ESFRI: a European model for research infrastructure projects

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#EUResearchArea

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Why an EU approach to RIs?

<u>Beginning of the XXI century</u>

- National research infrastructures + few international organisations (e.g. CERN, European Southern Observatory, European Molecular Biology Laboratory) – **fragmented, un-coordinated landscape**

<u>European Research Area (2000)</u>

- A vision of a fully **developed, functioning and interconnected research space**, without barriers, where collaboration would flourish and a functional integration process would take place.
- **European RI policy**:
  - ✓ To help **pooling resources** so that the EU can acquire and operate research infrastructures at world level – RIs are becoming ever larger, **more complex and demanding to establish**, and more costly
  - ✓ To **open access** to the research infrastructures existing in the individual Member States to all European researchers – addressing **inequalities in access** to top facilities
  - ✓ To **coordinate and rationalise the development and use** of research infrastructures, avoiding duplication of effort – addressing a **fragmented landscape**
  - ✓ To **connect national research communities** and increase the overall quality of the research and innovation - fostering European **competitiveness** in research and innovation
  - ✓ To trigger the **exchange of best practice**, develop interoperability of facilities and resources, strengthening **connections between facilities** and building up **human resources capacity** and expertise

What is ESFRI?

- An **informal body** composed by representatives of Member States, Associated Countries and the EC on issues related to research infrastructures, **providing advice** to the Council.

- A **platform** giving national authorities the opportunity to be informed of and to explore (i.e. without *a priori* commitments) international and national initiatives of European significance.

- An **incubator** of new RIs, where Member States structure their priorities and negotiate.

- A European **knowledge hub** on research infrastructures – setting standards for roadmap methodology, policy analysis and advice, information hub (COVID-19).

ESFRI mandate

**ESFRI** was established in 2002 with a mandate from the EU Council (2001) to:

- support a **coherent and strategy-led approach** to policy-making on research infrastructures in Europe

- **facilitate multilateral initiatives** leading to the better use and development of research infrastructures

- **establish a European Roadmap** for research infrastructures (new and major upgrades, pan-European interest) for the coming 10-20 years, stimulate the implementation of these facilities, and update the Roadmap as the need arises (Council 2004, 2007, 2014, 2016);

- ensure the **follow-up of implementation** of already on-going ESFRI projects after a comprehensive assessment, as well as the prioritisation of the infrastructure projects listed in the ESFRI Roadmap (Council 2012);

- to **implement European Research Area** actions on Research Infrastructures

ESFRI thematic coverage

Establishment of permanent SWG (science) & IG (governance).

ESFRI ROADMAP
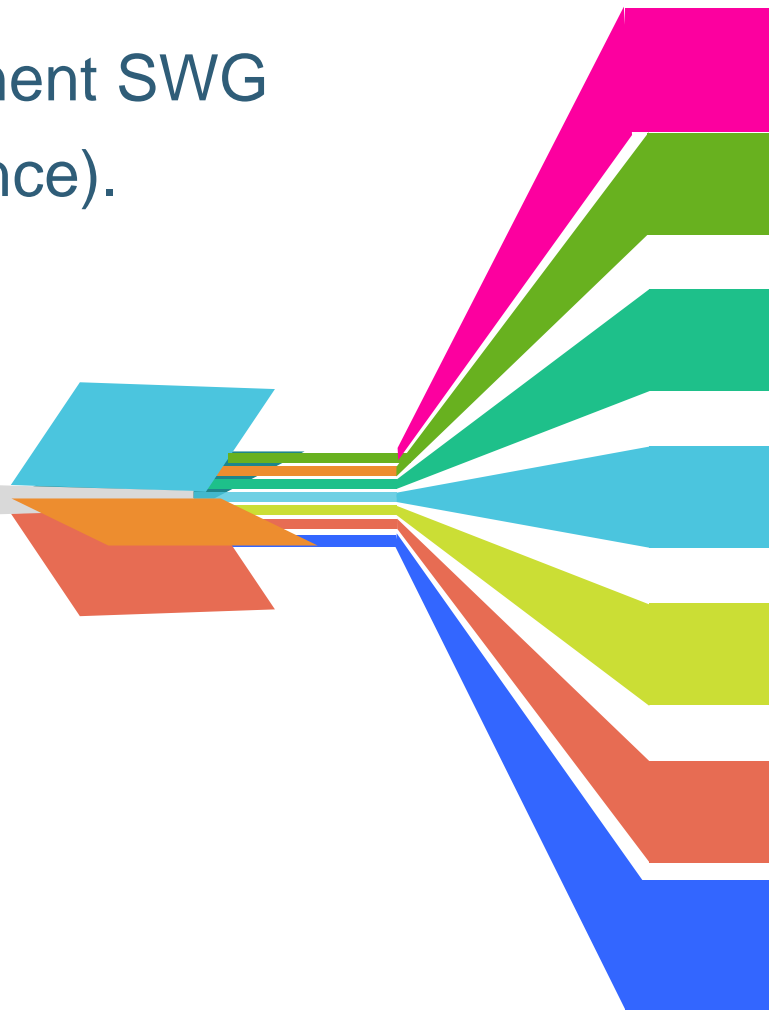
SWG SOCIAL & CULTURAL INNOVATION

SWG ENVIRONMENT

SWG DATA, COMPUTING AND DIGITAL RESEARCH INFRASTRUCTURES

SWG HEALTH & FOOD

SWG ENERGY

PHYSICAL SCIENCE & ENGINEERING

IMPLEMENTATION GROUP

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ESFRI Roadmap

1st ESFRI Roadmap cycle

- First Roadmap published in 2006, updated in 2008 and 2010, and contained **48 Projects** intended to foster European leadership across a broad range of scientific fields.

