

# RESEARCH INFRASTRUCTURE DEVELOPMENT ROADMAP OF THE REPUBLIC OF CROATIA 2023–2027



**REPUBLIC OF CROATIA**  
**Ministry of Science,  
Education and Youth**

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## Abbreviations

**GDP** – Gross Domestic Product  
**CPU** – Central Processing Unit  
**CSF** – Cerebrospinal Fluid  
**DG ENERG** – Directorate-General for Energy  
**DMP** – Data Management Plan  
**EBI** – European Bioinformatics Institute  
**ESFRI** – European Strategy Forum on Research Infrastructures  
**ERIC** – European Research Infrastructure Consortium  
**ESIF** – European Structural and Investment Funds  
**EU** – European Union  
**FAIR** – Findable, Accessible, Interoperable and Reusable  
**FTE** – Full-time equivalent  
**GB** – Gigabyte  
**GPGPU** – General-Purpose Graphics Processing Unit  
**H-index** – Hirsch index  
**HAMAG-BICRO** – Croatian Agency for SMEs, Innovations and Investments  
**HPC** – High-Performance Computing  
**HRK** – Croatian Kuna  
**ICT** – Information and Communication Technologies  
**RDI** – Research, Development, Innovation  
**ITER** – International Thermonuclear Experimental Reactor  
**MSEY** – Ministry of Science, Education and Youth  
**NI4OS Europe** – National Initiatives for Open Science in Europe  
**NRRP** – National Recovery and Resilience Plan 2021–2026  
**NDS** – National Development Strategy of the Republic of Croatia for 2030  
**Horizon 2020** – Horizon 2020 Framework Programme for Research and Innovation (2014–2020)  
**OPCC** – Competitiveness and Cohesion Operational Programme 2021–2027  
**R&D** – Research and Development  
**RI** – Research Infrastructure  
**S3** – Smart Specialisation Strategy 2021–2029  
**SMP** – Symmetric Multiprocessing  
**TB** – Terabyte  
**UN** – United Nations  
**SCE** – Scientific Centre of Excellence

## Foreword

In addition to human capital, research infrastructures are the basis of excellence in science. By enabling excellent research, accelerating knowledge transfer and acting as catalysts for innovation, they form the backbone of modern research and innovation ecosystems. They also play a key role in connecting the scientific and business communities, developing skills and attracting top talent.

At the initiative of the European Strategy Forum on Research Infrastructures and the European Commission, EU Member States periodically develop national roadmaps for research infrastructures. The Republic of Croatia prepared its first National Research Infrastructure Development Roadmap in 2014, which was subsequently updated in 2016. The Croatian Research Infrastructure Development Roadmap 2023–2027, adopted in 2023, provided for its further update during the implementation period. The Roadmap provides a comprehensive, up-to-date overview of national investments, as well as Croatia's participation in international infrastructures and organisations. Its aim is to ensure that their potential is used as effectively as possible for the benefit of society and the economy. The Roadmap confirms the priorities and development directions grounded in European and national strategic documents. Its aim is to contribute to addressing global challenges and further enhance the quality and international visibility of the Croatian research and innovation system. The Roadmap supports the development of open science based on excellence and international competitiveness as a foundation for an innovative and prosperous society. At the same time, it promotes excellence, cooperation and internationalisation, as well as the provision of services to the wider community in areas such as industry, education and the economy.

Croatia's national research infrastructures clearly demonstrate the country's potential to significantly contribute to a more competitive European Research Area. To align with European and global trends and ensure a prompt response to new challenges, the Roadmap will continue to be updated regularly in line with the needs of the national research environment and the objectives of European policy. Investment in research infrastructures is an investment in the future. It is also a prerequisite for excellent research and knowledge-based solutions to global societal challenges and economic needs.

I am confident that the updated Research Infrastructure Development Roadmap of the Republic of Croatia 2023–2027 will contribute to the long-term development of Croatia's research and innovation system. It will also further strengthen the capacity and performance of Croatian researchers in research, development and innovation, while enhancing international co

**Minister of Science, Education and Youth**  
**Prof. Radovan Fuchs, PhD**



# 1 Introduction

## 1.1 On research infrastructures

**Research infrastructures provide unique knowledge, expertise, comprehensive resources, and services to research communities in view of conducting research and fostering innovation development.** They include scientific equipment or sets of instruments, knowledge-based resources such as collections, archives, or scientific data infrastructures, computer systems, communication networks, and other infrastructure of a unique nature. They are open to external users and key to achieving excellence in research and innovation. They are important hubs of knowledge and innovation and thus a fundamental pillar of the European Research Area, essential for carrying out cutting-edge research, broadening the boundaries of human knowledge, and addressing global challenges.

There are several types of research infrastructures: traditional ones which are located in a single place – one resource per location, but they can also be spread out as a network of distributed resources; or virtual ones – where services are provided electronically. By the geographical area they belong to, they can be regional, national, macro regional, and pan-European.

**Scientific equipment** is a tangible or intangible set of instruments used in various laboratories, scientific organisations and research infrastructures. Scientific research equipment can be categorised according to its value as follows: large (purchase value over EUR 400,000), medium (purchase value between EUR 55,000 and EUR 400,000) and small equipment (purchase value up to EUR 55,000).



Figure 1 Examples of scientific equipment

**Research infrastructures are complex facilities that require significant capital and operating costs, as well as strong research groups and numerous partners from the academic, business, and public sector.** World-class research infrastructures provide essential services to research and innovation communities and therefore play a key role in broadening the boundaries of knowledge. They lay the groundwork for research and innovation contributions in view of addressing global challenges. They also enable and support the implementation of basic and applied research, the education and training of researchers and students, the provision of public services (e.g. healthcare) and the creation of start-ups and spin-offs.

Research infrastructures require quality researchers and contribute to attracting and retaining such researchers. They also facilitate researcher mobility and collaborative projects leading to knowledge sharing and the strengthening of researchers' competences.

**A highly important form of research infrastructure in Europe are the European Research Infrastructure Consortia, abbreviated as ERICs.** The possibility of establishing ERICs is provided for by the Council Regulation from June 2009, which defines them as a legal entity. This created a legal instrument for the establishment of future research infrastructures at the European level which regulates issues such as financing, taxes, procurement, etc., making it easier for Member States to participate in large infrastructures. Their primary task is to establish and manage research infrastructure on a non-economic basis, although regulation allows some basic economic activities in order to promote innovation and the transfer of knowledge and technology. Membership of an ERIC is open to EU Member States, associated countries, third countries, and specialised intergovernmental organisations. Their purpose is to provide access to research infrastructure for members of the European research community, to contribute to the mobility of researchers and the dissemination and optimisation of the results of research activities at the community level, as well as to provide technological development activities. European Research Infrastructure Consortia are a great opportunity for smaller countries that may have limited possibilities of setting up world-class research infrastructures.

**The ESFRI methodology identifies six main stages in the life cycle of research infrastructures<sup>1</sup>:**

1) **Concept development** – usually originates from scientific communities brought together by common scientific needs and objectives. 2) **Infrastructure design phase** – the scientific concept and technical feasibility of the infrastructure are assessed, and initial analyses are carried out, including analyses of potential users, costs, and political and financial support. 3) **Preparatory phase** – may include the development of project technical documentation (e.g. the main design), a feasibility study with a cost-benefit analysis and other activities necessary for the successful implementation of the project. 4) **Implementation phase** – construction, purchase and installation of equipment necessary for operation. Other activities may include the establishment of an organisational structure, recruitment, intellectual property protection policies and innovation policies, development of business plans and the provision of funding necessary for the operation of the research infrastructure. 5) **Operational phase** – conducting frontier research and providing advanced services, supporting the mobility of researchers and the establishment of start-ups and spin-offs, and attracting enterprises with significant innovation potential. 6) **Termination** – refers to activities such as the dismantling of the organisation, the dismantling of facilities and the related safety aspects, as well as the rehabilitation of the site in certain cases. This phase may result in the development of new research infrastructure based on advancements in the field of research.



Figure 2 Life cycle of research infrastructures

<sup>1</sup> [Strategy Report on Research Infrastructures, ROADMAP 2021 Public Guide](#)

## 1.2 Research Infrastructure Development Roadmap

**The Roadmap aims to contribute to the sustainable long-term development of the Croatian research and innovation system and to the achievement of the strategic goals identified in the relevant development strategies and plans.** The steering of national research infrastructure and targeted participation in European research infrastructures will lead to capacity building and the improved quality and performance of Croatian scientists in research, development and innovation, while improving international cooperation.

This document creates a framework for the long-term planning of research infrastructure projects that will strengthen synergies, minimise overlaps, and prevent unnecessary or double investments. Such planning and development will enable improved efficiency and long-term sustainability of research infrastructures while maximising their potential. Synergies between different national and international funding sources as well as the participation of private partners will be pursued. Basic selection criteria and key performance indicators have been developed to select, monitor, and periodically evaluate future and existing research infrastructures throughout their life cycle.

**The Roadmap is structured as follows: the first part outlines the strategic framework and the existing investments in the system; the second part contains an overview of the existing infrastructure; and the final part presents a plan for the further development of research infrastructures in Croatia.**

The **Strategic Committee on Research Infrastructures**<sup>2</sup> is an advisory and coordinating body of the Ministry of Science, Education and Youth, comprising designated experts from different fields. Its tasks are to provide guidance, recommendations, assessments and advice on research infrastructures. Additionally, one of the tasks of this Committee is to propose guidelines for the Republic of Croatia Research Infrastructure Development Roadmap in accordance with the relevant national and European strategic documents.

The Research Infrastructure Development Roadmap was subject to public consultation in which the public concerned and the expert community could provide their comments.

**The Research Infrastructure Development Roadmap will be periodically updated.**

## 1.3 Strategic framework

**At the EU level, the European Strategy Forum on Research Infrastructures (ESFRI) defines the relevant strategic framework for research infrastructures.** It is a strategic body established by the Council of the European Union in 2002 to support a coherent and strategic approach to research infrastructures policy-making in Europe. Its main task is to develop a comprehensive strategy for the development of research infrastructures that would provide scientists from all fields with a strong and high-quality basis for scientific research through consolidation and multilateral application. Since 2006, ESFRI has been developing a Research Infrastructure Development Roadmap, setting out investment priorities for European research infrastructures in the next 10 to 20 years. The Roadmap is being continuously revised and was updated in 2008, 2010, 2016 and 2018. The latest ESFRI Roadmap, published in 2021, provides an overview of 41 ESFRI Landmarks – research infrastructures that have been implemented or have reached a high level of implementation and constitute one of the key elements of the competitiveness of the European Research Area. It also contains an overview of the Projects added to the Roadmap in 2010 and 2016, as well as an assessment of new project proposals, 11 of which were added to the Roadmap. ESFRI Projects are research infrastructures in

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<sup>2</sup> <https://mzo.gov.hr/istaknute-teme/znanost/znanstvena-infrastruktura/znanstvena-oprema/145>

the preparatory phase that have been selected for their scientific excellence and maturity, with the expectation that they will reach the implementation phase within a ten-year period.

