CONNECT TO WIN 2022
Congress Centre Lombardia Region, Milan - 8, 9 November 2022

Research Infrastructures in the new ERA context:
services and challenges

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Outline

- European Research Infrastructure Ecosystem

  - Approach and achievements

  - Landscape and Challenges

- Policy context

  - European Research Area

  - New European Innovation Agenda

- European Open Science Cloud

- EU Programmes

  - Horizon Europe, EU Missions

  - Recovery and Resilience Facility

Approach

- A well-functioning European ecosystem of research infrastructures, integrating European large-scale research infrastructures and complementary national, mid- and small-sized research infrastructures allows to:

  - ensure scientific **excellence**;

  - address major scientific, environmental and societal **challenges** fostering public **services**;

  - underpin **industrial value chains**

- Challenge: a systemic approach at EU level to ensure economies of scale, avoid duplication of efforts, strengthen interoperability building on investments

Achievements

- A proven and exemplary experience of Member State cooperation and joint investment

- A uniquely rich research infrastructure landscape underpinning European leadership in the global context

  - **25** ERICs (facilitating establishment and operation of large European research infrastructures among Member States and Associated Countries); **41** ESFRI Landmarks (implemented research infrastructures with multi-country membership, providing services to researchers and industry); **22** ESFRI Projects (prioritised research infrastructures under preparation); **8** EIROs (international organisations established in Europe underpinning research infrastructures facilities); well-organised and interconnected networks and communities

- Well-established **EU framework** relying on mutually supporting activities

  - Strategic roadmapping ensured by **ESFRI**

  - Setting up dedicated "operators" enabled by the **ERIC** Framework Regulation,

  - Dedicated funding under the **framework programme**

Landscape Analysis Section 1 - DIGIT

DATA, COMPUTING AND DIGITAL RESEARCH INFRASTRUCTURES
DEFINITIONS AND CONTEXT
EUROPEAN OPEN SCIENCE CLOUD (EOSC)
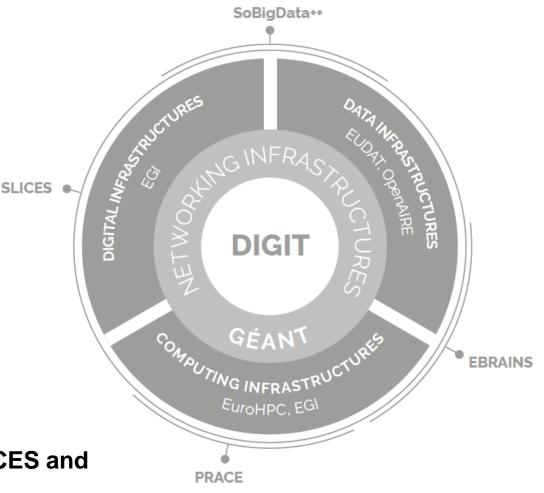**CURRENT STATUS**

> Networking and other services
> Data infrastructures
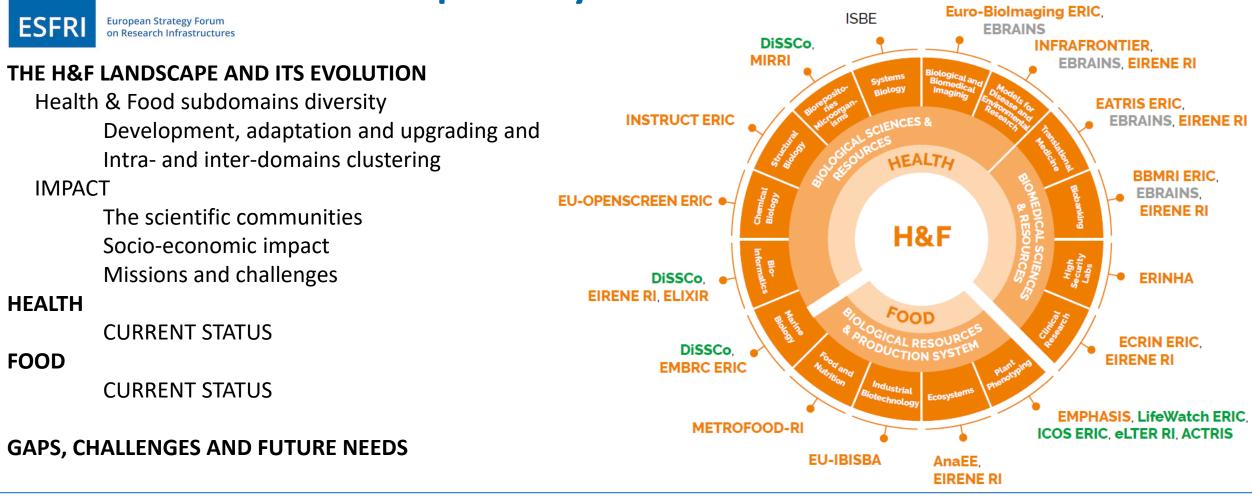> Computing infrastructures
> Thematic e-infrastructures

