Horizon 2020 and   
the Research Infrastructures Landscape

# Introduction

Developing new pan-European research infrastructures or integrating and opening national research infrastructures is a long-lasting process.

In addition, depending on the scientific field and type of infrastructures, the level of development or integration is different and requires a specific approach.

Research Infrastructures activities under **Horizon 2020** are therefore targeting different development phases, in line with a continuously evolving European Research Infrastructures landscape.

Complementary to the 2016 ESFRI roadmap[[1]](#footnote-1), this document gives a **snapshot** of Horizon 2020 contribution to structuring the **Research Infrastructures landscape** and will be updated on a regular basis**.** It covers the main scientific fields[[2]](#footnote-2):

* ENVIRONMENTAL AND EARTH SCIENCES
* BIOLOGICAL AND MEDICAL SCIENCES
* ENERGY
* MATERIAL SCIENCES AND ANALYTICAL FACILITIES
* PHYSICAL SCIENCES
* SOCIAL SCIENCE AND HUMANITIES
* MATHEMATICS AND ICT

**ENVIRONMENTAL and EARTH SCIENCES**

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| **ATMOSPHERE** | | | |
| **Type/Area** | **Infrastructure** | **Development Phase** | **ESFRI** |
| Ground-based stations | Aerosols, Clouds, and Trace gases Research InfraStructure (**ACTRIS-2**) | Integration |  |
| Aerosols, Clouds and Trace gases Preparatory Phase Project (**ACTRIS** **PPP**) | Preparatory Phase | ACTRIS |
| Ground-based stations | Readiness of ICOS for Necessities of integrated Global Observations (**RINGO**) | Implementation | ICOS ERIC |
| Ground-based radar | EISCAT\_3D: Preparation for Production (**EISCAT3D\_PfP**) | Implementation | EISCAT\_3D |
| Multi-platforms | Atmospheric dynamics Research InfraStructure in Europe (**ARISE2**) | Design |  |
| Simulation chambers | Integration of European Simulation Chambers for Investigating Atmospheric Processes – Towards 2020 and beyond (**EUROCHAMP-2020**) | Integration |  |

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| **BIOSPHERE** | | | | |
| **Type/Area** | **Infrastructure** | | **Development Phase** | **ESFRI** |
| Terrestrial sites | European Long-Term Ecosystem and socio-ecological Research Infrastructure (**eLTER**) | | Integration | eLTER |
| Advancing the European Long-Term Ecosystem, critical zone and socio-ecological Research Infrastructure towards ESFRI (**Advance\_eLTER**) | | Early phase | eLTER |
| Terrestrial stations | International Network for Terrestrial Research and Monitoring in the Arctic (**INTERACT**) | | Integration |  |
| Trees resources | Research Infrastructure for Circular Forest Bioeconomy (**ERIFORE**) | | Design |  |
| Natural history digital facilities | Innovation and consolidation for large scale digitisation of natural heritage (**ICEDIG**) | | Design |  |
| Biodiversity platforms | GLOBal Infrastructures for Supporting Biodiversity research (**GLOBIS-B**) | | International outreach |  |
| **GEOSPHERE** | | | | |
| **Type/Area** | | **Infrastructure** | **Development Phase** | **ESFRI** |
| Solid Earth science | | EPOS Implementation Phase  (**EPOS IP**) | Implementation | EPOS ERIC |
| Volcano observatories | | European Network of Observatories and Research Infrastructures for Volcanology (**EUROVOLC**) | Integration |  |

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| **HYDROSPHERE**  **Marine and freshwater** | | | |
| **Type/Area** | **Infrastructure** | **Development Phase** | **ESFRI** |
| Mesocosms | Network of Leading European AQUAtic MesoCOSM Facilities Connecting Mountains to Oceans from the Arctic to the Mediterranean (**AQUACOSM**) | Integration |  |
| Hydraulic experimental facilities | HYDRALAB+ Adapting to climate change (**HYDRALAB-PLUS**) | Integration |  |
| Multi-Platforms | Preparatory phase for the pan-european research infrastructure  Danubius–RI “The International centre for advanced studies on river-sea  systems (**DANUBIUS-PP**) | Preparatory phase | DANUBIUS-RI |