- Required **major financial investment** (~20 b€) and long- term commitment for operation (~2 b€/year)

2nd ESFRI Roadmap cycle

- **RI lifecycle concept** with minimal key requirements – comprehensive evaluation methodology

- ESFRI Roadmap 2016, 2018 and 2021: **Strategy report** + **Landscape Analysis** + **41 ESFRI Landmarks** + **22 ESFRI Projects** – strategic RIs for the future of ERA, RI investment agenda ~ 25 b€.

- Next ESFRI Roadmap update planned in 2025.

ESFRI Roadmap 2021

22 ESFRI Projects (11 new)

ENE	ENV	HF	PSE	SCI	e-RI
	DANUBIUS-RI	EMPHASIS	EST	E-RIHS	
			KM3NeT 2.0		**2016**
IFMIF-DONES	DiSSCo	EU-IBISBA		EHRI	
	eLTER	METROFOOD - RI			**2018**
MARINERG-i		EIRENE RI	ET	GGP	EBRAINS
		EuPRAXIA		GUIDE	SLICES
				OPERAS	SoBigData++
				RESILIENCE	**2021**

41 ESFRI Landmarks (4 new)

ENE	ENV	HF	PSE	SCI	e-RI
JHR	EMSO ERIC	BBMRI ERIC	E-ELT	CESSDA ERIC	PRACE
	EUROARGO ERIC	EATRIS ERIC	ELI	CLARIN ERIC	
	IAGOS	ECRIN ERIC	Eur. Spallation Source ERIC	DARIAH ERIC	
	ICOS ERIC	ELIXIR	EU-XFEL	ESS ERIC	
	LIFEWATCH ERIC	INFRA FRONTIER	FAIR	SHARE ERIC	
		INSTRUCT ERIC	ILL		
			SKA		
			SPIRAL2		**2006**
ECCSEL ERIC	EISCAT-3D	EMBRC ERIC	EMFL		
	EPOS ERIC	EU-OPEN Screen ERIC	CTA		
		ERINHA			
		EuroBio Imaging ERIC			**2008**
EU SOLARIS		AnaEE			
		MIRRI			**2010**
	ACTRIS		ESRF-EBS*		
			HL-LHC		**2016**

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European RI Landscape – where are we?