GAPS, CHALLENGES AND FUTURE NEEDS

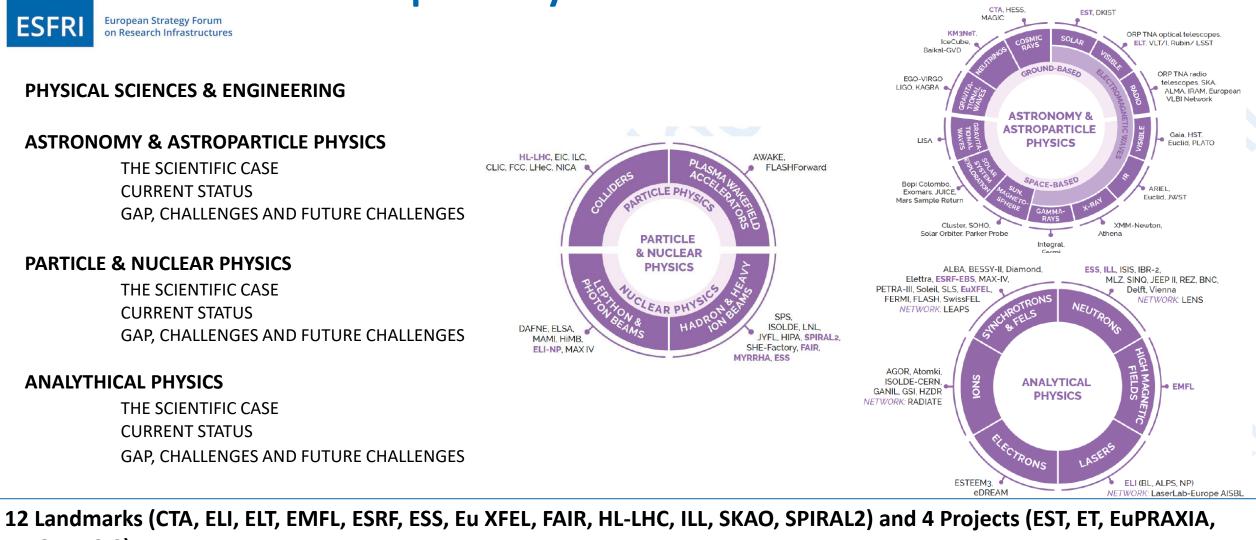**1 Landmark (PRACE) and 3 Projects (EBRAINS, SLICES and SoBigData++)**

Landscape Analysis Section 1 – H&F

THE H&F LANDSCAPE AND ITS EVOLUTION
- Health & Food subdomains diversity
  - Development, adaptation and upgrading and
  - Intra- and inter-domains clustering
- IMPACT
  - The scientific communities
  - Socio-economic impact
  - Missions and challenges