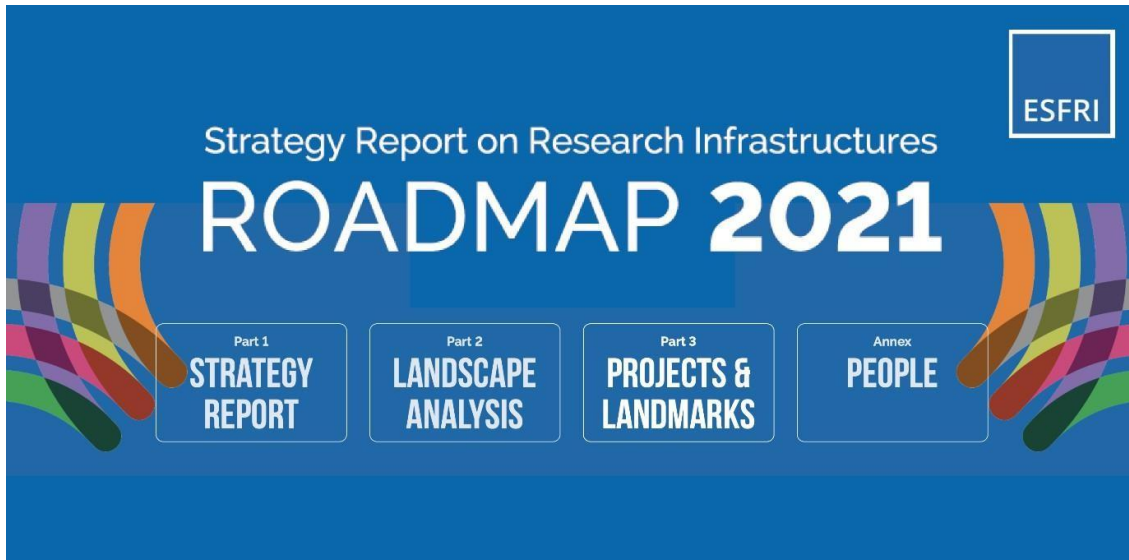


Figure 3 Overview of the ESFRI Roadmap published in 2021

**The European Commission and ESFRI encourage Member States and associated countries to develop national research infrastructure development roadmaps.** Even though these roadmaps are not obligatory, most EU countries have developed them as a blueprint for setting national priorities and securing funding. The Republic of Croatia adopted its first National Research Infrastructure Development Roadmap in 2014, and updated it in 2016.

**At the national level, the Research Infrastructure Development Roadmap is particularly aligned with the National Development Strategy for 2030 (NDS).** Specifically, the Roadmap is part of Development Direction 1 (DD1) – Sustainable Economy and Society and Development Direction 4 (DD4) – Balanced Regional Development, which are linked to investments in science, technology and regional competitiveness.

**The Smart Specialisation Strategy (S3) 2029** is aligned with the National Development Strategy for 2030 (NDS 2030). As part of the strategic framework of the NDS 2030, it is the main RDI strategy for the period until 2029. S3 2029 defines priority areas for promoting investment in RDI through public funding. It also constitutes an enabling condition (ENC) for the implementation of EU funds for 2021–2027 and provides the strategic basis for financing RDI projects from EU funds, including infrastructure investments.

## 2 Overview of the state of research infrastructures in Croatia

### 2.1 System overview

Research infrastructures are formally supervised by the Ministry of Science, Education and Youth, although its oversight is somewhat limited. **At the moment, investments in research infrastructure are mainly financed by the European Structural and Investment Funds (ESIF).** Therefore, regulations, rules and procedures related to the ESI Funds have a significant impact on the development of research infrastructure projects, as well as on their strategies and users. The previous preference for public funding of non-economic activities of research infrastructures has, in practice, limited their economic activities. Research infrastructure projects therefore need to be financially viable and secure funding for reinvestment in equipment from their own resources, collaborative research projects or national funding sources. Moreover, the funding of research infrastructure from the European Regional Development Fund usually does not cover investments in new researchers, skills, or partnerships that would enable the efficient use of new equipment, so such investments must be funded from other sources.

#### **Institutions from the science sector develop, own, and manage research infrastructures in Croatia.**

As project promoters, institutions from the science sector<sup>3</sup> develop, design and submit project proposals and, once funding has been approved, implement and manage research infrastructure projects. Institutions from the science sector are therefore responsible for the research performance, maintenance, and cost-effectiveness of the research infrastructure, as well as for additional investments made necessary by asset depreciation or technological progress. Given the duration of the research infrastructure life cycle and the complexity of the activities at each stage, institutions from the science sector need to develop (or in some cases acquire) the competences needed for infrastructure management.

#### **Research infrastructure ecosystems are generally underdeveloped and very poorly connected with the industry, which is also reflected in the functioning of certain research infrastructures.**

**A strategic approach to planning and investment in research infrastructures fosters better efficiency of R&D systems.** Since most research infrastructure is financed from the EU sources, it is crucial that the available funds are used strategically, i.e. in accordance with defined priorities and based on a comprehensive and transparent assessment, maximising the benefits for the Croatian economy and society.

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<sup>3</sup> Institutions within the science system include higher education institutions, research institutes and other legal entities and their organisational units. This definition also includes Centres of Research Excellence, private research organisations, and science and technology parks.

## 2.2 Investments to date by area

This chapter analyses projects in the RDI sector in accordance with the main Thematic Priority Areas (TPAs) of the Smart Specialisation Strategy (2029) and Horizon Europe priorities. As part of the NRRP 2021–2026, a total of 438 projects were funded, including 17 research infrastructure development projects and 421 RDI activities. Ten projects are currently being funded under the Competitiveness and Cohesion Programme 2021–2027, including a major infrastructure project and nine research, development and innovation activities. All RDI-related investments should contribute to the objectives and priorities of the Smart Specialisation Strategy and be aligned with thematic priority areas. The total number of projects by area and the amount of funding is shown in Table 1 and Table 2.

*Table 1 Number of funded projects by thematic priority area and project type*

| Thematic priority area                                     | RDI activities | Research infrastructure | Total      |
|------------------------------------------------------------|----------------|-------------------------|------------|
| Personalised healthcare                                    | 93             | 4                       | 97         |
| Smart and clean energy                                     | 64             | 2                       | 66         |
| Smart and green transport                                  | 29             | 3                       | 32         |
| Security – awareness, prevention, response and remediation | 19             |                         | 19         |
| Sustainable and circular food                              | 38             | 3                       | 41         |
| Customised and integrated wood products                    | 3              | 1                       | 4          |
| Digital products and platforms                             | 149            | 4                       | 153        |
| Interdisciplinary                                          |                | 1                       | 1          |
| <b>Total</b>                                               | <b>395</b>     | <b>18</b>               | <b>413</b> |

*Table 2 Funding amounts for RDI projects by thematic priority area and project type*

| Thematic priority area                                     | RDI activities       | Research infrastructure | Total                 |
|------------------------------------------------------------|----------------------|-------------------------|-----------------------|
| Personalised healthcare                                    | 27,974,468.46        | 6,478,209.12            | 34,452,677.58         |
| Smart and clean energy                                     | 15,966,979.14        | 7,842,478.16            | 23,809,457.30         |
| Smart and green transport                                  | 4,361,230.57         | 2,891,218.40            | 7,252,448.97          |
| Security – awareness, prevention, response and remediation | 2,129,806.34         | 0                       | 2,129,806.34          |
| Sustainable and circular food                              | 7,288,680.39         | 24,040,172.12           | 31,328,852.51         |
| Customised and integrated wood products                    | 169,926.19           | 12,876,847.47           | 13,046,773.66         |
| Digital products and platforms                             | 19,023,808.60        | 5,890,833.16            | 14,914,641.76         |
| Interdisciplinary                                          |                      | 88,702,213.00           | 88,702,213.00         |
| <b>Total</b>                                               | <b>66,914,899.69</b> | <b>148,721,971.43</b>   | <b>215,636,871.12</b> |

Horizon Europe funded 437 projects under the thematic priorities that largely overlap with the TPAs. The total number of projects by area and the amount of funding is shown in Table 3.

*Table 3 Horizon Europe: project funding by thematic priorities (Source: Horizon Dashboard, April 2026)*

| Priority area                                                       | No. of projects | Funding (EUR) |
|---------------------------------------------------------------------|-----------------|---------------|
| European Research Council                                           | 5               | 8.51          |
| Marie Skłodowska-Curie Actions (MSCA)                               | 56              | 7.54          |
| Research infrastructures                                            | 21              | 3.13          |
| Health                                                              | 40              | 15            |
| Culture, creativity and inclusive society                           | 31              | 7.46          |
| Civil security for society                                          | 11              | 2.13          |
| Digitalisation, industry and space                                  | 37              | 10.54         |
| Climate, energy and mobility                                        | 70              | 41.3          |
| Food, bioeconomy, natural resources, agriculture and environment    | 83              | 20.08         |
| European Innovation Council                                         | 12              | 8.42          |
| European innovation ecosystems                                      | 5               | 916.9k        |
| Widening participation and strengthening the European Research Area | 54              | 38.5          |
| <b>Total</b>                                                        | <b>425</b>      | <b>163.53</b> |

### 3 Overview of the Croatian research infrastructure

**The Croatian scientific and innovation system is still very fragmented.** This fragmentation, coupled with insufficient investment in research, development and innovation, hampers scientific excellence and the generation of high-quality research results, consequently limiting the productivity of the system as a whole. In view of negative demographic trends and population outflow, Croatia needs to improve the conditions for researchers not only when it comes to salaries and career prospects, but also in terms of providing them with quality research infrastructure.

**Investments in research infrastructure should be channelled into projects that contribute to reducing the gap in the Croatian scientific and innovation system.** The resources available for the development of research infrastructures are limited, which underlines the need to prioritise projects that best contribute to the successful implementation of national strategies and whose socio-economic impact is the highest. Moreover, prioritising certain investments enables the development of a predictable and stable environment for future investments and allows scientific organisations to plan their development more effectively.

**In order to achieve long-term sustainability of public research infrastructures, it is necessary to ensure a high degree of compliance between the relevant funding frameworks and strategic priorities.** Above all, it is necessary to monitor global trends, namely to keep pace with the European Union policy and its directions and priorities. In the development of this Roadmap, *ESFRI Roadmap 2021 – Strategy report on research infrastructures* was used as the base model of EU policy. In addition, the research infrastructure development priorities are reflected in and build on the relevant objectives and priorities set out in the main national strategies and development plans, primarily in the National Development Strategy 2030 (NDS), National Recovery and Resilience Plan 2021–2026 (NRRP), Operational Programme Competitiveness and Cohesion 2021–2027 (OPCC), and Smart Specialisation Strategy 2021–2029 (S3).

The Research Infrastructure Development Roadmap will also cover investments in technology infrastructures, as defined in the proposal for a new Community framework for State aid for RDI and in the Commission Staff Working Document entitled 'Technology Infrastructures'<sup>4</sup>. Technology infrastructures are essential for raising the technology readiness level of our economy.

As in the case of research infrastructure, technology infrastructure activities are predominantly non-economic in nature, with a strong focus on effective cooperation between science and the economy, as well as the transfer of technology, for the purpose of responding to the industry needs in industrial research and experimental development of new technologies, products and services. Technology infrastructure will enable the economy, particularly SMEs, to access the skills, knowledge and facilities essential to identify and develop the technologies they need, but also cannot access due to their limited resources, thereby reducing the risk of their investment in R&D. The introduction of the concept of technology infrastructures will promote the establishment and operation of non-profit research and technology organisations<sup>5</sup> for applied research as owners and/or managers of technology infrastructures. In order to fulfil their purpose of conducting applied research, mainly in cooperation with public and private partners, research and technology organisations will, in addition to technology infrastructure, provide highly qualified research and technology knowledge and expertise with technological foresight capabilities. Competitive public funding of research and technology organisations is expected, with a significant role played by funds from the private sector. Research and technology organisations may be established and co-owned by the Republic of Croatia, institutions from the science sector, local or state administrative bodies and industrial partners, provided that they do not have preferential access to research results.