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| **Marine** | | | |
| Coastal observatories | Joint European Research Infrastructure network for Coastal Observatory – Novel European eXpertise for coastal observaTories (**JERICO-NEXT**) | Integration |  |
| Deep sea observatories | EMSO implementation and operation: DEVelopment of instrument module (**EMSODEV**) | Implementation | EMSO ERIC |
| Implementation of the Strategy to Ensure the EMSO ERIC’s Long-term Sustainability (**EMSO-Link**) |
| Marine data centres | Extending the Ocean Data Interoperability Platform (**ODIP 2**) | International outreach |  |
| SeaDataCloud - Further developing the pan-European infrastructure for marine and ocean data management (**SeaDataCloud**) | Integration |  |
| Research icebreakers | Arctic Research Icebreaker Consortium: A strategy for meeting the needs for marine-based research in the Arctic (**ARICE**) | Integration |  |
| Marine robotics facilities | Marine robotics research infrastructure network (**EUMarineRobots**) | Integration |  |

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| **Interdisciplinary Platforms and Services** | | | |
| **Type/Area** | **Infrastructure** | **Development Phase** | **ESFRI** |
| Multi-platforms | Environmental Research Infrastructures Providing Shared Solutions for Science and Society (**ENVRI PLUS**) | Implementation | *(Cluster)* |
| Multi-platforms | Cooperation of Research Infrastructures to address global challenges in the environment field (**COOP\_PLUS**) | International outreach |  |

**BIOLOGICAL AND MEDICAL SCIENCES**

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| **Biological Resource Centres** | | | |
| **Type/Area** | **Infrastructure** | **Development Phase** | **ESFRI** |
| Biobanks | implementAtion anD OPeration of the gateway for healTh into BBMRI-ERIC (**ADOPT BBMRI-ERIC**) | Implementation | BBMRI |
| Bridging Biobanking and Biomedical Research across Europe and Africa (**B3Africa**) | International outreach |
| Biobanks | EurOPDX Distributed Infrastructure for Research on patient-derived cancer Xenografts (**EDIReX**) | Integration |  |
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| Virus Archive | European Virus Archive goes global (**EVAg**) | Integration |  |
| Insect repositories | Research Infrastructures for the control of vector-borne diseases (**INFRAVEC2**) | Integration |  |
| Mouse archive and Phenotyping centre | Towards enduring mouse resources and services advancing research into human health and disease (**INFRAFRONTIER2020**) | Implementation | INFRAFRONTIER |
| Research Infrastructures for Phenotyping, Archiving and Distribution of Mouse Disease Models - Promoting International Cooperation and User Engagement to Enhance Biomedical Innovation (**IPAD-MD**) | International outreach |
| Marine biology resource | European Marine Biology Resource Centre preparatory phase 2 (**pp2EMBRC**) | Preparatory Phase | EMBRC ERIC |
| European Marine Biological Research Infrastructure Cluster to promote the Blue Bioeconomy (**EMBRIC**) | Implementation | *(Cluster)* |
| Association of European Marine Biological Laboratories Expanded (**ASSEMBLE Plus**) | Integration |  |

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| **Genomics and proteomics facilities** | | | |
| **Type/Area** | **Infrastructure** | **Development Phase** | **ESFRI** |
| Structural biology facilities | Infrastructure for NMR, EM and X-ray crystallography for translational research (**iNEXT**) | Integration |  |
| Releasing the full potential of Instruct to expand and consolidate infrastructure services for integrated structural life science research (**INSTRUCT**-ULTRA) | Implementation | INSTRUCT ERIC |

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| **Imaging Facilities** | | | |
| **Type/Area** | **Infrastructure** | **Development Phase** | **ESFRI** |
| Cell and medical imaging facilities | Euro-BioImaging Preparatory Phase II – Project (**EuBI PPII**) | Preparatory Phase | EURO-BIOIMAGING |
| Global BioImaging Project - International imaging infrastructure services for the life science community (**Global BioImaging**) | International outreach |