HEALTH

  CURRENT STATUS

FOOD

  CURRENT STATUS

GAPS, CHALLENGES AND FUTURE NEEDS

12 Landmarks (ANAEE, BBMRI, EATRIS, ECRIN, ELIXIR, EMBRC, ERINHA, EU-OPENSCREEN, Euro-BioImaging, INFRAFRONTIER, INSTRUCT, MIRRI) and 4 Projects (EIRENE, EMPHASIS, EU-IBISBA, METROFOOD))
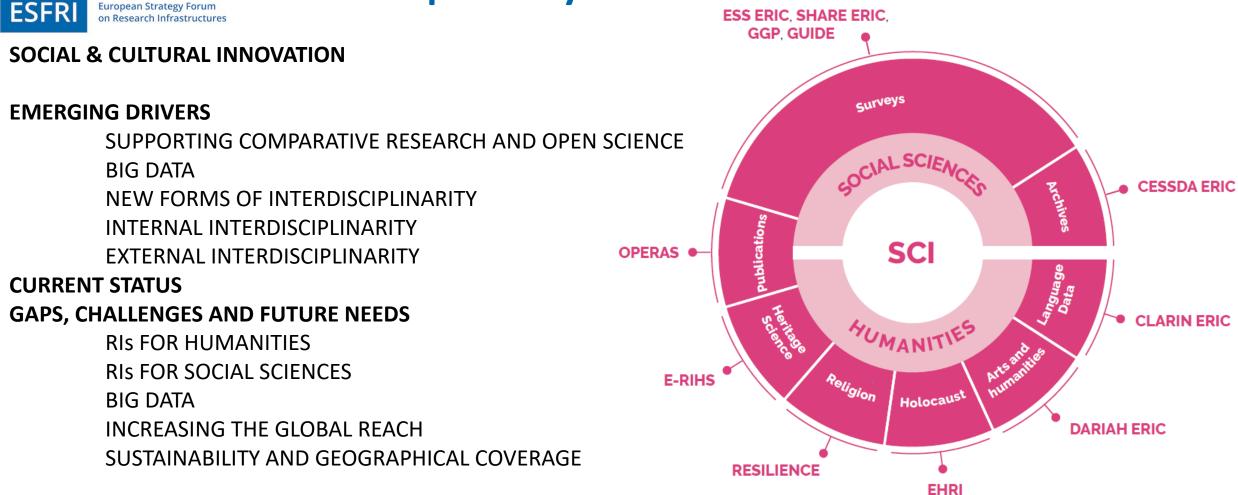
ESFRI
European Strategy Forum
on Research Infrastructures

PHYSICAL SCIENCES & ENGINEERING

ASTRONOMY & ASTROPARTICLE PHYSICS

    THE SCIENTIFIC CASE

    CURRENT STATUS

    GAP, CHALLENGES AND FUTURE CHALLENGES

PARTICLE & NUCLEAR PHYSICS

    THE SCIENTIFIC CASE

    CURRENT STATUS

    GAP, CHALLENGES AND FUTURE CHALLENGES

ANALYTHICAL PHYSICS

    THE SCIENTIFIC CASE

    CURRENT STATUS

    GAP, CHALLENGES AND FUTURE CHALLENGES

12 Landmarks (CTA, ELI, ELT, EMFL, ESRF, ESS, Eu XFEL, FAIR, HL-LHC, ILL, SKAO, SPIRAL2) and 4 Projects (EST, ET, EuPRAXIA, KM3Net 2.0)

ESFRI

Landscape Analysis Section 1 – SCI

SOCIAL & CULTURAL INNOVATION

EMERGING DRIVERS
>   SUPPORTING COMPARATIVE RESEARCH AND OPEN SCIENCE
>   BIG DATA
>   NEW FORMS OF INTERDISCIPLINARITY
>   INTERNAL INTERDISCIPLINARITY
>   EXTERNAL INTERDISCIPLINARITY

CURRENT STATUS

GAPS, CHALLENGES AND FUTURE NEEDS
>   RIs FOR HUMANITIES
>   RIs FOR SOCIAL SCIENCES
>   BIG DATA
>   INCREASING THE GLOBAL REACH
>   SUSTAINABILITY AND GEOGRAPHICAL COVERAGE

5 Landmarks (CESSDA, CLARIN, DARIAH, ESS ERIC, SHARE) and 6 Projects (E-RIHS, EHRI, GGP, GUIDE, OPERAS, RESILIENCE)

Digital transition of research infrastructures

- Digital transition has multiple dimensions
  - digitalisation of instrumentation, remote access and remote operation; integration of data and information from RIs e.g. in digital twins; technology development + value chains; Skills and training
- Coordination and interconnection between physical and digital infrastructures
  - User-driven digital developments based on RI roadmaps and relying on EOSC interoperability requirements
- ESFRI RIs generate/process big data and need data-intensive capacities: data providers and users of EOSC data and services
  - cooperation between ESFRI and EOSC facilitating coherent and complementary strategies as well as joint activities

European Commission

Greening of research infrastructures

- New technologies and solutions for reducing the environmental and climate footprint of RIs

- Optimisation of resource and energy consumption integrated through the full life cycle of research infrastructures

- Increased long-term sustainability of European research infrastructures

- Identify common interoperable methodologies to assess environmental impact and strategies to reduce it, efficiency gains in the broader ecosystem

European Commission

The new ERA

Pact for research and innovation in Europe

- 10 values and principles
- 4 priority areas
  - Deepening ERA
  - Broadening ERA and relevance
  - Amplifying access to excellence
  - Advancing R&I investments and reforms
- Research and development targets

ERA Policy Agenda

- Designed to contribute to the priority areas of the Pact for R&I, setting out the voluntary ERA actions which are defined and coordinated at Union level.