Development of an interconnected European RI landscape
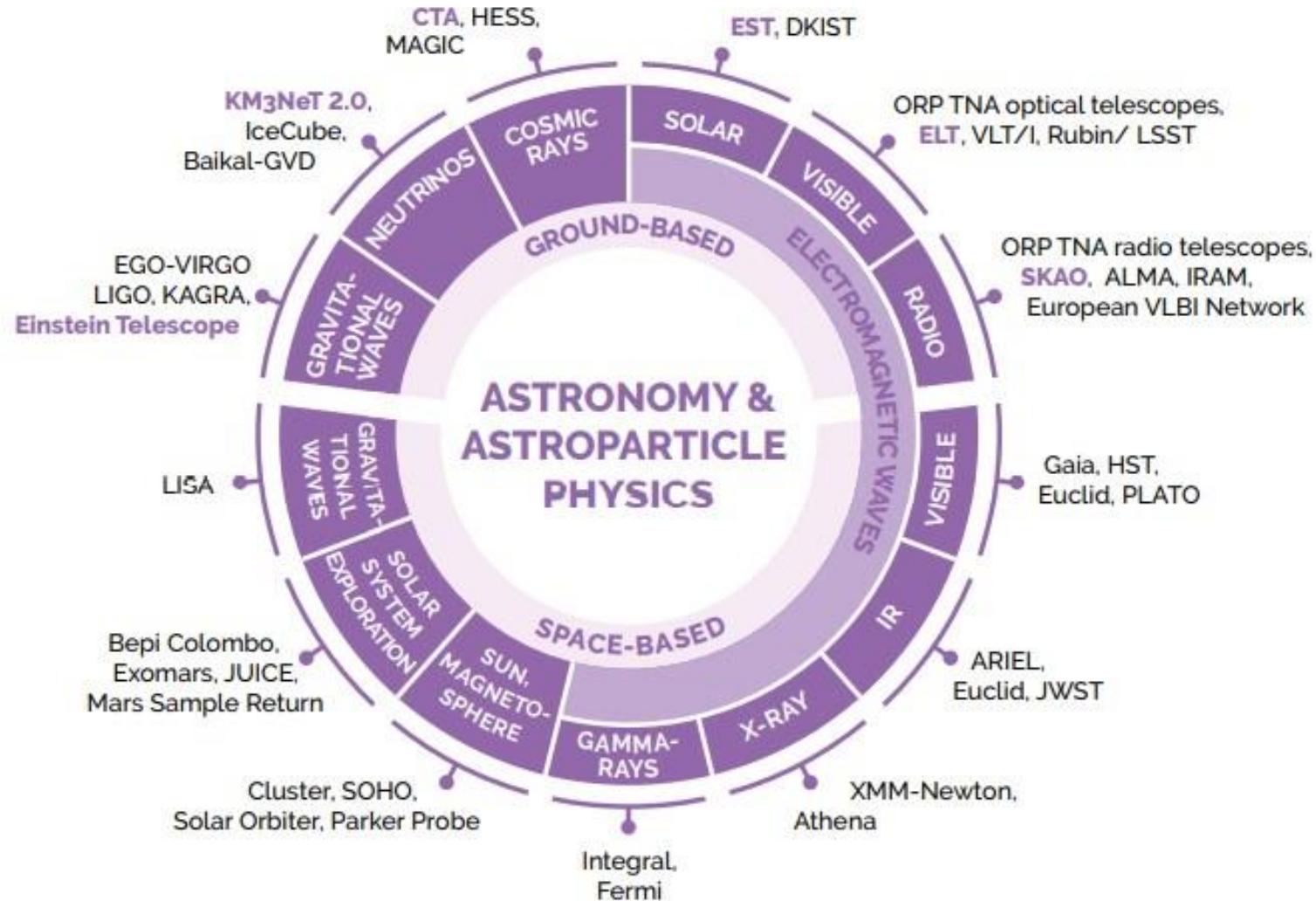
- **Pan-European RIs**
  - **ESFRI Roadmap** – RI incubator (41+22=63), 6 broad thematic areas, single-sited and distributed – preparation and implementation supported by the EU, investments financed by national governments and EU regional development and cohesion funds (over EUR 20 billion), international membership (SKA)
  - **European Research Infrastructure Consortium (ERIC)** - legal framework (implementation), special legal entity for RIs, members – countries and international organisations, 22 ERICs
- **European RI networks** – set up through EU research programme (joint research activities, networking, access provision) opening up national RIs, common access programmes, H2020 – 90 networks, 37.000 researchers supported, open to international members and users
- **National facilities and labs** – large and small scale, national roadmaps (alignment of methodologies and priorities), often nodes of European RIs, national + EU funding (capacity building)
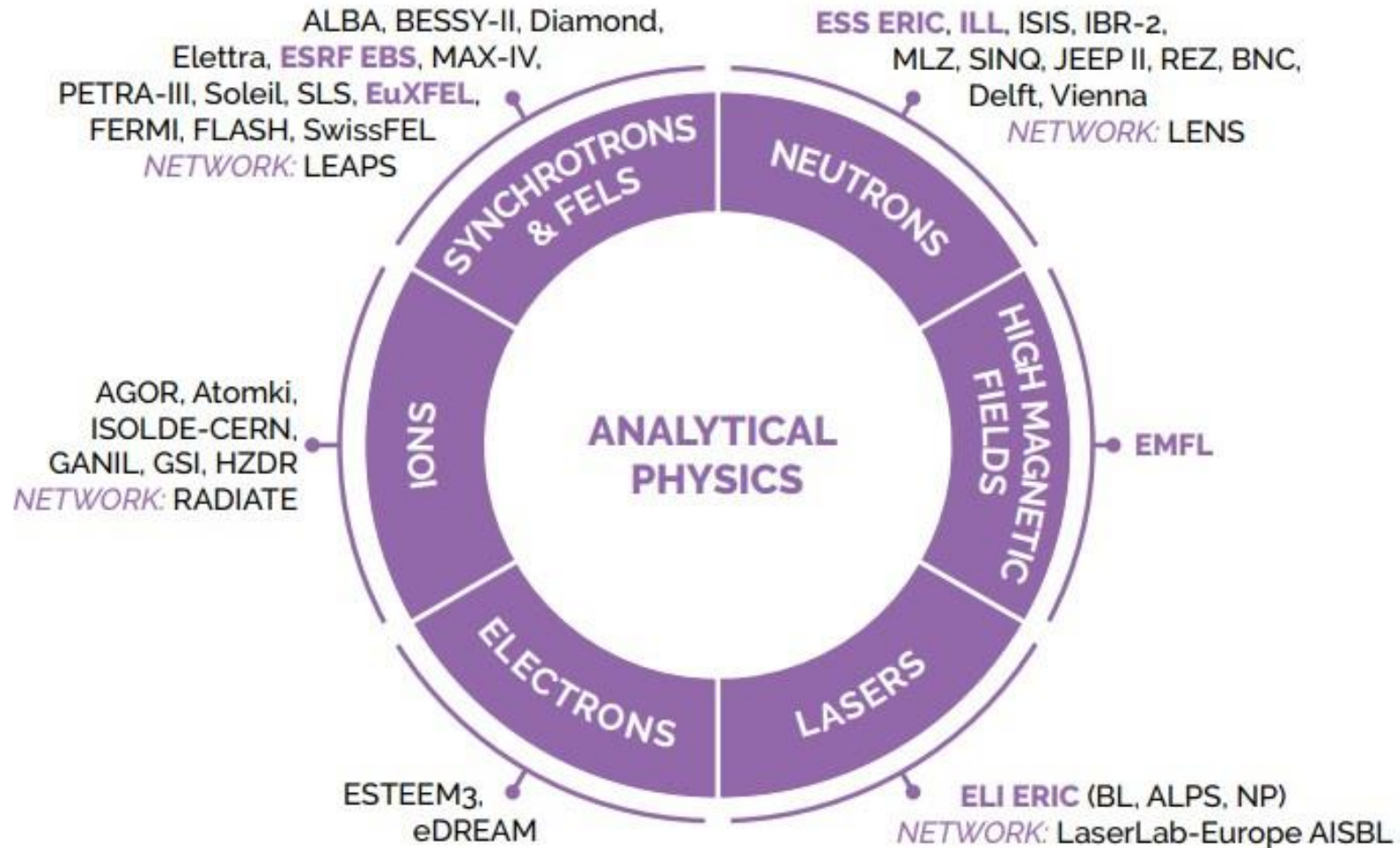
ESFRI strategic role in practice