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| **Medical Research Facilities** | | | |
| **Type/Area** | **Infrastructure** | **Development Phase** | **ESFRI** |
| BSL4 Laboratories | European Research Infrastructure on Highly Pathogenic Agents 2 (**ERINHA2**) | Preparation phase | ERINHA |
| Nanomedicine Characterization Laboratory | European Nanomedicine Characterization Laboratory (**EU-NCL**) | Integration |  |
| Paediatric facilities | Paediatric Clinical Research Infrastructure Network (**PedCRIN**) | Implementation | ECRIN-ERIC |

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| **Food and agriculture research facilities** | | | |
| **Type/Area** | **Infrastructure** | **Development Phase** | **ESFRI** |
| Aquaculture research facility | AQUAculture infrastructures for EXCELlence in European fish research towards 2020 (**AQUAEXCEL2020**) | Integration |  |
| Plants phenomics and food security facilities | Preparation for EMPHASIS: European Infrastructure for multi-scale Plant Phenomics and Simulation for food security in a changing climate (**EMPHASIS-PREP**) | Preparatory Phase | EMPHASIS |
| Food security facilities | Supporting EU-African Cooperation on Research Infrastructures for Food Security and Greenhouse Gas Observations (**SEACRIFOG**) | International outreach |  |
| Metrology in food facilities | Progressing towards the construction of **METROFOOD-RI** (PRO-METROFOOD) | Preparatory Phase | METROFOOD -RI |
| Plant phenotyping facilities | European Plant Phenotyping Network 2020 (**EPPN2020**) | Integration |  |

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| **Bioinformatics resources** | | | |
| **Type/Area** | **Infrastructure** | **Development Phase** | **ESFRI** |
| Bioinformatic resources | ELIXIR-EXCELERATE: Fast-track ELIXIR implementation and drive early user exploitation across the life-sciences (**ELIXIR EXCELERATE**) | Implementation | ELIXIR |
| Health and Food data infrastructure | Research Infrastructure on Consumer Health and Food Intake using E-science with Linked Data Sharing (**RICHFIELDS**) | Design |  |

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| **Interdisciplinary Platforms and Services** | | | |
| **Type/Area** | **Infrastructure** | **Development Phase** | **ESFRI** |
| Biological and medical facilities | Coordinated Research Infrastructures Building Enduring Life-science services (**CORBEL**) | Implementation | *(Cluster)* |
| Biotechnology facilities | Industrial Biotechnology Innovation and Synthetic Biology Accelerator (**IBISBA 1.0**) | Integration |  |

**ENERGY**

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| **Energy** | | | |
| **Type/Area** | **Infrastructure** | **Development Phase** | **ESFRI** |
| CO2 capture and storage | European Carbon Dioxide Capture and Storage Laboratory Infrastructure (**ECCSEL**) | Implementation | ECCSEL ERIC |
| Electrical laboratories | European Research Infrastructure supporting Smart Grid Systems Technology Development, Validation and Roll Out (**ERIGrid**) | Integration |  |
| Underground storage facilities | Design Study for the European Underground Research Infra-structure related to Advanced Adiabatic Compressed Air Energy Storage (**RICAS2020**) | Design |  |
| Offshore renewable energy | Marine Renewable Infrastructure Network for Enhancing Technologies 2 (**MARINET2**) | Integration |  |
| Marine Renewable Energy Research Infrastructure (**MARINERGI**) | Preparatory Phase |  |
| Biofuels facilities | Biofuels Research Infrastructure for Sharing Knowledge II (**BRISK II**) | Integration |  |
| Smart sensors | European Infrastructure Powering the Internet of Things (**EnABLES**) | Integration |  |