**This Roadmap selected the areas that will be best aligned with the aforementioned policies and strategies and that will additionally emphasize the areas in which the Croatian scientific community already excels.**

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<sup>4</sup>'Technology infrastructure' means the facilities, equipment, capabilities and related support services required for the development, testing and upgrading of technology to advance, through industrial research and experimental development activities, from laboratory validation to validation in an operational environment. Their users are mainly industry actors, including SMEs, seeking support for the development and integration of innovative technologies to develop new products, processes and services, while ensuring feasibility and regulatory compliance.

<sup>5</sup> Abbreviated as RTOs.

# DATA, COMPUTING AND DIGITAL RESEARCH INFRASTRUCTURES

## 3.1 Data, computing and digital research infrastructures

This area focuses on data, advanced computing and digital research infrastructures as key drivers of the modern scientific research and innovation system. The development and availability of these resources are prerequisites for open science, effective cooperation and accelerated knowledge transfer to the economy and society. Particular importance is placed on ensuring standardised data management and the reuse of data, including the application of the FAIR principles.

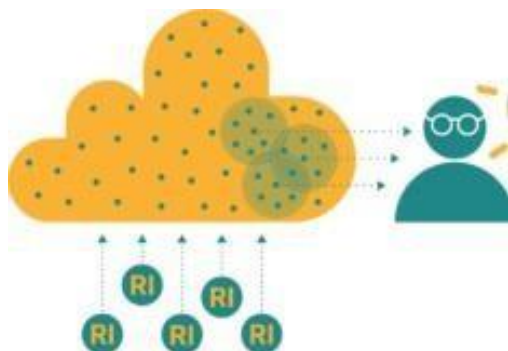
At the global level, this priority area is characterised by the exponential growth in the volume of data, the development of artificial intelligence (AI) and the growing need for advanced computing capacities and secure digital environments.

**In Croatia, there is a growing need to develop and use supercomputers and interoperable digital platforms** that enable more efficient exchange and processing of scientific data. Particular emphasis is placed on developing AI, computer science and data engineering capacities, as well as various applications across scientific and societal fields. In line with the national strategic framework and European initiatives, priorities include the development of high-performance computing infrastructures and the establishment of systems for managing and sharing research data, while the development of advanced communication technologies, including quantum communication networks, is also encouraged.

### INVESTMENT PRIORITY WILL BE GIVEN TO RESEARCH INFRASTRUCTURES THAT AIM TO:

- Promote the development and application of AI, high-performance computing, big data, blockchain technologies, robotics, quantum computing and communications, the Internet of Things (IoT) and cloud services as key solutions to existing and future societal challenges.
- Connect scientific research institutions and economic operators with the aim of contributing to the development of innovations in the field of cybersecurity.
- Contribute to developing competitive human capital and bridging the digital divide.
- Support interdisciplinary research and innovation through the integration of digital technologies into various scientific and societal fields.
- Promote open science through the standardisation, interoperability and long-term availability of research data, as well as its reuse in scientific and innovation processes.

## The European Open Science Cloud



**Type:** International organisation

**Headquarters:** Brussels, BE

**Founded in:** 2020

**Croatian membership since:** 2020

**National coordinator:**

University of Zagreb, University Computing Centre (SRCE)

**Website:**

<https://eosc-portal.eu/>

The European Open Science Cloud (EOSC) is a European Commission initiative that supports the development of open science through research infrastructures and services. It brings together around 250 members and observers. EOSC advocates the management and use of research data in order to provide researchers with access to data-driven science.

The EOSC Federation consists of various EOSC nodes, i.e. autonomous national or thematic infrastructures that support interoperable sharing and usage of data and services within a common European framework. Within the Federation, the EOSC EU Node operates as a central access point provided by the European Commission, facilitating user access to research outputs, services and tools.

During the implementation phase (2021–2030), EOSC operates as a co-programmed partnership.

## European High Performance Computing Joint Undertaking



**Type:** Joint undertaking

**Headquarters:**

Luxembourg, LU

**Founded in:** 2018

**Croatian membership since:** 2020

**National coordinator:**

University of Zagreb, University Computing Centre (SRCE)

**Website:**

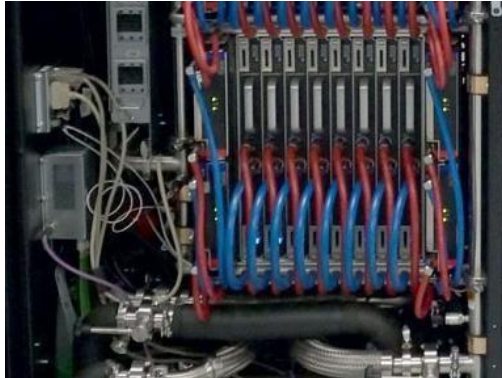
[https://eurohpc-ju.europa.eu/index\\_en](https://eurohpc-ju.europa.eu/index_en)

The partnership was established to coordinate joint efforts and pool resources with the aim of making Europe a global leader in supercomputing. Europe's role in the data economy, scientific excellence and industrial competitiveness increasingly depends on the development of HPC technologies, the availability of state-of-the-art supercomputing and data infrastructures, and the strengthening of high-performance computing applications. The EuroHPC JU coordinates the procurement and management of supercomputers. It provides access to these resources for researchers, industry and the public sector through open calls and the allocation of computing resources for research, innovation and complex simulations. Particular emphasis is placed on strengthening European technological sovereignty and developing applications in areas such as AI, climate modelling and the development of new materials. To date, the EuroHPC JU has already procured several supercomputers, including LUMI in Finland, Leonardo in Italy, MeluXina in Luxembourg, Vega in Slovenia, Karolina in Czechia, Discoverer in Bulgaria and Deucalion in Portugal, along with newer systems such as MareNostrum5 in Spain and Alps in Switzerland.

# Napredno računanje



## Supek Supercomputer and Advanced Cloud Computing Resource Vrančić



**Type:** Research infrastructure

**Location:** Zagreb

**National coordinator:**

University of Zagreb, University Computing Centre (SRCE)

**Website:**

<https://www.srce.unizg.hr/index.php/napredno-racunanje>

Advanced computing uses state-of-the-art computing technologies to address resource-intensive challenges faced by researchers across various scientific fields.

Supek, first demonstrated in 2023, is Croatia's first petascale supercomputer. It provides scientists with a world-class computing environment for high performance computing (HPC). HPC enables the execution of user applications with very high performance and capacity requirements of various computing resources – processor cores, accelerators such as graphic processors, RAM, storage, and network connectivity.

Vrančić is based on cloud computing, which uses virtual rather than physical resources. Provides institutions with the possibility of installing additional infrastructure resources in accordance with their needs, without having to acquire, install, configure and maintain physical devices.

# ACROSS-DataScience



## Centre of Research Excellence for Advanced Methods and Technologies in Data Science and Cooperative Systems



**Type:** Scientific centre of excellence

**Location:** Zagreb

**National coordinator:**

University of Zagreb, Faculty of Electrical Engineering and Computing

**Website:**

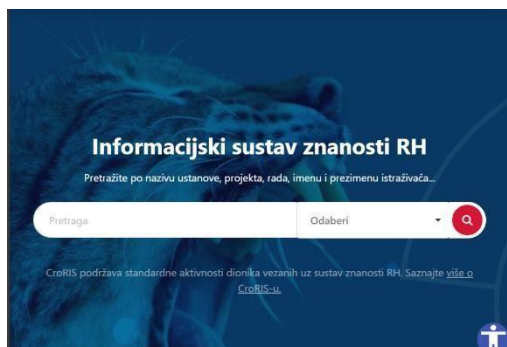
<https://www.fer.unizg.hr/zci>

The Centre consists of two research units: Data Science Research Unit (DataScience RU) and Advanced Cooperative Systems Research Unit (ACROSS RU).

DataScience RU focuses on extracting knowledge from data, including big data, using methods from mathematics, statistics, machine learning, signal processing, databases and high-performance computing. Research is organised into the areas of multimodal data processing, machine learning, heterogeneous cloud computing and data-intensive applications.

ACROSS RU focuses on developing efficient and reliable complex systems, including component design and cooperation. It specialises in autonomous and cooperative robotic systems, computer vision, sensor and networked services, and cyber-physical systems, with applications in healthcare, security, the environment, smart cities and industry.

## Croatian Research Information System



**Type:** Research infrastructure

**Location:** online

**National coordinator:**  
Ministry of Science, Education and Youth

**Website:**  
<https://croris.hr/>

Developed as part of the Scientific and Technological Foresight project, the Croatian Research Information System (CroRIS) is a central platform providing comprehensive, integrated and reliable information on every aspect of Croatia's research and innovation system. Its modules contain extensive information on research and scientific activities in Croatia, including information on researchers, institutions, projects, research studies, publications, products, patents, equipment and its use. A significant portion of the CroRIS software modules has been developed to facilitate integration with other information systems. Much of the information available through CroRIS is publicly accessible. Any changes to the data are made by authorised users only. CroRIS users are primarily researchers, science-based institutions, public administration bodies involved in setting priorities in the fields of science, research and innovation, and the business sector.

# ENERGY

## 3.2 Energy

**This area includes modern energy technologies and efficient, environmentally friendly and remotely controlled solutions.** At EU and global level, the energy sector is undergoing an accelerated transition towards low-carbon systems, decarbonisation and greater energy independence. This transition is accompanied by the rapid development of renewable energy sources, smart grids, energy storage systems and the digitalisation of energy systems. Particular emphasis is placed on strengthening the flexibility and resilience of energy systems and their integration with digital technologies to support more efficient management of energy production and consumption. These global trends directly shape national development priorities and accelerate the transformation of the energy sector.

Croatia's energy sector is characterised by a diverse energy mix, with a gradual increase in the share of renewable energy sources in total energy consumption. Croatia has a strong tradition of production, building and technical know-how in the energy sector. However, R&D potential is hampered by outdated infrastructure, which requires significant investments to remain competitive. In line with national and European strategic frameworks, the sector is evolving towards decarbonisation, greater energy efficiency, enhanced security of supply and reduced dependence on energy imports. At the same time, investment in renewable energy sources and advanced energy technologies is being promoted.

### INVESTMENT PRIORITY WILL BE GIVEN TO RESEARCH INFRASTRUCTURES THAT AIM TO:

- Promote the development of smart and clean energy solutions.
- Focus on the development of modern energy technologies and production capacities that are efficient, remotely controlled, smart-grid-compatible and environmentally friendly.
- Make a clear contribution to reducing Croatia's dependence on energy imports.
- Stimulate the comprehensive renovation of buildings, covering not only energy efficiency but also fire safety and seismic protection.
- Promote greater flexibility of the energy system and better integration of renewable energy sources into the power grid.
- Enable the development of smart and sustainable cities.