- ESFRI Roadmap identifies **scientific priorities**
- ESFRI Roadmap **facilitates commitments** and **access to funds** at national level
- ESFRI Roadmap **facilitates access to structural funds** (ex ante conditionality) and other sources of **funding** (ex. EIB)
- **Analytical work** testing and advancing RI policy concepts:
  - responding to EU Council of Ministers' requests: investments in e-Infrastructures, long-term sustainability action plan, RI prioritisation, monitoring of RI performance
  - own initiatives: socio-economic impact of RIs, links with industry and innovation, evolution of neutron sources
- **ERA implementation**
- Providing **visibility** to European RIs
- Facilitating **links** of European RIs with other EU and global partners
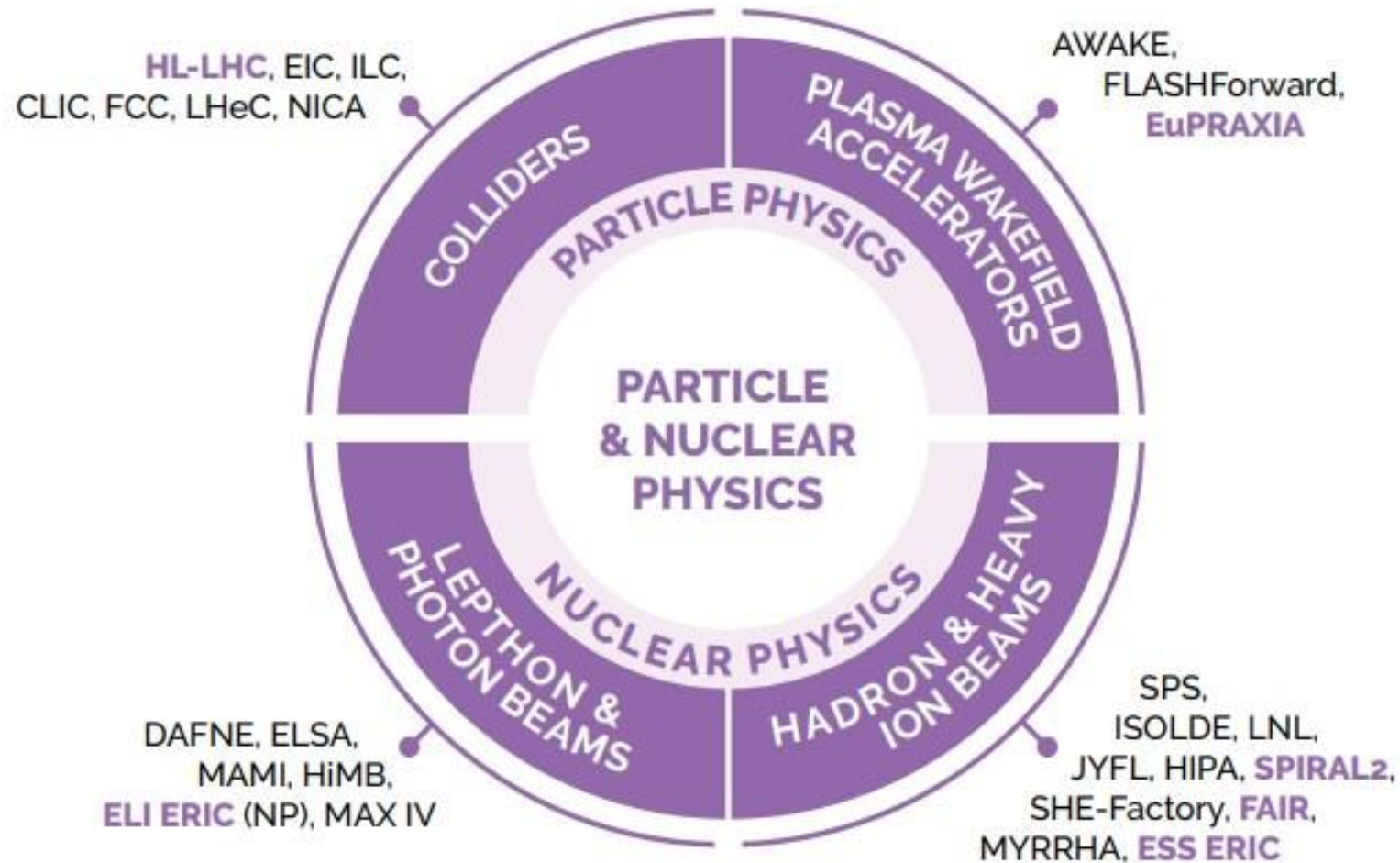
European landscape of RIs

Physical Sciences - ESFRI Landscape

ALBA, BESSY-II, Diamond, Elettra, ESRF EBS, MAX-IV, PETRA-III, Soleil, SLS, EuXFEL, FERMI, FLASH, SwissFEL
NETWORK: LEAPS

ESS ERIC, ILL, ISIS, IBR-2, MLZ, SINQ, JEEP II, REZ, BNC, Delft, Vienna
NETWORK: LENS

AGOR, Atomki, ISOLDE-CERN, GANIL, GSI, HZDR
NETWORK: RADIATE

EMFL

ESTEEM3, eDREAM

ELI ERIC (BL, ALPS, NP)
NETWORK: LaserLab-Europe AISBL

SYNCHROTRONS & FELS

NEUTRONS

HIGH MAGNETIC FIELDS

IONS

ANALYTICAL PHYSICS

ELECTRONS

LASERS

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Physical Sciences - ESFRI Landmarks

CTA	Cherenkov Telescope Array
ELI ERIC	Extreme Light Infrastructure
ELT	Extremely Large Telescope
EMFL	European Magnetic Field Laboratory
ESRF EBS	European Synchrotron Radiation Facility Extremely Brilliant Source
European Spallation Source ERIC	European Spallation Source
European XFEL	European X-Ray Free-Electron Laser Facility
FAIR	Facility for Antiproton and Ion Research
HL-LHC	High-Luminosity Large Hadron Collider
ILL	Institut Max von Laue - Paul Langevin
SKAO	Square Kilometre Array Observatory
SPIRAL2	Système de Production d'Ions Radioactifs en Ligne de 2e génération

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Physical Sciences - ESFRI Projects

|	
EST	European Solar Telescope
ET	Einstein Telescope
EuPRAXIA	European Plasma Research Accelerator with Excellence in Applications
KM3NeT 2.0	KM3 Neutrino Telescope 2.0