**MATERIAL SCIENCES AND ANALYTICAL FACILITIES**

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| **Type/Area** | **Infrastructure** | **Development Phase** | **ESFRI** |
| Micro and nanotechnology facilities | Nanoscience Foundries And Fine Analysis – Europe (**NFFA**-Europe) | Integration |  |
| Lasers for Laser Science | The Integrated Initiative of European Laser Research Infrastructures (**LASERLAB**-EUROPE) | Integration |  |
| Neutron scattering facilities | Building a research infrastructure and synergies for highest scientific impact on ESS (**BrightnESS**) | Implementation | European Spallation Source ERIC |
| Neutrino detecting facilities | Feasibility Study for employing the uniquely powerful ESS linear accelerator to generate an intense neutrino beam for leptonic CP violation discovery and measurement. (**ESSnuSB**) | Design |  |
| Micro and nanoelectronics labs | Access to European Nanoelectronics Network (**ASCENT**) | Integration |  |
| Novel Materials and biomaterial facilities | ACCELERATing Europe's Leading Research Infrastructures (**ACCELERATE**) | Implementation |  |
| Accelerators and magnets resources | Accelerator and Magnet Infrastructure for Cooperation and Innovation (**AMICI**) | Technological infrastructure |  |
| Neutrons facilities | World class Science and Innovation with Neutrons in Europe 2020 (**SINE2020**) | Implementation | *(Cluster)* |
| Neutron facilities | Solid-State Neutron Detector - A new Neutron Detector for High-Flux Applications (**SoNDe**) | Design |  |
| Laser facilities | ELITRANS-Facilitating the transformation of ELI from ERDF funded, distributed infrastructures towards a unified ELI-ERIC (**ELITRANS**) | Implementation | ELI |
| Laser physics instruments | European Cluster of Advanced Laser Light Sources (**EUCALL**) | Implementation | *(Cluster)* |
| Light sources | Convenient Access to Light Sources Open to Innovation, Science and to the World (**CALIPSOplus**) | Integration |  |
| Soft matter facilities | European infrastructure for spectroscopy, scattering and imaging of soft matter (**EUSMI**) | Integration |  |
| Mass spectroscopy facilities | European Network of Fourier-Transform Ion-Cyclotron-Resonance Mass Spectrometry Centers (EU\_FT-ICR\_MS) | Integration |  |
| Free electron lasers facilities | XLS CompactLight | Design |  |

**PHYSICAL SCIENCES**

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| **Accelerators and colliders** | | | |
| **Type/Area** | **Infrastructure** | **Development Phase** | **ESFRI** |
| Particle Detectors | Advanced European Infrastructures for Detectors at Accelerators (**AIDA-2020**) | Integration |  |
| Accelerators resources | Accelerator Research and Innovation for European Science and Society (**ARIES**) | Integration |  |
| Particle accelerators | Proposal for a Horizon 2020 Design Study on the “European Plasma Research Accelerator with eXcellence In Applications“ (**EuPRAXIA**) | Implementation |  |
| Particle accelerators | European Circular Energy-Frontier Collider Study **(EuroCirCol**) | Design |  |
| Particle accelerators | QUAdrupoleCOrrector (**Quaco**) | Innovation |  |
| Physics | Connecting Russian and European Measures for Large-scale Research Infrastructures (**Cremlin**) | International Outreach |  |
| Nuclear physics facilities | European Nuclear Science and Application Research 2 (**ENSAR2**) | Integration |  |
| Nuclear physics facilities | International Development of gAnil-spirAL2 (**IDEAAL**) | Implementation | SPIRAL-2 |
| Optical fiber clock services | CLOck NETwork Services: Strategy and innovation for clock services over optical-fibre networks (**CLONETS**) | Technological Infrastructure |  |
| Neutrons  facilities | The Future of ILL 2030 (**FILL2030**) | Implementation | ILL |

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| **Astronomy** | | | |
| **Type/Area** | **Infrastructure** | **Development Phase** | **ESFRI** |
| Solar telescopes | Getting Ready for EST (**GREST**) | Design | EST |
| Preparatory Phase for the European Solar Telescope (**PRE-EST**) | Preparatory Phase |
| Gamma-Ray observatories | Cherenkov Telescope Array: Infrastructure Development and Start of Implementation (**CTA**-DEV) | Preparatory Phase | CTA |
| Radio telescopes | Square Kilometre Array: Infrastructure Detailed Design for SKA Phase 1 (**IN-SKA**) | Implementation | SKA |
| Astronomy facilities | Astronomy ESFRI and Research Infrastructure Cluster (**ASTERICS**) | Implementation | *(Cluster)* |
| Astroparticles and oscillations facilities | Astroparticle and Oscillations Research with Cosmics in the Abyss -ARCA and ORCA- (**KM3NeT 2.0)** | Preparatory Phase | KM3NeT 2.0 |
| Radio astronomy facilities | Advanced Radio Astronomy in Europe (**RadioNet**) | Integration |  |
| Optical Infrared facilities | Optical Infrared Coordination Network for Astronomy (**OPTICON**) | Integration |  |
| High-energy astrophysics facilities | Integrated Activities for the High Energy Astrophysics Domain (**AHEAD**) | Integration |  |
| Planetary research facilities | EUROPLANET 2020 Research Infrastructure (**EPN2020-RI**) | Integration |  |
| Infrared telescopes | Innovative infrastructure for astronomical research based on stratospheric balloons (**ORISON**) | Innovation |  |
| Radio-telescopes | The LOFAR for Space weather (LOFAR4SW) | Design |  |
| Radio-telescopes | Maximizing the profile of JIVE  (JUMPING JIVE) | Design |  |
| Balloon telescopes | European Stratospheric Balloon Observatory Design Study (**ESBO DS**) | Design |  |
| Integrated access to balloon-borne platforms for innovative research and  Technology (**HEMERA**) | Integration |  |