## International Fusion Materials Irradiation Facility – Demo Oriented NEutron Source



**Type:** Research infrastructure

**Headquarters:** Granada, ES

**Founded in:** 2018

**Croatian membership since:** 2018

**National coordinator:**  
Ruđer Bošković Institute

**Website:**  
<https://ifmif-dones.es/>

A European strategic project worth more than EUR 700 million, IFMIF-DONES is aimed at developing research infrastructure for testing materials in an environment that mimics the conditions inside a fusion reactor. As a Spanish-Croatian initiative, the project was included in the ESFRI portfolio as a project of strategic importance to the EU in 2018.

The DONES project is a crucial step in the development of the future Demonstration Fusion Power Plant (DEMO), the construction of which is planned following the commissioning of the ITER experimental nuclear fusion reactor in Cadarache, France. Cooperation between Croatia and Spain has been formalised through a series of agreements, including the 2018 Memorandum of Cooperation and the 2022 Memorandum of Understanding between the competent ministries of the two countries. Under this partnership, Croatia contributes approximately 5% of the project's value (around EUR 35 million), which in turn entitles it to a proportional share of the experimental capacity of this unique research facility.

# ENVIRONMENT

## 3.3 Environment

**This field comprises the natural and biotechnical sciences that are the basis for understanding the world around us. The focus is on climate change mitigation and adaptation, the prevention of environmental pollution, and the conservation and sustainable use of natural resources.** Policy responses to these challenges need to be comprehensive and focus on improving health and quality of life, strengthening resilience and fostering competitiveness. Anthropogenic pressure plays a prominent role in the most pressing global challenges humanity is currently facing.

Due to its unique geographical location, **Croatia is characterised by a rich biodiversity, geodiversity and landscape diversity.** However, it is also exposed to high risks posed by human activity and climate change. The value of healthy, functioning ecosystems and well-preserved biodiversity has not yet been fully recognised, despite the significant economic benefits generated by Croatia's natural capital, particularly through the blue economy.

**Environmental policies in Croatia are aligned with the objectives of the European Green Deal** and oriented towards achieving climate neutrality by 2050, strengthening resilience to climate change and preserving natural resources. Particular emphasis is placed on the transition to a circular economy, reducing greenhouse gas emissions and ensuring the efficient management of natural capital. This requires an integrated approach linking environmental protection, climate policy and sustainable development.

### INVESTMENT PRIORITY WILL BE GIVEN TO RESEARCH INFRASTRUCTURES THAT AIM TO:

- Focus on preserving biological and landscape diversity and exceptional natural and water resources.
- Make a clear contribution to climate change mitigation and the reduction of anthropogenic impacts, while promoting sustainable development and the bioeconomy.
- Strengthen the resilience of ecosystems and society to climate risks.
- Develop solutions to protect and improve air, soil and water quality, including the monitoring and modelling of environmental pollution.
- Strengthen systems for monitoring, managing and protecting natural resources through the use of digital technologies, geographic information systems and advanced analytical methods.
- Improve science-based environmental planning and management through the development of data, indicators and models to support decision-making in nature conservation and climate policy.

## Mediterranean Science Commission



**Type:** International organisation

**Headquarters:** Monaco

**Founded in:** 1919

**Croatian membership since:** 1992

**National coordinator:**  
Institute of Oceanography and Fisheries

**Website:**  
<https://www.ciesm.org/>

CIESM is an independent international scientific organisation that promotes cooperation in research on the Mediterranean and Black Seas. Bringing together more than 20 countries, numerous research institutions and thousands of scientists, CIESM serves as a hub for knowledge exchange, the development of scientific standards and the coordination of research.

Research covers the geophysical, chemical and biological processes of the seas, as well as seabed mapping, with the aim of improving the understanding, monitoring and protection of marine ecosystems. The organisation operates through thematic committees and working groups that implement research programmes, coordinate workshops, host conferences and provide independent scientific advice to national and international bodies. Particular emphasis is placed on monitoring climate change, biodiversity, pollution, invasive species and changes in marine ecosystems.

# ICGEB



# ICGEB

## International Centre for Genetic Engineering and Biotechnology



**Type:** International organisation

**Headquarters:** Trieste, IT

**Founded in:** 1994

**Croatian membership since:** 1998

**National coordinator:**  
University of Zagreb, Faculty of  
Science

**Website:**  
<https://www.icgeb.org/>

Established in 1983 under the UNIDO programme, ICGEB has operated as an autonomous intergovernmental organisation in cooperation with the United Nations since 1994. Its mission is to promote and conduct research and education in molecular biology and biotechnology, while strengthening scientific capacities in its Member States.

It supports research in fields such as biomedicine, environmental protection, agriculture and industrial biotechnology, including the development of biopharmaceuticals, biopesticides and biofuels. Priority is given to applied research and solutions to global challenges such as infectious diseases, sustainable food production and environmental protection.

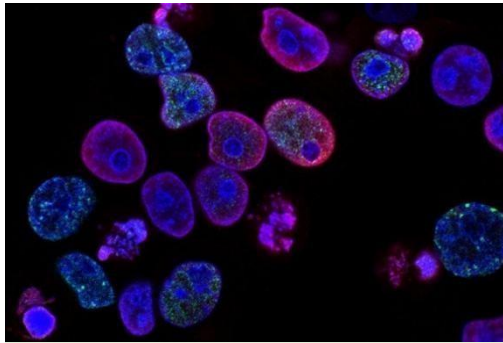
ICGEB manages a network of world-class laboratories and research centres in almost 70 Member States. Through research projects, training programmes and technology transfer, ICGEB provides a framework for advancing scientific excellence and applying biotechnology to address global scientific and societal challenges.

# EMBL i EMBC



European Molecular Biology Laboratory

European Molecular Biology Conference



**Type:** International  
organisation

**Headquarters:** Heidelberg, DE

**Founded in:** 1964

**Croatian membership since:** 1997

**National coordinator:**  
Institute for  
Anthropological  
Research

**Website:**  
<https://embo.org/>

EMBC is an intergovernmental organisation established in 1969 that brings together 30 Member States. Its goal is to provide a framework for European cooperation in molecular biology and related sciences and to fund joint scientific programmes. EMBC Member States regularly meet at Council and delegate level to take decisions on funding and strategic directions for the European Molecular Biology Organization (EMBO) and EMBL. Through its General Programme, EMBC supports researcher mobility, training activities, workshops and conferences, thereby facilitating links between scientific communities across Europe and beyond.

EMBL is Europe's leading research laboratory in the life sciences. It brings together 28 Member States and has several research sites across Europe. EMBL employs around 1,800 scientists and other professionals. EMBL conducts world-class research in molecular biology, develops new methods and technologies, and provides scientific services and resources to the wider research community. EMBL-EBI (European Bioinformatics Institute) plays a particularly important role as Europe's central hub for biological databases and bioinformatics tools.

## European Plate Observing System



**Type:** ERIC

**Headquarters:** Rome, IT

**Founded in:** 2018

**Croatian membership since:** 2023

**National coordinator:**

Croatian Geological  
Survey

**Website:**

<https://www.epos-eu.org/> <https://epos-hr.hgi-cgs.hr/>

EPOS, the European Plate Observing System, is a multidisciplinary research infrastructure that provides access to a wide range of data, services and equipment in the Earth sciences. It brings together European centres of excellence working on the solid Earth and geodynamic processes, with the aim of improving understanding of complex natural phenomena.

EPOS ERIC provides the scientific community with access to integrated resources, including research infrastructures, specialised equipment, data products and advanced e-science services. Particular emphasis is placed on integrating national and transnational infrastructures into a single interoperable platform that enables the efficient sharing of data and knowledge.

EPOS ERIC provides its members with access to services covering the collection, processing and sharing of geoscientific data, as well as the development of digital tools for their analysis. It also promotes interdisciplinary cooperation and contributes to strengthening capacities for research into and management of natural hazards such as earthquakes and volcanic activity.

## Incubation Centre for Biosciences and Commercialisation of Technology



**Type:** Incubation hub

**Location:** Zagreb

**National coordinator:**

Ministry of Science, Education and  
Youth

Croatian Agency for SMEs, Innovations and  
Investments

**Website:**

<https://www.biocentre.hr/>

BIOCentre is a research and innovation hub established in 2015. It is located on the eastern campus of the University of Zagreb in Borongaj.

The centre operates through several key programmes. Its BIOIncubation and BIOFacility programmes offer advisory services and rental of fully equipped and non-equipped laboratory and office space. BIONetwork connects start-ups and biotechnology companies with universities, research institutes and industry in Croatia and abroad, thereby promoting product development and more effective commercialisation.

The BIOTransfer and BIOEducation programmes focus on knowledge transfer and professional training in biotechnology and chemistry. These activities are carried out through the Central Laboratory, which comprises five specialised units: a microbiology laboratory, a cell biology laboratory, an isolation and purification laboratory, and two bioanalytical laboratories specialising in chemistry and proteomics.

## Scientific Centre of Excellence for Marine BioProspecting



**Type:** Scientific centre of excellence

**Location:** Zagreb

**National coordinator:**  
Ruđer Bošković Institute

**Website:**  
<https://www.irb.hr/Istrazivanja/Projekti/Znanstveni-centar-izvrsnosti-za-bioprospecting-mora>

BioProCro is a multidisciplinary centre for biotechnology research on the Adriatic Sea. It focuses on applying advanced biological and analytical methods to study the marine environment and its biological components. The focus is on identifying and developing marine biomolecules and bioproducts, including enzymes, proteins, peptides, secondary metabolites, polysaccharides, lipids and fatty acids derived from marine organisms such as bacteria and algae.

BioProCro aims to develop and optimise methods for the extraction, isolation and characterisation of bioactive compounds and assess their potential applications in the food, cosmetics and pharmaceutical industries, with a particular focus on sustainable production.

The centre operates through eight research units covering biological and chemical diversity, the isolation and characterisation of biomolecules, bioorganic synthesis, testing, bioinformatics and bioprocess development.

# FOOD AND HEALTH

## 3.4 Food and health

**This area focuses on health, healthcare services and food, as well as the interconnections between these sectors. Good health and safe, high-quality food are essential prerequisites for economic and social development. Investment in the health sector is therefore an investment in human capital and the long-term development of society.**

At global level, this priority area is facing challenges such as population growth and ageing, increasing multimorbidity, growing demand for safe, affordable and sustainable food, and mounting pressure on healthcare and food systems. In this context, rapid technological progress is driving the development of innovative solutions aimed at disease prevention, personalised healthcare, improving the quality and functionality of food, and the application of digital technologies.

In Croatia, in line with current national and European strategies and action plans, emphasis is placed on strengthening the resilience of healthcare and food systems, improving public health and food security, and ensuring the sustainable management of resources. Particular attention is paid to developing innovative and sustainable solutions, including reducing food losses and waste, improving the efficiency of the food supply chain, and strengthening the links between nutrition and health. In line with national and European strategic objectives, the development of sustainable food systems that contribute to public health, environmental sustainability and increased product value is encouraged.

### INVESTMENT PRIORITY WILL BE GIVEN TO RESEARCH INFRASTRUCTURES THAT AIM TO:

- Improve the quality of life and health of individuals and the population of Croatia as a whole, and develop and provide personalised healthcare services.
- Ensure a high level of food and feed safety and develop value-added functional foods.
- Significantly strengthen responses to emerging health challenges and the needs of the population, with a particular emphasis on disease prevention.
- Promote translational research.
- Integrate digital technologies and digital health.
- Improve waste management and reduce unnecessary food waste throughout the food supply chain.