Health and Food - ESFRI Landscape
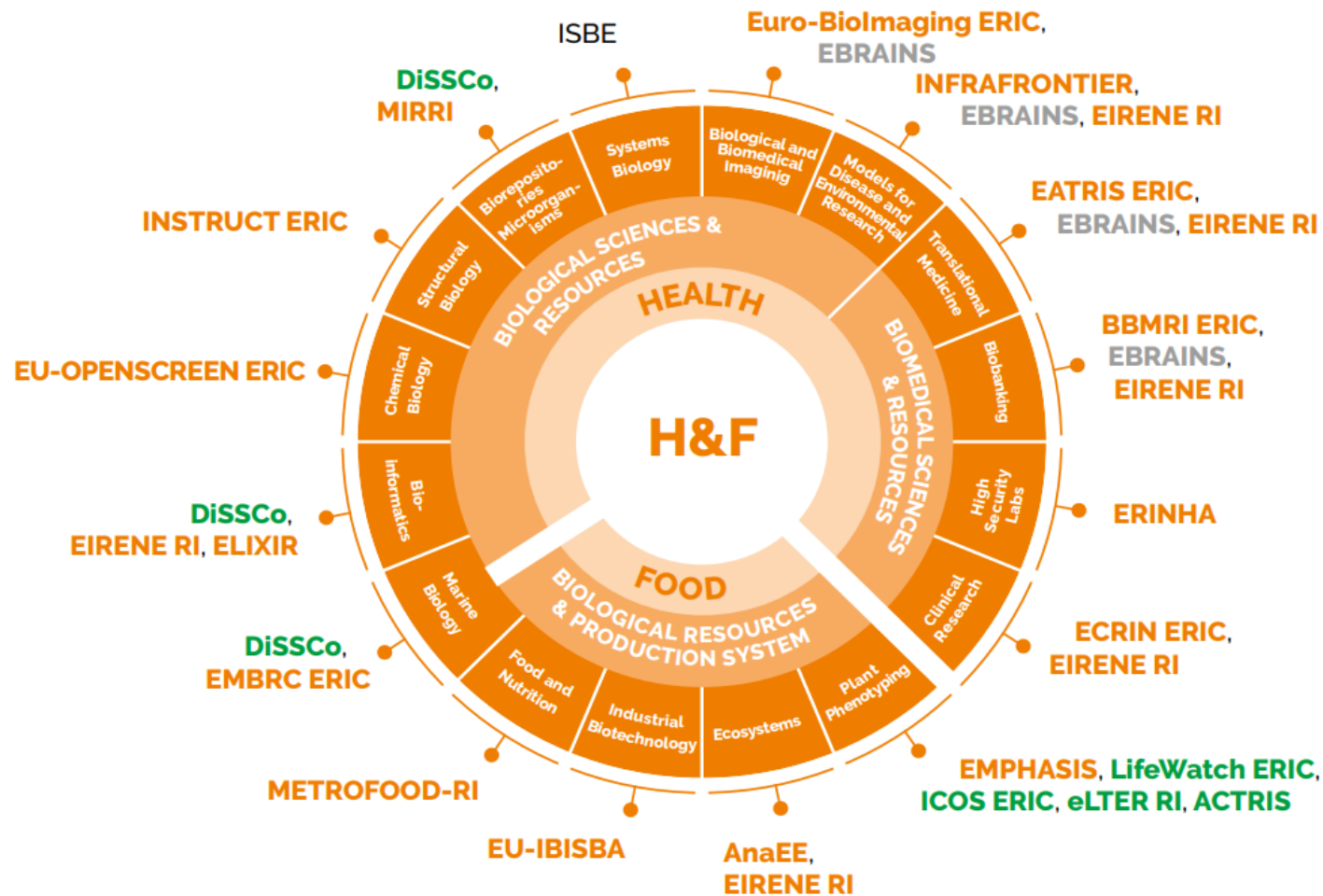
Health and Food - ESFRI Landmarks

AnaEE	Analysis and Experimentation on Ecosystems
BBMRI ERIC	Biobanking and BioMolecular Resources Research Infrastructure
EATRIS ERIC	European Advanced Translational Research Infrastructure in Medicine
ECRIN ERIC	European Clinical Research Infrastructure Network
ELIXIR	A distributed infrastructure for life-science data
EMBRC ERIC	European Marine Biological Resource Centre
ERINHA	European Research Infrastructure on Highly Pathogenic Agents
EU-OPENSCREEN ERIC	European Infrastructure of Open Screening Platforms for Chemical Biology
Euro-BioImaging ERIC	European Research Infrastructure for Imaging Technologies in Biological and Biomedical Sciences
INFRAFRONTIER	European Research Infrastructure for the generation, phenotyping, archiving and distribution of mouse disease models
INSTRUCT ERIC	Integrated Structural Biology Infrastructure
MIRRI	Microbial Resource Research Infrastructure

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Health and Food - ESFRI Projects

EIRENE RI	Research Infrastructure for EnvIRonmental Exposure assessmeNt in Europe
EMPHASIS	European Infrastructure for Multi-scale Plant Phenomics and Simulation
EU-IBISBA	European Industrial Biotechnology Innovation and Synthetic Biology Accelerator
METROFOOD-RI	Infrastructure for promoting Metrology in Food and Nutrition

