding costs of research data management** across Europe but also **the planned or necessary costs for aligning, federating** and where appropriate **integrating research data infrastructures** at a national level and/or at the level of individual disciplines. Irrespective of the EOSC initiative, all modern research systems will make research data FAIR and will upgrade research data infrastructures to stay competitive in the age of data-driven, open science. **Very little to no published information** exists on **current spending on data infrastructures and (FAIR) data management** across the EC.
 - The true cost of EOSC is the cost of ensuring that **these upgrades happen in a coordinated and harmonised way at European level**. This additional constrain will inevitably lead to additional costs initially, and are likely to lead later on to operational cost savings as economies of scale and scope occur. The initial additional costs have the character of an **investment**. However, **these costs are expected to vary**, depending on the existing readiness of data infrastructures at various MS.

F. Financing structure of the EOSC Model

- Guiding principles of the business model for the EOSC:
 - The business model and funding streams of existing research data infrastructures should not be affected by the development and operation of the EOSC, as long as they are compatible with the operating principles of the EOSC (cf services and access/interface sections). At this stage, there is only one funding stream that appears as problematic: the "user fee" model for accessing and reusing research data. Data infrastructures wishing to join the EOSC will need to adapt their business model in case it makes use of this funding stream.
 - The true cost of the EOSC is what needs to be financed in addition to current and planned costs for making research data FAIR and federating research data infrastructures at MS or discipline level.
 - The true cost of the EOSC corresponds essentially to the costs of **establishing and maintaining the EOSC federating core** - in particular the EOSC shared resources, the EOSC hub and the EOSC governance framework – and the costs of **adapting research data infrastructures to make them EOSC-ready**.

F. Financing structure of the EOSC Model

- Guiding principles of the business model for the EOSC:
 - The development of the former (federating core) has been supported by the EC through Horizon 2020 and will continue to be supported through the INFRAEOSC Call in 2018-2020 with a budget of ca. 300 million euro.
 - The adaptation of research data infrastructures to the new EOSC environment will require a combination of supply- and demand- side financing instruments. On the demand-side, the EC is contributing by making the costs of FAIR curation eligible for reimbursement as part of Horizon 2020. Member States should consider doing the same, so as to ensure that a small but decisive share of all research public funding in Europe supports the upskilling and upgrading of research data infrastructures in Europe. By way of example, using only 1% of all public research funding in Europe to make data FAIR would inject more than 1 billion euro per year in the system, for the benefit of research data infrastructures.
 - On the supply-side, it is expected that some MS and some disciplines may require additional capacity building in terms of physical or human resources, which could be made eligible for funding through cohesion policy (structural and social funds).

F. Financing of the EOSC: staged approach

- In Phase 1, until 2020:
 - the Commission will invest EUR 300 million to support the core functions of the EOSC as per milestones
 - Member States would flag the national initiatives that they want to federate into the EOSC (e.g. the work of the Helmholtz Data Alliance); and the resources they are willing to provide in kind;
 - Research funders would start making costs eligible for FAIR data only.

In Phase 2, after 2020, the activities of the EOSC could be financed by a mix of funding including possibly deposit fees from national funders

The Governance Framework would produce a full cost estimate for the running of the EOSC in Phase 1; based on this, it will prepare a financial prospect for Phase 2, addressing scalability and legacy.

EOSC implementation milestones

- Q2 2018 Launch of a stakeholder consultation on rules by HLEG EOSC
- Q3 2018 **FAIR data Action Plan**
- Q4 2018 **Initial EOSC Catalogue of services accessible**
 Prototype of EOSC Portal accessible
 EOSC Governance established (EOSC Board, Executive Board, Stakeholder Forum)
 First annual work plan adopted by the Governance structure
- Q1 2019 **Initial EOSC Rules of Participation**
- Q2 2019 **European framework for FAIR research data agreed**
 Initial EOSC catalogue of datasets accessible

EOSC implementation milestones

- Q4 2019
- Final EOSC Rules of Participation published**
 - FAIR Persistent Unique Identifier policy defined**
 - FAIR Certification Scheme available**
 - Initial registry of data infrastructures federated of the EOSC**
 - Initial EOSC federating core in place**
 - Updated EOSC catalogue of services & EOSC portal**
- Q2 2020
- Preliminary connection of most data infrastructures and services to the EOSC**
- Q3 2020
- Recommendations on strategic and financing orientations and organisational settings post 2020**

High-level timeline of the implementation

Actions	Before EOSC Governance established				Under EOSC Governance framework							
	Q1 2018	Q2 2018	Q3 2018	Q4 2018	Q1 2019	Q2 2019	Q3 2019	Q4 2019	Q1 2020	Q2 2020	Q3 2020	Q4 2020
Stakeholder consultation on RoP		█										
FAIR data Action Plan			█	█								
Initial EOSC Catalogue of services				█								
Prototype of EOSC Portal			█	█								
EOSC Governance			█	█								
1st annual work plan (Governance structure)				█								
Initial EOSC Rules of Participation			█	█	█							
European framework for FAIR research data			█	█	█	█						
Initial EOSC catalogue of datasets			█	█	█	█						
Final EOSC Rules of Participation								█	█			
FAIR Persistent Unique Identifier policy								█	█			
FAIR Certification Scheme								█	█			
Initial registry of data infrastructures						█	█	█	█			
Initial EOSC federating core						█	█	█	█			
Updated EOSC catalogue of services & EOSC portal								█	█	█	█	
Preliminary connection of most data infrastructures and services								█	█	█	█	█
Recommendations on the post-2020 set-up											█	█

EOSC policy milestones

- June 2017 EOSC Summit forming the coalition of the willing
- Oct 2017 EOSC Declaration published for endorsements and to seek commitments
- March 2018 EOSC Roadmap presented for consultation to Council RWP

- May 2018 Council conclusions endorsing the EOSC Roadmap
- < Oct 2018 Selection of members to the governance structure
- Fall 2018 Establishment of the Governance structure; MS designate representatives to the EOSC board
- Nov 2018 Launch of the EOSC governance structure (AT Presidency event)
- End 2020 MS+ EC agreement on the future strategic orientation and financing scheme for the EOSC