## International Association for Cereal Science and Technology



**Type:** International organisation

**Headquarters:** Vienna, AT

**Founded in:** 1955

**Croatian membership since:** 1998

**National coordinator:**

Josip Juraj Strossmayer University of  
Osijek, Faculty of Food Technology

**Website:**

<https://icc.or.at/>

International Commission for Cereals (ICC) is a leading international organisation dedicated to improving the safety and quality of cereal-based food products. It brings together Member States from different parts of the world and provides an important platform for international cooperation between the scientific community, industry and food technology professionals.

The ICC focuses on disseminating knowledge, promoting and conducting scientific research, and developing and standardising analytical methods. ICC activities contribute significantly to innovation, improving product quality and ensuring a high level of food safety, with the ultimate aim of protecting people's health and well-being worldwide.

Membership of the ICC offers numerous benefits, including free access to ICC standard analytical methods, which are widely recognised by the scientific and industrial communities.

## European Infrastructure for Translational Medicine



**Type:** ERIC

**Headquarters:** Amsterdam, NL

**Founded in:** 2013

**Croatian membership since:** 2021

**National coordinator:**  
University of Zagreb, School of Medicine

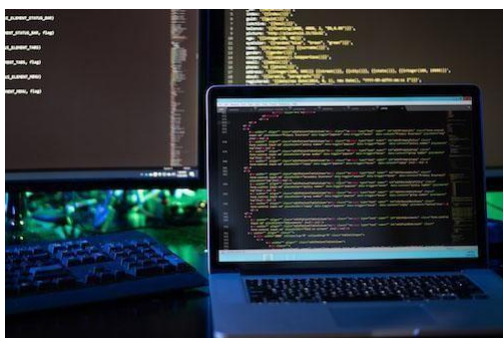
**Website:**  
<https://eatris.eu/>

European Advanced Translational Research Infrastructure in Medicine (EATRIS) provides access to a broad range of preclinical and clinical expertise available across more than 140 leading academic and research institutions in 14 European countries. It brings together European centres of excellence in translational research in the fields of medicines, diagnostics and medical devices.

Within EATRIS-ERIC, academia and industry have access to key resources for the development of new therapies, including research infrastructures, specialised equipment, expertise, biobanks, sample collections and support for regulatory processes. The focus is on the preclinical and early clinical development of medicines, vaccines and diagnostic methods.

Its members have access to platforms covering key areas of translational medicine, including advanced therapy medicinal products, biomarkers, small molecules, biomedical imaging and vaccine development. It also provides training, continuing professional development and mentoring for researchers and professionals.

## Distributed Infrastructure for Life-Science Data



**Type:** International organisation

**Headquarters:** Cambridgeshire, UK

**Founded in:** 2013

**Croatian membership since:** 2025

**National coordinator:**  
University of Zagreb, School of Medicine

**Website:**  
<https://elixir-europe.org/>

ELIXIR is a distributed European research infrastructure for life science data, bringing together 23 Member States and more than 180 scientific organisations. It connects databases, software tools, computing resources, cloud storage and training materials from across Europe.

The aim of ELIXIR is to integrate existing resources into a single interoperable infrastructure that facilitates the discovery, sharing and reuse of scientific data and strengthens cooperation in the life sciences.

Its activities are organised around five platforms: Data, Tools, Interoperability, Compute and Training. Croatia's application for full membership has been approved, and the country is currently in the process of joining the consortium.

## Scientific Centre of Excellence for Virus Immunology and Vaccines



**Type:** Scientific centre of excellence

**Location:** Zagreb, Rijeka

**National coordinator:**

University of Rijeka, Faculty of Medicine

**Website:**

CerVirVac is a SCE conducting research aimed at developing vaccines that induce a strong immune response, more effective than the response elicited by natural infection or tumours. It investigates the interactions between viruses and the host immune system, with particular emphasis on the design of effective vaccines.

The research focuses on developing 'smart' recombinant live vaccines and viral vector vaccine platforms. Their effectiveness is tested in preclinical models as a prerequisite for clinical trials in humans.

The ultimate aim is to develop and produce vaccines that will make a significant contribution to preventing and treating infectious diseases and cancer, which are among the key public health challenges of our time.

# Neuro



## Scientific Centre of Excellence for Basic, Clinical and Translational Neuroscience



**Type:** Scientific centre of excellence

**Location:** Zagreb

**National coordinator:**  
University of Zagreb

**Website:**  
<http://zci.hiim.hr/index.php/en/>

Neuro develops innovative and integrated approaches to the early detection, treatment, outcome assessment and rehabilitation of patients with hypoxic-ischaemic and haemorrhagic brain injuries in adulthood and during development. The centre brings together basic and clinical research in neuroscience.

Research is organised around six main areas: the developmental origins of neurodevelopmental disorders following perinatal hypoxic-ischaemic brain injury; biomarkers of ageing, Alzheimer's disease and vascular dementia; clinical and experimental research on cerebral lesions and disorders of intracranial dynamics; preclinical rodent models; the analysis of language and cognitive disorders and recovery; and the development of biomarkers of treatment response in mental disorders.

The Centre conducts interdisciplinary and multidisciplinary research, integrating basic and clinical neuroscience to improve the understanding and treatment of neurological disorders.

## Scientific Centre of Excellence for Reproductive and Regenerative Medicine



**Type:** Scientific centre of excellence

**Location:** Zagreb

**National coordinator:**

University of Zagreb, School of Medicine

**Website:**

<https://mef.unizg.hr/znanstveni-smo-centar-izvrsnosti/>

CERRM focuses on developing new diagnostic and prognostic markers for disorders of the reproductive system and new therapeutic approaches for bone regeneration and the prevention of fibrosis.

The centre consists of two research units: Biomedical Research of Reproduction and Development (RepMed) and Regenerative Medicine (RegMed). The RepMed unit addresses the growing demographic and health challenges associated with low birth rates, increasing infertility and the rising incidence of cancers of the reproductive system. RegMed focuses on developing innovative therapies for treating bone defects, degenerative diseases of the spine and fibrotic diseases, which represent significant global health and socioeconomic challenges.

The centre contributes to the development of new diagnostic and therapeutic approaches and to improving healthcare and the quality of life of a large number of patients.

## Scientific Centre of Excellence for Biodiversity and Molecular Plant Breeding



**Type:** Scientific centre of excellence

**Location:** Zagreb

**National coordinator:**

University of Zagreb, Faculty of Agriculture

**Website:**

<https://www.agr.unizg.hr/hr/group/55/Znanstveni+centar+izvrsnosti>

CroP-BioDiv focuses on knowledge and technology transfer to advance agricultural research.

It brings together scientists from universities and research institutes in Croatia and focuses on the conservation of plant genetic resources, phenotyping, genotyping and the application of bioinformatics in plant breeding. Research is based on state-of-the-art high-throughput methods and advanced data analysis.

Research is conducted on eight plant species, including major agricultural crops and species with potential for future production in Croatia. Particular emphasis is placed on the standardisation of methodologies and the more efficient use of plant genetic resources.

The Centre aims to strengthen cooperation between Croatian scientific institutions and develop an integrated research platform to advance plant breeding.

# NATURAL SCIENCE AND ENGINEERING

## 3.5 Natural science and engineering

This area is characterised by robust involvement in international research partnerships and growing integration into the European Research Area through access to and participation in major research infrastructures. This field provides a foundation for the development of advanced technologies, particularly in physics, materials science, space science and high-tech engineering.

At global level, new developments in natural science and engineering are characterised by the application of cutting-edge technologies and intensive cooperation between academia and industry in the development of new materials, detector systems, accelerator technologies and advanced experimental methods. Large-scale research infrastructures play a key role in pushing the frontiers of knowledge and developing technologies with applications in medicine, industry, security and digital systems.

In Croatia, this area is developing through active participation in international research projects and research infrastructures, with a focus on particle physics, astrophysics, cosmology, gravitation and mathematical physics, as well as on developing expertise in advanced engineering and applied natural sciences. There is significant potential to strengthen links with industry and develop knowledge and technologies arising from large-scale research systems, including applications in medicine, materials science and digital technologies. Space technologies and data obtained from space missions are also playing an increasingly important role in supporting research and the development of innovative solutions in energy, the environment, climate policy and natural resource management.

### INVESTMENT PRIORITY WILL BE GIVEN TO RESEARCH INFRASTRUCTURES THAT AIM TO:

- Strengthen the development of new scientific methods and technological solutions that advance research.
- Enable the development of space technologies by bringing together the academic, business and public sectors.
- Promote the use of space data to develop innovative solutions.
- Promote the development of advanced experimental, measurement and detector technologies, as well as next-generation instruments that increase the precision and sensitivity of research.
- Promote the transfer of knowledge and technology to industry and society.

# ESA



## European Space Agency



**Type:** International organisation

**Headquarters:** Paris, FR

**Founded in:** 1975

**Croatian membership since:** 2018

**National coordinator:**  
Ministry of Science, Education and  
Youth

**Website:**  
<https://www.esa.int/>

The mission of the European Space Agency (ESA) is to develop Europe's space capabilities and invest in space and space technologies for the benefit of its citizens. It brings together 23 Member States, three Associate Members, one Cooperating State and four participating countries. Its purpose is to promote cooperation between European countries in space research and technology, exclusively for peaceful purposes.

The Agreement Concerning Space Cooperation for Peaceful Purposes between the ESA and Croatia entered into force in 2018 for a period of five years. It established a legal framework for cooperation in the field of space exploration and peaceful use and set out the conditions for the implementation of projects of mutual interest.

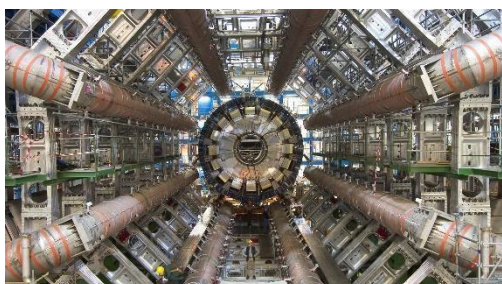
In 2020, ESA and Croatia concluded an Implementing Arrangement for Technical and Expert Assistance. In 2023, Croatia signed the European Cooperating States agreement, enabling participation in ESA programmes and projects. This was supplemented by the Plan for European Cooperating States (PECS Charter).

Cooperation with ESA enables stronger links between the academic and private sectors, indirect access to its programmes and training, and greater alignment between the space activities of ESA Member States and Croatia.

# CERN



## European Organisation for Nuclear Research



**Type:** Research infrastructure

**Headquarters:** Geneva, CH

**Founded in:** 1952

**Croatian membership since:** 2019

**National coordinator:**  
Ruđer Bošković Institute

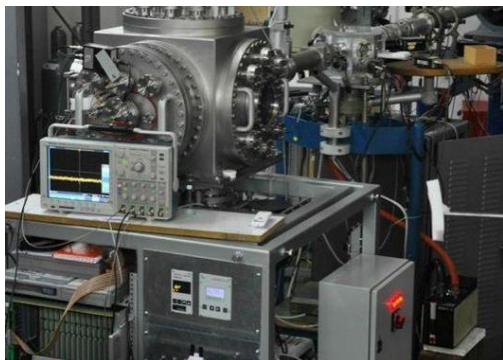
**Website:** <https://home.cern/>

The European Organization for Nuclear Research (CERN) is the world's largest laboratory for particle physics, focusing on fundamental research into the structure of matter and the Universe. It brings together 25 Member States and a number of Associate Member States, including Croatia. Croatia has cooperated with CERN since gaining independence and has held Associate Member status since 2019.