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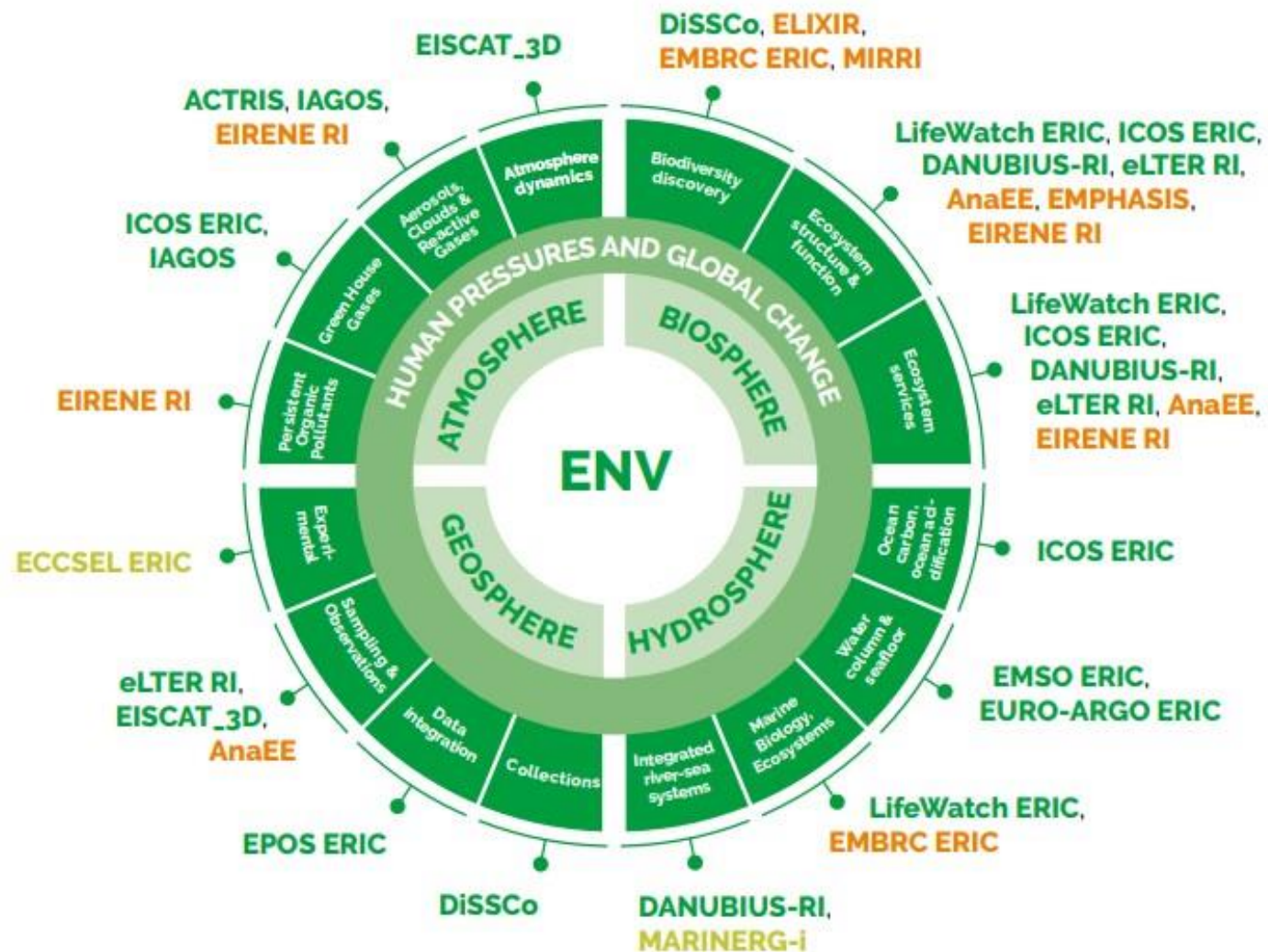
Environment - ESFRI Projects & Landmarks
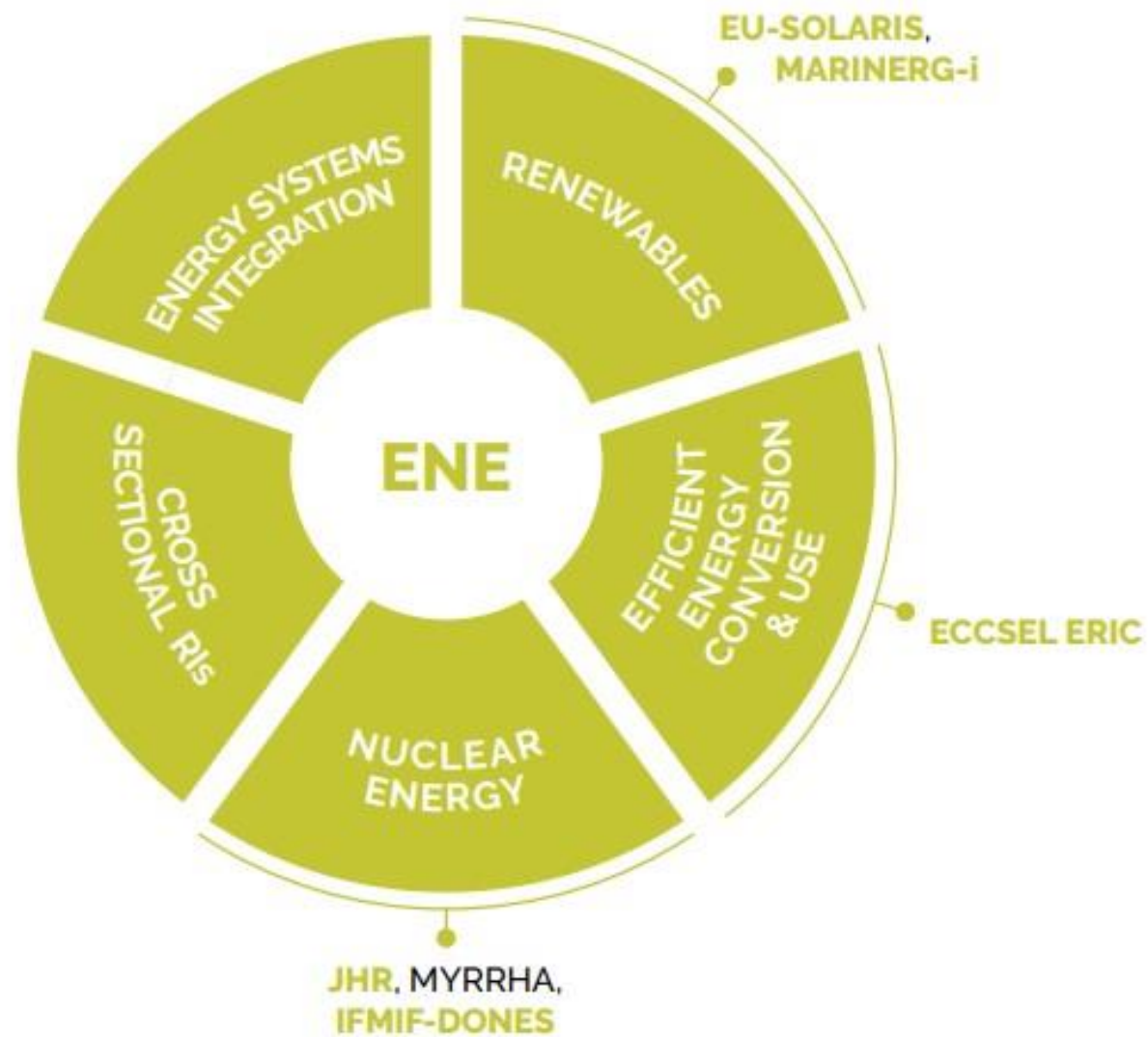
Landmarks