- 20 actions for 2022-24

ERA Governance

ERA Forum (+ subgroups)
Expert group for coordination and implementation of the ERA, together with EU countries, Associated countries and stakeholders

ERAC
high-level strategic policy body, providing advice

Council
Decision making
"Owner" of Policy Agenda

ERA Monitoring

- Ensure a proper basis for evidence informed policy making
- Provide evidence and analysis in the context of the European Semester

ERA Policy Agenda 2022-2024

DEEPENING A TRULY FUNCTIONING INTERNAL MARKET FOR KNOWLEDGE

1. Open sharing of knowledge, incl. EOSC
2. Data legislation fit for research
3. Reform of research assessment
4. Strengthen research careers
5. Gender equality and inclusiveness
6. Protect academic freedom
7. Better knowledge valorisation
8. Research infrastructures
9. International cooperation, reciprocity

TOGETHER FOR TWIN GREEN AND DIGITAL TRANSITION, AND INCREASING SOCIETY'S PARTICIPATION IN THE ERA

10. R&I Missions and Partnerships for ERA
11. Green energy transformation
12. Transition of industrial ecosystems
13. Empower higher education institutions
14. Bring science closer to society

AMPLIFYING ACCESS TO RESEARCH AND INNOVATION EXCELLENCE ACROSS THE UNION
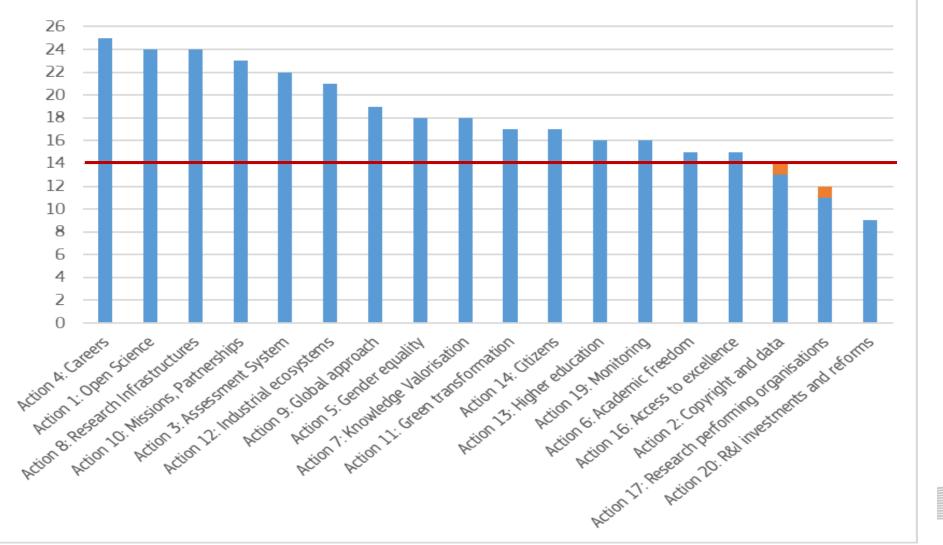
15. Regional and national R&I ecosystems
16. EU-wide access to excellence
17. Strategic capacity of public RPOs/RFOs

ADVANCING CONCERTED R&I INVESTMENTS AND REFORMS

18. Coordination national support for ERA
19. ERA monitoring mechanism
20. Prioritisation and coordination of R&I investments and reforms