CERN's core research infrastructure consists of particle accelerators and particle detectors, supported by an extensive high-energy physics ecosystem. In accelerators, particles are accelerated to almost the speed of light and brought into collision, while detectors record the results of these collisions and enable scientists to study the interactions between particles. CERN's flagship project – the Large Hadron Collider (LHC) – enables research into the fundamental laws of nature by observing collisions between protons and heavy ions at high energies.

Croatian research teams from the Ruđer Bošković Institute, the University of Zagreb, the University of Split and the University of Rijeka also participate in CERN programmes.

## Central European Research Infrastructure Consortium



**Type:** ERIC

**Headquarters:** Trieste, IT

**Founded in:** 2014

**Croatian membership since:** 2017

**National coordinator:**  
Ruđer Bošković Institute

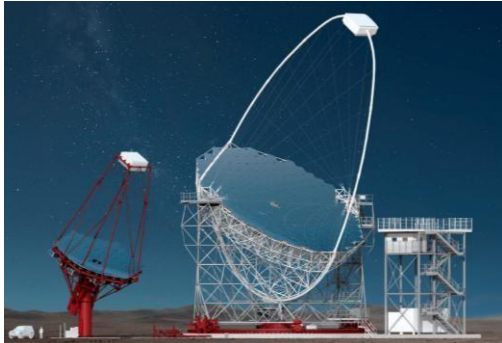
**Website:**  
<https://www.ceric-eric.eu/>

CERIC links research infrastructures in several Central and South-Eastern European countries, including Italy, Austria, Slovenia, Hungary, Romania and Serbia. It covers a broad interdisciplinary field of nanoscale materials science, with links to biomaterials and structural biology. It enables the research, analysis and synthesis of materials using technologies based on photons, electrons, neutrons and ions.

The consortium operates according to an 'equal partnership, no fee' model, with cooperation based on contributions in the form of researchers' work. Access to the infrastructure is obtained by submitting research proposals, which are evaluated through international peer review. The highest-rated projects are granted free access to the facilities of CERIC-ERIC partners.

CERIC-ERIC regularly launches annual calls for access to its infrastructure, thereby providing the international scientific community with continuous and transparent access to state-of-the-art research equipment.

## Cherenkov Telescope Array Observatory



**Type:** ERIC

**Headquarters:** Bologna, IT

**Founded in:** 2025

**Croatian membership since:** 2025

**National coordinator:**

University of Split, Faculty of Electrical Engineering, Mechanical Engineering and Naval Architecture

**Website:**

<https://www.ctao.org/>

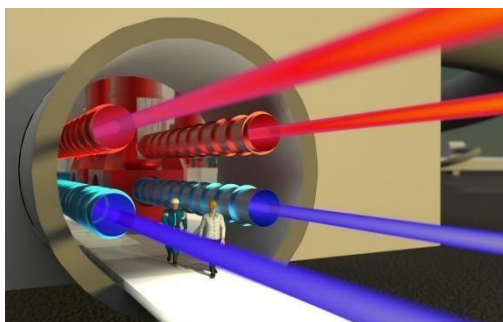
CTAO is an emerging international research infrastructure set to become the most advanced and sensitive observatory for very-high-energy gamma-ray observations. It involves the construction of more than 60 telescopes at two sites: on the island of La Palma (Spain) and in the Paranal area of the Atacama Desert (Chile).

CTAO will enable the study of extreme astrophysical phenomena such as supernovae, black holes and processes associated with dark matter. The project will contribute to the development of new knowledge and technologies in astrophysics, with the potential to significantly advance our understanding of the Universe and strengthen European and global scientific cooperation.

Through the development of advanced detection and analysis technologies, CTAO will foster innovation with applications beyond astronomy.

# ET

## Einstein Telescope



**Type:** Research infrastructure

**Headquarters:**

**Founded in:**

**Croatian membership since:** 2024

**National coordinator:**

University of Rijeka, Faculty of Physics

**Website:**

<https://einsteintelelescope.eu/>

The Einstein Telescope is a planned next-generation European research infrastructure for the detection of gravitational waves. It will be a third-generation interferometric detector, with significantly greater sensitivity than existing observatories. This will enable observations of the early Universe and the weakest gravitational-wave signals.

The infrastructure will enable the study of black hole and neutron star mergers and the testing of fundamental laws of physics under extreme conditions. It is expected to make a particular contribution to understanding the evolution of the Universe, dark matter and fundamental interactions.

The project is currently in the planning and site-selection phase. It represents one of the key strategic investments in European research infrastructure and has the potential to provide new insights into the structure and evolution of the Universe.

## Regional Centre of Excellence for Robotic Technology



**Type:** Regional centre of excellence

**Location:** Zagreb

**National coordinator:**

University of Zagreb, Faculty of Mechanical Engineering and Naval Architecture

**Website:**

<https://crtarobotics.com/>

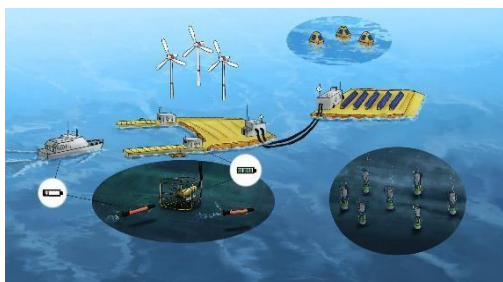
CRTA is a reference centre for research, development and educational activities in the fields of robotics and AI. The centre focuses on the research and development of advanced robotic systems for applications in industry and medicine, where traditional forms of automation and repetitive work are gradually being replaced by flexible, versatile and adaptive robotic systems.

CRTA is open to the public and serves as a venue for promoting science, technology and robotics, particularly among primary and secondary school students, as well as the wider community. At the same time, it provides a platform for businesses to explore, test and apply new robotic and digital technologies in real-world conditions.

# CoE MARBLE



## Centre of Excellence in Maritime Robotics and Technologies for Sustainable Blue Economy



**Type:** Centre of excellence

**Location:** Zagreb

**National coordinator:**

University of Zagreb, Faculty of Electrical Engineering and Computing

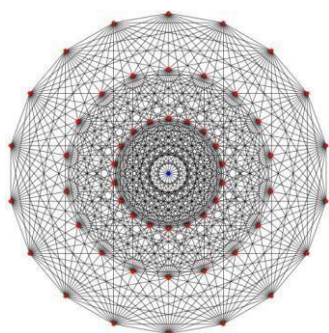
**Website:**

<https://marble.eu/>

CoE MARBLE focuses on research and development in marine robotics, autonomous systems and advanced digital technologies for a sustainable blue economy. The centre's activities include the development and application of autonomous underwater and surface systems, the maritime Internet of Things, digital twins, and solutions aimed at improving energy efficiency and reducing the environmental footprint. The technologies developed are applied in key sectors such as maritime security, aquaculture and fisheries, and maritime transport.

MARBLE serves as a hub for connecting the scientific community, businesses and the public sector, enabling the development, testing and application of innovative technologies in real-world conditions. Through an interdisciplinary approach and cooperation with international partners, it contributes to strengthening research excellence, knowledge transfer and innovation aimed at the sustainable development and digital transformation of the maritime sector.

## Scientific Centre of Excellence for Quantum and Complex Systems and Representations of Lie Algebras



**Type:** Scientific centre of excellence

**Location:** Zagreb

**National coordinator:**

University of Zagreb, Faculty of  
Science

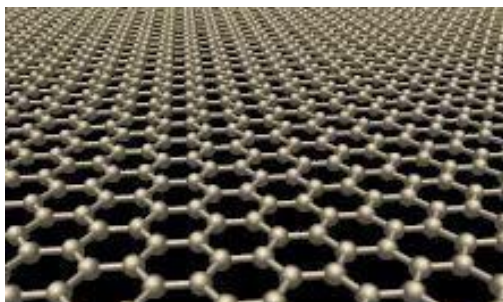
**Website:**

QuantiXLie operates through two research units: the Unit for the Theory of Quantum and Complex Systems and the Unit for Representation Theory of Lie Algebras, Number Theory and Related Structures.

Research in the Theory of Quantum and Complex Systems unit covers quantum physics and complex systems, including atomic and nuclear physics, condensed matter physics, optics and photonics, and biophysics, with an emphasis on the theoretical understanding and modelling of quantum phenomena.

The second unit focuses on methods in mathematical physics and theoretical mathematics, including Harish-Chandra modules and Dirac operators, Kac–Moody algebras and vertex algebras, W-algebras and conformal field theory, as well as number theory, elliptic curves and modular forms.

## Scientific Centre of Excellence for Advanced Materials and Sensing Devices



**Type:** Scientific centre of excellence

**Location:** Zagreb

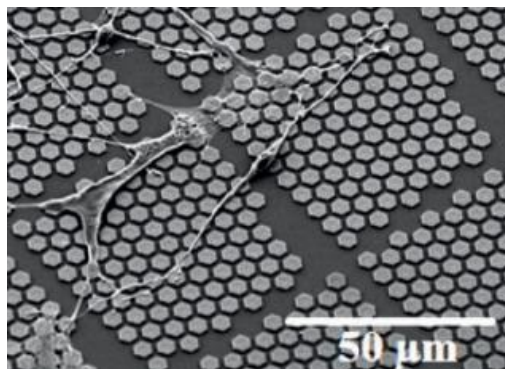
**National coordinator:**  
Ruđer Bošković Institute

**Website:**

The CEMS SCE is organised into research units that bring together expertise in the research, development and application of new materials and devices. The centre's primary objective is the synthesis and characterisation of advanced materials and structures, including those with potential applications in various areas of fundamental and applied science, thereby providing a basis for innovation and technology transfer.

CEMS promotes an interdisciplinary approach through four key research units: Ion Beam Physics and Technology, New Functional Materials, Graphene and Related Two-Dimensional Structures, and Photonics and Quantum Optics. Projects include the development of materials with tailored properties and research at the intersection of physics, chemistry and engineering, with the aim of creating new functional solutions for future technologies.

## Centre of Excellence for Science and Technology – Integration of the Mediterranean Region



**Type:** Scientific centre of excellence

**Location:** Split

**National coordinator:**  
University of Split

**Website:** <https://stim.unist.hr/>

It integrates research (R), innovation (I) and education (E) across three thematic areas focused on scientific excellence and societal needs.

The first area covers advanced nanotechnologies, focusing on the development of new materials for renewable energy and medical diagnostics, including materials for fuel cells and solar cells, as well as nanostructured materials for biosensing and biomedicine.

The second area focuses on water and environmental research, including pollutant transport dynamics, monitoring and the impact of climate change on coastal and marine areas, together with the characterisation of biologically active substances and biofilms.

The third area covers education and the development of young researchers through knowledge and technology transfer and by linking scientific results with practical applications, with the aim of strengthening creativity, flexibility and entrepreneurial potential.

# SOCIAL AND CULTURAL INNOVATION

## 3.6 Social and cultural innovation

This area encompasses the social sciences and humanities, as well as the cultural and creative sectors, with a focus on cultural heritage, creative industries, education and well-being, and on understanding social, economic and political processes and trends. It provides a unique basis for interpreting past, present and future societal changes and for developing responses to complex societal challenges.