ACTRIS	Aerosol, Clouds and Trace Gases Research Infrastructure
EISCAT_3D	Next generation European Incoherent Scatter radar system
EMSO ERIC	European Multidisciplinary Seafloor and water-column Observatory
EPOS ERIC	European Plate Observing System
EURO-ARGO ERIC	European contribution to the international Argo Programme
IAGOS	In-service Aircraft for a Global Observing System
ICOS ERIC	Integrated Carbon Observation System
LifeWatch ERIC	e-Infrastructure for Biodiversity and Ecosystem Research

Projects

DANUBIUS-RI	International Centre for Advanced Studies on River-Sea Systems
DiSSCo	Distributed System of Scientific Collections
eLTER RI	Integrated European Long-Term Ecosystem, critical zone and socio-ecological system Research Infrastructure

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Energy - ESFRI Landscape

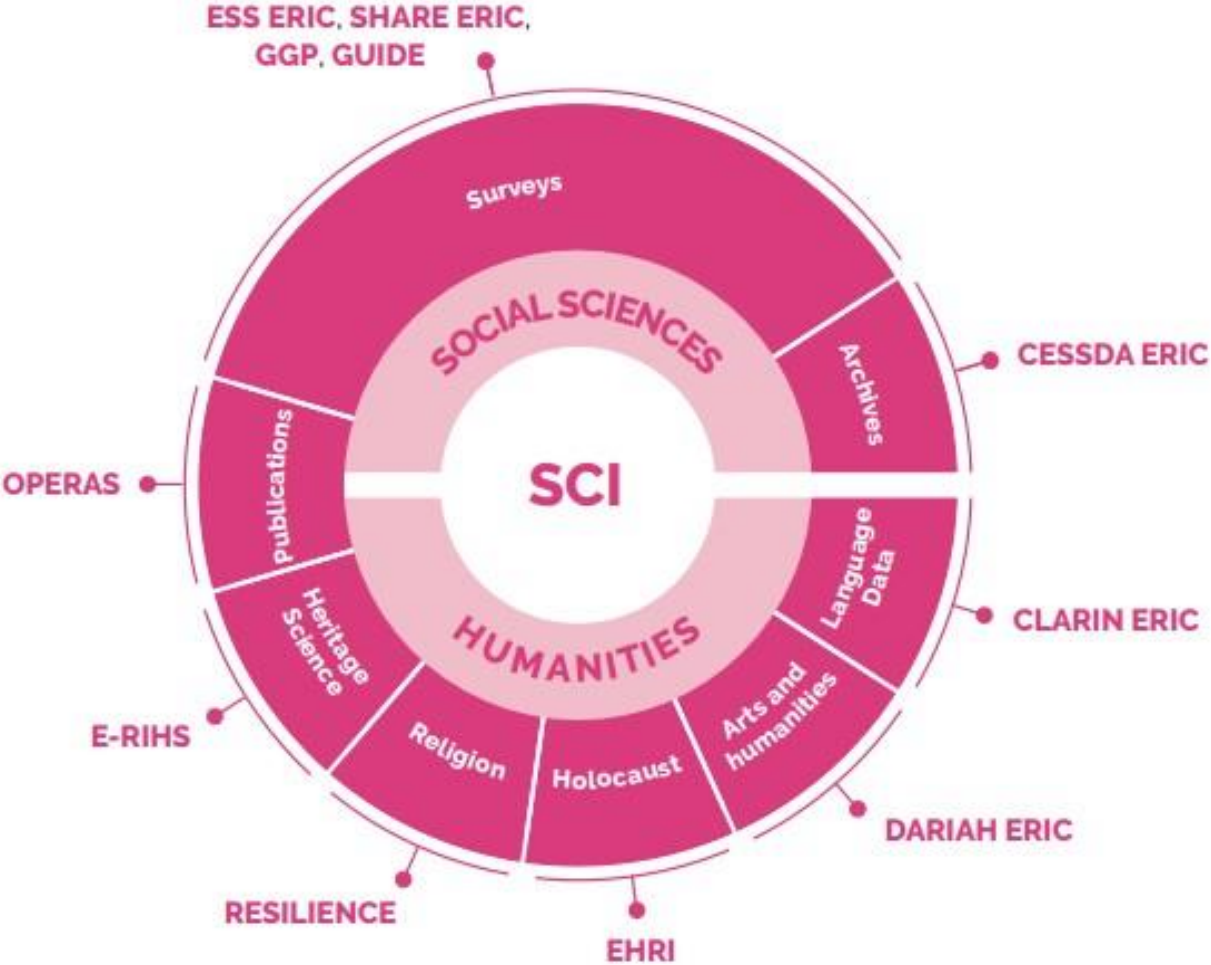# Energy - ESFRI Projects & Landmarks

Landmarks

ECCSEL ERIC	European Carbon Dioxide Capture and Storage Laboratory Infrastructure
EU-SOLARIS	European Solar Research Infrastructure for Concentrated Solar Power
JHR	Jules Horowitz Reactor