European Commission
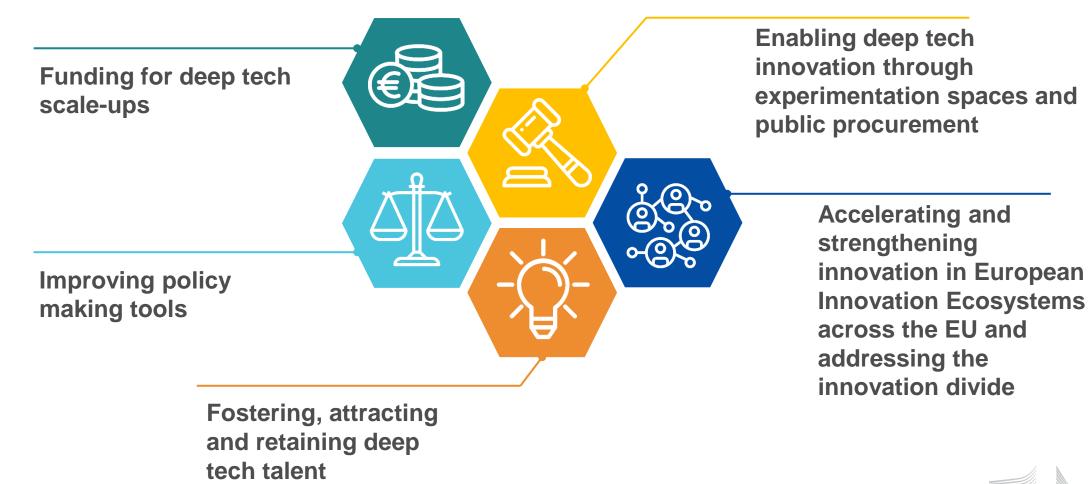
Member States' commitment per action

23-09-2022

European Commission

New European Innovation Agenda: five flagships

Funding for deep tech scale-ups

Enabling deep tech innovation through experimentation spaces and public procurement

Improving policy making tools

Accelerating and strengthening innovation in European Innovation Ecosystems across the EU and addressing the innovation divide

Fostering, attracting and retaining deep tech talent

European Commission

EOSC implementation: a two-stage approach

EOSC phase 1: preparatory	EOSC phase 2: continuous EOSC roll-out
2018 - 2020	**2021 - 2030**

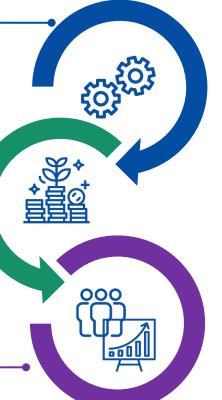| H2020 calls/grants approach	Partnership approach in Horizon Europe
EOSC roadmap 2018-2020 by the European Commission	EOSC Strategic Research and Innovation Agenda (**EOSC SRIA**) 2021-2027 by the EOSC community
Initial EOSC Governance (Member States and the Commission to steer and oversee initial EOSC development)	**New EOSC Governance** (Increasingly stakeholder-driven, high-level steering role maintained for the European Commission and the Member States)

Partnering for:

Directionality
- Industry R&I strategy
- **Member States/Pan-European**

Additionality
- Industry investments (critical mass, lowering risks)
- **Member States (critical mass, coordination to ease take-up)**

Impact
- Economic (competitiveness, value chain, choice/sovereignty, jobs,…)
- **Social (trust, green,…)**

Scope of the EOSC Partnership
"C" as a data Commons (not a federation of cloud providers)

- Towards a **Web of FAIR data** for science (across borders and scientific disciplines)
- Common strategic vision to develop **a European data space for science, research and innovation** articulated with other public/private data spaces. Public-Public partnership to start with

- **Multiple levels**: Pan-European / national / institutional levels. **Multiple stakeholders**: EU, MS/AC, Funding agencies, RPOs, universities, libraries, research infrastructures, e-Infrastructures.
- **Multiple commitments**: EU / national investments, Open Science policy alignment & commitments, FAIR uptake, trusted repositories, EOSC-registered services

- **Research efficiency, trust in science, data sovereignty, societal relevance of science, innovation in the digital age**

European Commission

EOSC Partnership Memorandum of Understanding

The EOSC partnership was launched at the R&I Days 2021

Main provisions:

- The MoU is established between the Partners:
  - ✓ The EU represented by the Commission
  - ✓ The EOSC Association ("Partners other than the Union"), including its constituent entities (members)

- **Scope & objectives**
  - ✓ Based on the **Strategic Research and Innovation Agenda (SRIA)**

- Contributions by the Partners:
  - ✓ Expected financial amounts

Up to EUR 970 million

- Governance:
  - ✓ Partnership Board composed of representatives appointed by the Partners other than the Union, Commission officials and Representatives of the Steering Board

European Commission

EOSC Strategic Research and Innovation Agenda (SRIA)

- Provides the **overall framework for future activities**, in the context of the EOSC Partnership, to be **undertaken at EU level** and **at national/institutional level**.