At global and European level, increasing emphasis is being placed on the role of the social sciences and humanities in major societal transitions, including the green and digital transitions, enhancing societal resilience, addressing demographic change and inequalities, and bolstering democratic processes and trust in institutions. In this context, there is a growing need for interdisciplinary approaches that bring together the social, technological and natural sciences to ensure the societal acceptance and effectiveness of innovation.

In Croatia, emphasis is placed on strengthening social cohesion, cultural identity and inclusive development, as well as improving education, public policies and quality of life. Particular attention is paid to understanding the societal impacts of technologies and developing innovations that take account of societal values, ethical considerations and user behaviour. The social sciences and humanities play a key role in ensuring that research, innovation and technology achieve their full societal and transformative potential.

### INVESTMENT PRIORITY WILL BE GIVEN TO RESEARCH INFRASTRUCTURES THAT AIM TO:

- Strengthen the response to the demographic challenges facing Croatia, including population ageing and depopulation.
- Promote the reduction of poverty and social exclusion through the development of knowledge and solutions that strengthen social cohesion.
- Reduce regional gaps in development between different parts of Croatia.
- Bolster the development of cultural and social innovations that contribute to inclusion, quality of life and public trust in science.
- Develop the knowledge and competences needed to facilitate societal adaptation to demographic, technological and societal changes and strengthen the resilience of social systems.

## Common Language Resources and Technology Infrastructure (for humanities and social sciences)



**Type:** ERIC

**Headquarters:** Utrecht, NL

**Founded in:** 2012

**Croatian membership since:** 2018

**National coordinator:**

University of Zagreb, Faculty of Humanities  
and Social Sciences

**Website:**

<https://www.clarin.eu/>

<https://www.clarin.hr/hr/>

Common Language Resources and Technology Infrastructure (CLARIN) is a product of several initiatives in computational linguistics, natural language processing and digital humanities. Its aim is to apply language technologies as a research infrastructure, primarily in the humanities and social sciences, but also in other scientific fields.

CLARIN provides researchers in the humanities and social sciences and beyond with easy and sustainable access to digital language data in written, spoken and multimodal form. Furthermore, it also offers advanced tools for detecting, exploring, exploiting, marking, analysing, or combining such datasets, regardless of their location. This is achieved through a distributed federation of centres comprising language data repositories, service centres and knowledge centres, supported by a single authentication system that enables access for members of the academic community in participating countries.

## Survey of Health, Ageing and Retirement in Europe



**Type:** ERIC

**Headquarters:** Munich, DE

**Founded in:** 2011

**Croatian membership since:** 2014

**National coordinator:**

University of Zagreb, Faculty of Economics  
and Business

**Website:**

<https://share-eric.eu/>

<https://www.share-project.hr/>

The Survey of Health, Ageing and Retirement in Europe (SHARE) is an international longitudinal study aimed at understanding the effects of population ageing on European societies and providing an empirical basis for designing health, social and economic policies.

It is a multidisciplinary and multinational database of microdata on the health, socioeconomic status and social and family relationships of people aged 50 and over. Today, SHARE covers more than 140,000 respondents and more than 500,000 interviews across its survey waves in more than 25 European countries and Israel.

Methodologically, SHARE is harmonised with related studies such as the US Health and Retirement Study (HRS) and the UK English Longitudinal Study of Ageing (ELSA) and serves as a reference model for ageing research worldwide.

## Digital Research Infrastructure for the Arts and Humanities



**Type:** ERIC

**Headquarters:** Paris, FR

**Founded in:** 2014

**Croatian membership since:** 2014

**National coordinator:**

Institute of Ethnology and Folklore Research

**Website:**

<https://www.dariah.eu/>

<http://dariah.hr/hr/naslovnica/>

The Digital Research Infrastructure for the Arts and Humanities (DARIAH) currently has 20 members, with Croatia being one of its 15 founding countries. This consortium consists of a network of people, expertise, information, knowledge, content, methods, tools, and technologies provided by the member countries. DARIAH promotes and increases awareness of digital arts and humanities, projects, tools, and best practices, and advocates open access to information and free sharing of results and innovation. It develops, maintains and manages an infrastructure that supports research practices based on information and communication technologies and supports researchers in their use with the purpose of creating, analysing and interpreting digital resources. It is a large, long-term, pan-European endeavour that affects four interconnected domains: research, education, culture, and economy, and it operates through the European network of Virtual Competency Centres (VCCs) and their constituent working groups.

# ESS ERIC

## European Social Survey



**Type:** ERIC

**Headquarters:** London, UK

**Founded in:** 2013

**Croatian membership since:** 2019

**National coordinator:**

University of Zagreb, Faculty of Humanities  
and Social Sciences

**Website:**

<http://www.europeansocialsurvey.org/>

The European Science Foundation launched the European Social Survey (ESS) in 2001 with the aim of continuously monitoring changes in the social and political attitudes and values of citizens across European countries through comparative surveys.

The ESS analyses the interaction between changing social institutions and the attitudes, beliefs and behavioural patterns of different European populations. The survey is conducted every two years, enabling changes to be monitored over time and reliable comparisons to be made between countries.

Distinguished by its rigorous methodological standards and open access to data, the ESS contributes to the transparency and quality of social research in Europe.

# CESSDA ERIC



## Consortium of European Social Science Data Archives

# - CROSSDA

**Type:** ERIC

**Headquarters:** Bergen, NO

**Founded in:** 2017

**Croatian membership since:** 2019

**National coordinator:**

University of Zagreb, Faculty of Humanities  
and Social Sciences

**Website:**

<https://www.cessda.eu/>

<https://www.crossda.hr/>

The Consortium of European Social Science Data Archives (CESSDA) provides comprehensive, integrated and sustainable data services for the social sciences. It connects national data archives across Europe with the aim of improving access to and reuse of research data and promoting international cooperation.

The Croatian service provider within CESSDA is the Croatian Social Science Data Archive (CROSSDA) at the Faculty of Humanities and Social Sciences, University of Zagreb.

The basic services of the data archive are the following: data collection from researchers, data management and long-term data retention, maintaining a catalogue of stored data, providing access to and administration of access rights, supporting, assisting and consulting those who store data and those who use them, fostering a culture of data provision for use by others, and open access to data and secondary analyses.

## European Holocaust Research Infrastructure



**Type:** ERIC

**Headquarters:** Amsterdam, NL

**Founded in:** 2025

**Croatian membership since:** 2025

**National coordinator:**

University of Zagreb, Faculty of Humanities and Social Sciences

**Website:**

<https://www.ehri-project.eu/>

<https://www.ehri.hr/>

European Holocaust Research Infrastructure (EHRI-ERIC) is dedicated to Holocaust research and promotes transnational cooperation and the development of digital research methods. The EHRI initiative was launched in 2010 with the aim of tackling the fragmentation of sources and expertise and connecting archival collections and research communities across Europe and beyond.

EHRI provides integrated access to distributed and multilingual sources through digital services. The EHRI Portal serves as a central hub for searching information on Holocaust-related archival collections from around the world. It also develops advanced tools such as digital editions of documents, geospatial repositories and virtual research environments, enabling new approaches to the analysis and interpretation of sources. Through its projects, EHRI promotes the standardisation of archival descriptions and facilitates the interconnection and accessibility of archival sources in the digital environment.

## Generations & Gender Programme



**Type:** Research infrastructure

**Headquarters:** Hague, NL

**Founded in:** 2000

**Croatian membership since:** 2022

**National coordinator:**

University of Zagreb, Faculty of Economics and Business

**Website:**

<https://www.ggp-i.org/>

The Generations and Gender Programme (GGP) provides high-quality longitudinal data to researchers and other stakeholders interested in analysing and addressing demographic challenges. The programme is run by a network of leading European research institutions in the field of demography, with a focus on contemporary demographic trends.

The aim of the GGP is to promote high-quality and innovative research through the development of standardised and comparable data for scientific and educational purposes and for analysing the effects of public policies on demographic processes. A key component of the GGP is the Generations and Gender Survey (GGS), a multidisciplinary, multinational, longitudinal study consisting of a baseline questionnaire and two additional waves. This is a panel survey, i.e. the same people are interviewed in waves (every three years). In Croatia, the project is run by the Central State Office for Demography and Youth in cooperation with the Faculty of Economics and Business of the University of Zagreb in the period from 2022 to 2028.

## Summary of infrastructure

| ABBREVIATION              | INFRASTRUCTURE NAME                                                                                  | LOCATION       |
|---------------------------|------------------------------------------------------------------------------------------------------|----------------|
| <b>EOSC</b>               | European Open Science Cloud                                                                          | Brussels, BE   |
| <b>EuroHPC JU</b>         | European High Performance Computing Joint Undertaking                                                | Luxembourg, LU |
| Napredno računanje        | Supek Supercomputer and Vrančić Cloud Computing Resource                                             | Zagreb         |
| <b>ACROSS-DataScience</b> | Scientific Centre of Excellence for Data Science and Cooperative Systems                             | Zagreb         |
| <b>CroRIS</b>             | Croatian Research Information System                                                                 | Zagreb         |
| <b>IFMIF DONES</b>        | International Fusion Materials Irradiation Facility – Demo Oriented NEutron Source                   | Granada, ES    |
| <b>CIESM</b>              | Mediterranean Science Commission                                                                     | Monaco         |
| <b>ICGEB</b>              | International Centre for Genetic Engineering and Biotechnology                                       | Trieste, IT    |
| <b>EMBL i EMBC</b>        | European Molecular Biology Laboratory and European Molecular Biology Conference                      | Heidelberg, DE |
| <b>EPOS ERIC</b>          | European Plate Observing System                                                                      | Rome, IT       |
| <b>BIOCentar</b>          | Incubation Centre for Biosciences and Commercialisation of Technology                                | Zagreb         |
| <b>BioProCro</b>          | Scientific Centre of Excellence for Marine BioProspecting                                            | Zagreb         |
| <b>ICC</b>                | International Association for Cereal Science and Technology                                          | Vienna, AT     |
| <b>EATRIS ERIC</b>        | European Infrastructure for Translational Medicine                                                   | Amsterdam, NL  |
| <b>ELIXIR</b>             | Distributed Infrastructure for Life-Science Data                                                     | Hinxton, UK    |
| <b>CerVirVac</b>          | Scientific Centre of Excellence for Virus Immunology and Vaccines                                    | Zagreb, Rijeka |
| <b>Neuro</b>              | Scientific Centre of Excellence for Basic, Clinical and Translational Neuroscience                   | Zagreb         |
| <b>CERRM</b>              | Scientific Centre of Excellence for Reproductive and Regenerative Medicine                           | Zagreb         |
| <b>CroP-BioDiv</b>        | Scientific Centre of Excellence for Biodiversity and Molecular Plant Breeding                        | Zagreb         |
| <b>ESA</b>                | European Space Agency                                                                                | Paris, FR      |
| <b>CERN</b>               | European Organisation for Nuclear Research                                                           | Geneva, CH     |
| <b>CERIC ERIC</b>         | Central European Research Infrastructure Consortium                                                  | Trieste, IT    |
| <b>CTAO ERIC</b>          | Cherenkov Telescope Array Observatory                                                                | Bologna, IT    |
| <b>ET</b>                 | Einstein Telescope                                                                                   |                |
| <b>CRTA</b>               | Regional Centre of Excellence for Robotic Technology                                                 | Zagreb         |
| <b>CoE MARBLE</b>         | Centre of Excellence in Maritime Robotics and Technologies for Sustainable Blue Economy              | Zagreb         |
| <b>QuantiXLie</b>         | Scientific Centre of Excellence for Quantum and Complex Systems and Representations of Lie Algebras  | Zagreb         |
| <b>CEMS</b>               | Scientific Centre of Excellence for Advanced Materials and Sensing Devices                           | Zagreb         |
| <b>STIM</b>               | Scientific Centre of Excellence for Science and Technology – Integration of the Mediterranean Region | Split          |
| <b>CLARIN ERIC</b>        | Common Language Resources and Technology Infrastructure (for humanities and social sciences)         | Utrecht, NL    |
| <b>SHARE ERIC</b>         | Survey of Health, Ageing and Retirement in Europe                                                    | Munich, DE     |
| <b>DARIAH ERIC</b>        | Digital Research Infrastructure for the Arts and Humanities                                          | Paris, FR      |
| <b>ESS ERIC</b>           | European Social Survey                                                                               | London, UK     |
| <b>CESSDA ERIC</b>        | Consortium of European Social Science Data Archives                                                  | Bergen, NO     |
| <b>EHRI ERIC</b>          | European Holocaust Research Infrastructure                                                           | Amsterdam, NL  |
| <b>GGP</b>                | Generations & Gender Programme                                                                       | Hague, NL      |