Projects

IFMIF-DONES	International Fusion Materials Irradiation Facility – DEMO Oriented NEutron Source
MARINERG-i	Marine Renewable Energy Research Infrastructure

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Social Sciences and Humanities - ESFRI Landscape

Social Sciences and Humanities - ESFRI Projects & Landmarks
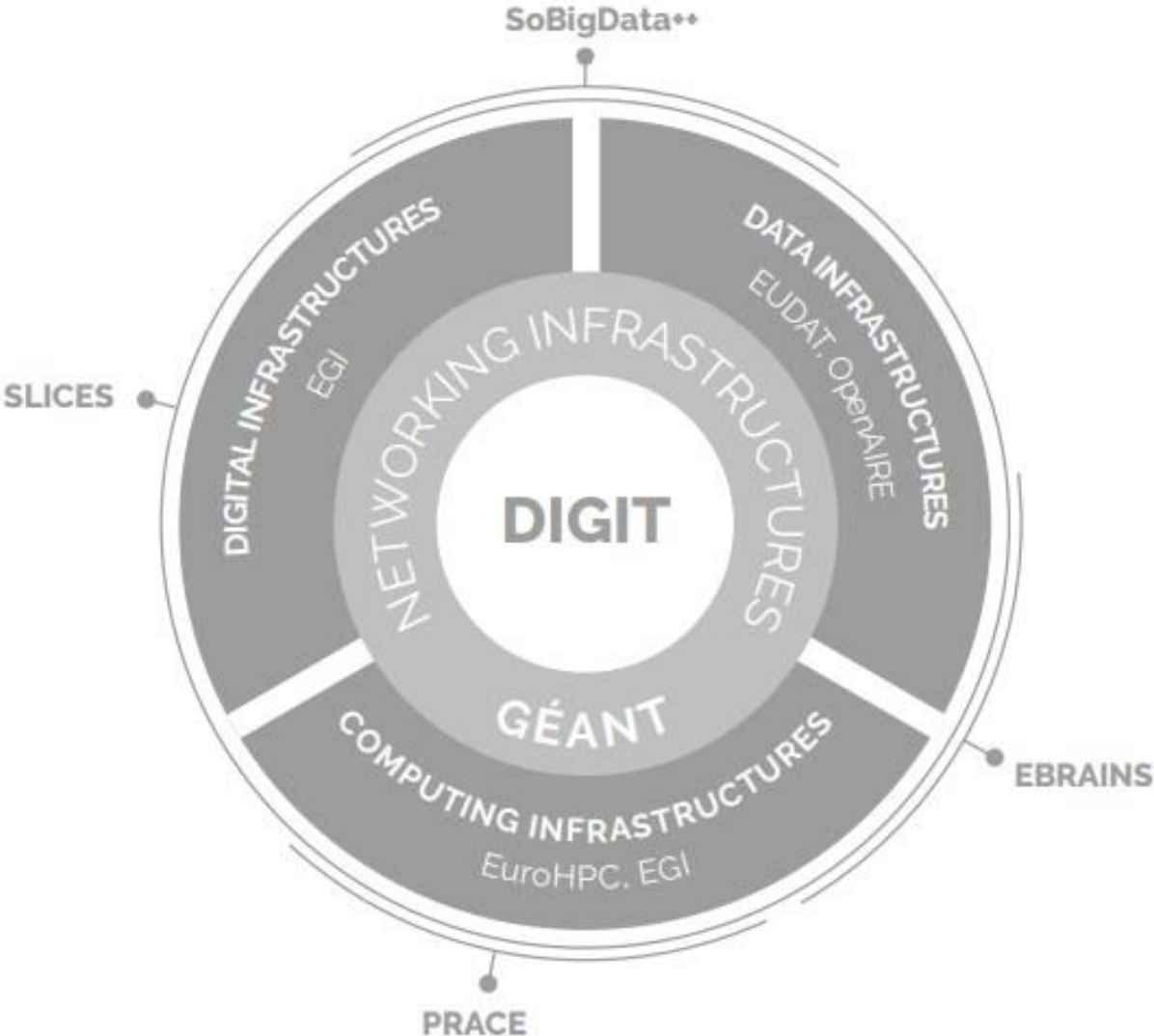
Landmarks

CESSDA ERIC	Consortium of European Social Science Data Archives
CLARIN ERIC	Common Language Resources and Technology Infrastructure
DARIAH ERIC	Digital Research Infrastructure for the Arts and Humanities
ESS ERIC	European Social Survey
SHARE ERIC	Survey of Health, Ageing and Retirement in Europe

Projects

E-RIHS	European Research Infrastructure for Heritage Science
EHRI	European Holocaust Research Infrastructure
GGP	The Generations and Gender Programme
GUIDE	Growing Up in Digital Europe: EuroCohort
OPERAS	OPen scholarly communication in the European Research Area for Social Sciences and Humanities
RESILIENCE	REligious Studies Infrastructure: tooLs, Innovation, Experts, conNections and Centres in Europe

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Digital & Computing RIs - ESFRI Projects & Landmarks

Landmarks

PRACE	Partnership for Advanced Computing in Europe

Projects

EBRAINS	European Brain ReseArch INfrastructureS	
SLICES	Scientific Large-scale Infrastructure for Computing/ Communication Experimental Studies	
SoBigData++	European Integrated Infrastructure for Social Mining and Big Data Analytics	

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Thank you!

For more info:

- Commission's website on Research Infrastructures:
https://ec.europa.eu/info/research-and-innovation/strategy/strategy-2020-2024/our-digital-future/european-research-infrastructures_en

- Horizon Europe:
https://ec.europa.eu/info/research-and-innovation/funding/funding-opportunities/funding-programmes-and-open-calls/horizon-europe_en

- European Strategy Forum on Research Infrastructures:
www.esfri.eu

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