**SOCIAL SCIENCE AND HUMANITIES**

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| **Social Sciences** | | | |
| **Type/Area** | **Infrastructure** | **Development Phase** | **ESFRI** |
| Social science Data Archives | Strengthening and widening the European infrastructure for social science data archives (**CESSDA-SaW**) | Implementation | CESSDA ERIC |
| European survey | European Social Survey Sustainability (**ESS-SUSTAIN**) | Implementation | ESS ERIC |
| European survey | Achieving world-class standards in all SHARE countries (**SHARE-DEV3**) | Imlpementation | SHARE ERIC |
| European survey | European Cohort Development Project (**ECDP**) | Design |  |
| Social sciences facilities | Synergies for Europe's Research Infrastructures in the Social Sciences (**SERISS**) | Implementation | *(Cluster)* |
| European survey | Generations and Gender Programme: Evaluate, Plan, Initiate (**GGP-EPI)** | Early Phase |  |
| European databanks | Historical high-quality company-level data for Europe (**EURHISFIR**M) | Design |  |

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| **Arts and Humanities** | | | | |
| **Type/Area** | **Infrastructure** | **Development Phase** | | **ESFRI** |
| Data infrastructure on Arts and Humanities | DARIAH ERIC Sustainability Refined (**DESIR**) | | Implementation | DARIAH ERIC |
| Humanities at Scale: Evolving the DARIAH-ERIC (**HaS-DARIAH**) | |
| Analytical facilities on Cultural Heritage | Integrated Platform for the European Research Infrastructure ON Cultural Heritage (**IPERION CH**) | Integration | |  |
| Inter-disciplinary services on Cultural Heritage | Pooling Activities, Resources and Tools for Heritage E-research Networking, Optimization and Synergies (**PARTHENOS**) | Implementation | | *(Cluster)* |
| Inter-disciplinary facilities on Cultural Heritage | The European Research Infrastructure for Heritage Science Preparatory Phase (**E-RIHS PP**) | Preparatory Phase | | E-RIHS |
| **Linguistics** | | | | |
| **Type/Area** | **Infrastructure** | **Development Phase** | | **ESFRI** |
| Data infrastructure | Strengthening the CLARIN Infrastructure (**CLARIN-PLUS**) | Implementation | | CLARIN ERIC |
| Inter-disciplinary facilities on Cultural Heritage | European Lexicographic Infrastructure (**ELEXIS**) | Integration | |  |

**MATHEMATICS AND ICT**

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| **Type/Area** | **Infrastructure** | **Development Phase** | **ESFRI** |
| Cloud | The European Open Science Cloud for Research Pilot Project (**EOSCpilot**) | Pilot |  |
| Data infrastructures | SoBigData Research Infrastructure (**SoBigData**) | Integration |  |
| Mobile network | Design of the European mobile network operator for research (**EuWireless**) | Design |  |
| HPC systems | Transnational Access Programme for a Pan-European Network of HPC Research Infrastructures and Laboratories for scientific computing (**HPC-EUROPA3**) | Integration |  |

1. New (and major upgrades of) research infrastructures of pan-European interest prioritised by the European Strategy Forum on Research Infrastructures. [↑](#footnote-ref-1)
2. Multi-disciplinary Research Infrastructures are reported only once according to a core scientific field. [↑](#footnote-ref-2)