- Initial drafting of the **SRIA** was led by the Executive Board with support of the Commission, then finalised by the EOSC Association and adopted by the EOSC Partnership Board.

- The current **SRIA** provides a **granular translation** of priority areas and expected outcomes for the years 2021 and 2022. It has been instrumental to shape the topics under the **2021-2022 RI WP**.

Strategic Research and Innovation Agenda (SRIA) of the European Open Science Cloud (EOSC)
Version 1.0 11 February 2021

EUROPEAN OPEN SCIENCE CLOUD

European Commission

EOSC Strategic Research and Innovation Agenda (SRIA)

Three <u>General Objectives</u>

GO1. **Open Science practices** and skills are rewarded and taught, becoming 'the new normal'
- ➢ <u>Scope</u>: the EOSC ecosystem underpins the reward of OS practices

GO2. Sustainable and **federated infrastructures** enable open sharing of scientific results
- ➢ <u>Scope</u>: **EOSC-Core**, federated data infrastructures and **Marketplace**

GO3. Standards, tools and services allow researchers to find access, reuse and combine results
- ➢ <u>Scope</u>: Turning the FAIR principles into practice (all type of research artefacts in a digital form)

Fourteen EOSC <u>Action Areas</u> to be tackled

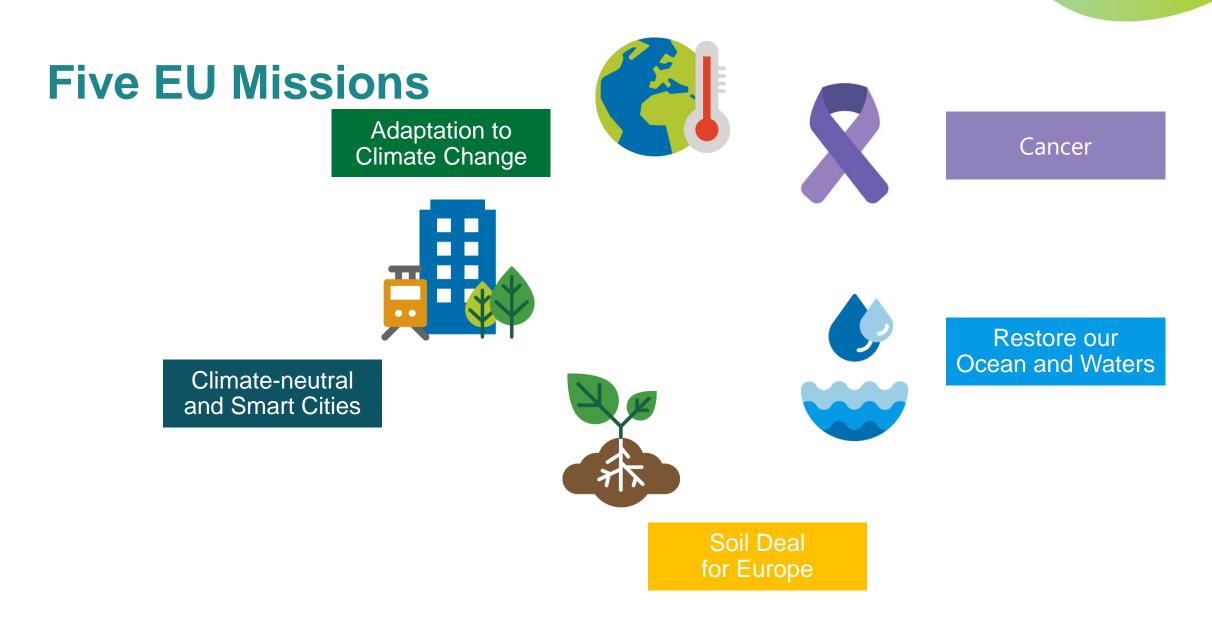| Implementation challenges	Boundary conditions
AA1. Identifiers	**AA8**. Rules of Participation
AA2. Metadata and ontologies	**AA9**. Landscape monitoring
AA3. FAIR metrics & certification	**AA10**. Funding models
AA4. Authentification and Autorisation Infrastructures (AAI)	**AA11**. Skills and training
AA5. User environments	**AA12**. Rewards and recognition
AA6. Resource provider environments	**AA13**. Communication
AA7. EOSC interoperability framework	**AA14**. Widening to public and private sectors & going global

RIs in Horizon Europe – Five destinations

- **INFRADEV :**   Developing, consolidating and optimising European RIs landscape, maintaining global leadership

- **INFRAEOSC :**   Enabling an operational, open and FAIR EOSC ecosystem

- **INFRASERV :**   RI services to support health research, accelerate the green and digital transformation, and advance frontier knowledge

- **INFRATECH :**   Next generation of scientific instruments, tools and methods and advanced digital solutions

- **INFRANET :**   Network connectivity - enabler for collaboration without boundaries

European Commission

Five EU Missions

Adaptation to Climate Change

Cancer

Climate-neutral and Smart Cities

Restore our Ocean and Waters

Soil Deal for Europe

EOSC4Cancer

EOSC contribution to the EU Cancer Mission

Project Acronym: *EOSC4Cancer*

Project Full Name: *A European-wide foundation to accelerate Data-driven Cancer Research*

Duration: *30 months*

Starting Date: *1 September 2022*

End Date: *28 February 2025*

 # Beneficiaries: *28 (+1 assoc. partner, +5 affiliated entities)*

Coordinators:

BSC-CNS, Barcelona Supercomputing Center-Centro Nacional de Supercomputación

ELIXIR-Hub

EMPIRICA, EMPIRICA Gesellschaft fur kommunikations und technologieforschung MBH

Beneficiaries:

BSC-CNS	*Instruct*
BBMRI-ERIC	*EU-OS*
ELIXIR/EBI/EMBL	*ALU-FR*
UiO	*ECRIN*
FSP CNIO	*EURO-BIOIMAGING*
CNRS	*INFRAFRONTIER*
UP	*KI*
NKI	*MU*
UMCG	*ECPC*
CERTH	*IRB BARCELONA*
CNR	*UBx*
VHIO	*LYGATURE*
EMPIRICA	*UNIMAN (AP)*
EATRIS	*DTL PROJECTS (AE)*
CRG-EGA	*IMG (AE)*
DKFZ	*CSC (AE)*
	ERASMUS MC (AE)
	UNITO (AE)

Objectives & key results

EOSC4Cancer

Main objective:
EOSC4Cancer as provider of the **infrastructure for the exploitation of cancer data** for the **EU Cancer Mission**.

Expected key results:

- A platform that will enable **storage, sharing, access, and analysis** of research data and other digital research objects from basic and clinical cancer research.
- **Mobilization, interconnection, and interoperation of datasets** relevant in cancer research (**FAIR** principles).
- Cancer research data and **analysis systems** made **easily accessible** to basic and clinical scientists in open cancer analysis portals.
- Integrated **digital tools, data analytics, and Artificial Intelligence/Machine Learning methods** for the analysis for cancer-related data in the **cancer analysis environments**.
- **Roadmap for EOSC** support to a **European Cancer Data Space in the European Health Data Space (EHDS)** in partnership with the **Cancer Mission**.
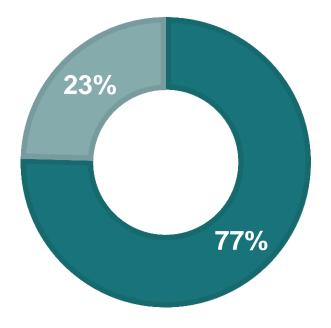
The RRF, a powerful tool for R&I investments & reforms

R&I MEASURES

■ R&I investments   ■ R&I reforms

Total amount of R&I investments in the RRPs*:

47 bn EUR

23%

77%

Based on the 25 RRPs approved by the Council by September 2022

Very R&I-rich RRPs

SHARE OF EXPENDITURE ON R&I
% OF TOTAL ALLOCATION PER MEMBER STATE

Based on the 25 RRPs approved by the Council by September 2022

For further information

ESFRI Roadmap 2021

European Research Infrastructure Consortium (ERIC) Framework

European Open Science Cloud

Horizon Europe Research Infrastructures

EU Missions

Recovery and Resilience Facility

European Commission