## 4 A Vision for the Development of Research Infrastructures in Croatia

### 4.1 Vision, horizontal principles, and development priorities and measures

The vision of the Research Infrastructure Development Roadmap is formulated as follows:

Through the use of national and international research infrastructures, Croatia will excel in internationally competitive research and will strengthen international cooperation and the visibility of Croatian science, economy, and society as a whole.

**In their work, Croatian research infrastructures should be guided by the following horizontal principles:**

- **promoting the application of the FAIR principles** to research data, ensuring that data are Findable, Accessible, Interoperable and Reusable, and implementing Open Research Data Management (ORDM);
- **ensuring open, transparent and equal access to the infrastructure** for all relevant stakeholders;
- **strengthening international cooperation and the visibility of Croatian researchers** and enhancing their performance in international projects;
- **strengthening research integrity** and the resilience of the research system to undue influence and misuse;
- **fostering excellence in science;**
- **strengthening the cohesion of the research community** at national level;
- promoting **sustainable development**, the circular economy and the bioeconomy;
- promoting **equality** and equal opportunities.

To deliver on this vision, specific priorities and accompanying actions have been developed to be implemented from 2021 to 2027.

**1) The development of research infrastructures will be planned in such a way as to enable their long-term sustainability and to maximise their contribution to the national research and innovation system**

- The planning of each research infrastructure will primarily take into account the number of potential users of this infrastructure (number of faculties and scientific institutes in the field, number of scientists, interest of foreign partners, enterprises that will benefit from the infrastructure) and its contribution to the quality and development of society.
- The planning of new research infrastructures will take into account the identified gaps in specific areas at the national and European level.
- The planning of new research infrastructures will take into account how they contribute to the Sustainable Development Goals (SDGs).
- The planning of new research infrastructures will take into account the financial sustainability of the infrastructure investments to be assessed as part of the cost-benefit analysis of the planned investment, which will be supported at a later stage by a business plan and by monitoring its execution.
- Emphasis must be placed on achieving the appropriate quality of the research infrastructure needed for excellence in research and the development of partnerships with international organisations.
- Each infrastructure or its founder will have the obligation to draw up a visibility plan with the aim of increasing international visibility and cooperation between Croatian research infrastructures at the EU level.
- The development of research infrastructure will include investments in public technology and innovation infrastructure and support for science and technology organisations, creating strong and lasting links between science and business sectors and the industry in key S3 areas and enabling the transition towards a sustainable, digital, and resilient economy and society.
- Each infrastructure will be planned in such a way as to leave as little ecological footprint as possible when used, and to promote the use of green technologies and the transition to a circular and biobased economy.

**2) Research infrastructures will promote open access and cooperation with other stakeholders, including other research infrastructures, higher education institutions, businesses and civil society**

- All research infrastructures will operate under an open-access policy based on the FAIR principles for research data, ensuring that data are Findable, Accessible, Interoperable and Reusable.
- All research infrastructures must have a developed and publicly published Data Management Plan (DMP).

- Each publicly funded research infrastructure will develop and regularly update a catalogue of services for external users, which will be easily accessible and contain contact details for cooperation.
- Each publicly funded research infrastructure will regularly update the list of available scientific equipment in the national database of scientific equipment that will be integrated into the Croatian Research Information System (CroRIS).
- Networking of existing and new research infrastructures will be encouraged to strengthen the capacities of regional infrastructures, disseminate knowledge and good practices, and foster integration with the European Research Area.
- Each infrastructure will have its own website in Croatian and English containing basic information (contact info, strategy, list of scientific equipment, service catalogue, etc.).

### **3) The availability of funding will be increased**

- The continuity and transparency of funding will be improved so as to enable long-term planning and sustainability throughout the life cycle of research infrastructures.
- Coordination between all stakeholders involved in the funding of research infrastructures and RDI activities, including business and industry, will be improved to facilitate a coordinated approach to the development and funding of research infrastructures.
- Funding mechanisms will be developed to support the participation of Croatian research infrastructures in EU funding programmes and to promote links with relevant research infrastructures and pan-European programmes.

### **4) Planning, monitoring and evaluation mechanisms will be implemented to ensure quality planning and management of research infrastructures, as well as the development of fact-based public policies**

- Research infrastructures, i.e. the institution where the infrastructure is located, will regularly develop and update their business plans to enable the alignment of strategies, resources and objectives, but also to enable their missions to be interconnected with the national and strategic programmes of the European Union.
- Research infrastructure work plans will serve as management tools and as living documents, with the aim of ensuring the long-term sustainability of research infrastructures.
- The institution where the research infrastructure is located will submit annual reports to the ministry responsible for science, which should contain the information specified in Annex 2 to this document.

## 4.2 Selection of research infrastructure projects

### 4.2.1 Selection process

**Future selection, development, and approval of research infrastructure projects will be a continuous process.** Research infrastructure proposals will be assessed against the sets of criteria set out below, covering the scientific, governance and sustainability, technical and operational, strategic, and socioeconomic dimensions. Proposals for research infrastructures that are positively evaluated will be included in the List of Research Infrastructure Projects for potential funding. The quality of the project proposal submitted for funding and the overall development of Croatia's research and innovation system will also be taken into account. This includes the need to avoid overlaps with existing or planned research infrastructures, while promoting synergies, scientific excellence and regional development. As part of the project selection process, project proposals will be classified across a range of categories, from scientific infrastructure to technological infrastructure, in order to assess their suitability for specific funding frameworks and direct investment towards infrastructures that best meet the strategic priorities and needs of the research and innovation ecosystem.

**The evaluation and selection will be organised in several phases.** Before the evaluation, an eligibility and compliance check will be carried out to determine whether the submitted proposals meet the basic administrative and thematic requirements. In the **first stage**, a project summary will be submitted and evaluated to assess its strategic relevance, alignment with national priorities and preliminary feasibility. Projects with an approved project summary will proceed to the **preparatory phase**. During the **preparatory phase**, applicants will be required to submit and defend a feasibility study, together with a cost-benefit analysis and a draft project application. The preparatory phase will involve a detailed assessment of the project's technical, organisational and financial viability. The **final phase** will include the submission and evaluation of the revised feasibility study and cost-benefit analysis, the final project application and a business plan covering the first five years of operation. The contents of the documents required for each stage will be defined by guidelines to be defined and adopted by the Strategic Committee on Research Infrastructures. Projects that successfully complete all phases will be approved for funding, in accordance with the relevant procedures and available funds. In the next stages of the life cycle of project implementation and functioning, in relation to monitoring and assessment, the performance indicators defined during the project preparation will be used.

### 4.2.2 Criteria for project proposal assessment

**The assessment methodology is based on the ESFRI and InRoad<sup>6</sup> guidelines and covers the following key dimensions of research infrastructure:**

- **Scientific dimension**, including scientific and technological excellence, national and international cooperation, and the degree of internationalisation.
- **Governance and sustainability dimension**, covering governance, management and human resources; the strategic plan, the financial plan and the funding framework; the expected investment payback period; the user attraction strategy and the open-access policy; and risk monitoring and management.
- **Technical and operational dimension**, covering technical feasibility, the project's level of maturity, installation and maintenance plans, availability of relevant expertise, and assessment of risks and interoperability.

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<sup>6</sup> [Towards better Synchronisation of Priority Settings and Evaluation Mechanisms for Research Infrastructures Beyond National Relevance](#)

- **Strategic dimension**, assessing the relevance of the infrastructure to national and EU development objectives and priorities, as well as its complementarity with existing infrastructures at national and European level.
- **Socio-economic dimension**, covering the contribution of the research infrastructure to the Sustainable Development Goals; assessment of socio-economic impact; assessment of interest from the business community; and assessment of its impact on education and training.

Each of these dimensions will be evaluated for each infrastructure in accordance with the sub-dimensions and minimum key requirements (criteria), which will serve as a basis for the development and assessment of research infrastructure projects, as well as for monitoring the funded infrastructures.

The importance assigned to each dimension and to the corresponding criteria will be defined in the evaluation guidelines adopted by the Strategic Committee for Research Infrastructures.

#### 4.2.3 Measuring the socio-economic impacts of research infrastructures

**Socio-economic impact assessment is a tool that makes it possible to understand the potential range of impacts of the research infrastructure and to predict possible stakeholder responses.** The results of the assessment and the knowledge obtained during the assessment provide the basis for designing ways to maximise the positive effects of the research infrastructure, as well as to minimise any potential negative impacts. Different methods may be used to analyse the socio-economic impacts of research infrastructures; most of them are complementary and sometimes overlap, which demonstrates the importance of an integrated approach when carrying out an assessment of the potential economic and social impacts of existing and/or planned research infrastructures on society as a whole.

**The impact of research infrastructures and excellent researchers on the society and economy in which they operate goes far beyond research itself, which is usually their primary role.** Research infrastructures can facilitate the scientific, technological and socio-economic development of the region, implying the importance of identifying and analysing their socio-economic impact, so that the management and implementation of individual research infrastructures is optimal and in line with the responsibility for the public funding provided. Research infrastructure projects can also contribute to the development of public policies and programmes at regional and national level.

**The main socio-economic impacts of research infrastructures include:**

##### 1) Direct and indirect economic impacts

These impacts vary according to the stage of development of the infrastructure. At the design and construction stage, direct impacts stem from the involvement of local suppliers and service providers in design and construction, including revenues, new jobs, increased spending, etc.

The impacts arising during the operational phase of an infrastructure typically include employment for scientists, technicians, administrative and support staff; the involvement of companies and research-performing organisations that use the infrastructure; the number of software solutions developed; new projects arising from the use of the infrastructure; and increased expenditure during the operational phase, such as the procurement of goods and services and maintenance. These activities generate multiplier effects for the local economy and relevant global value chains.

##### 2) Social impacts

Social impacts are primarily related to the contribution of research infrastructures to education,

public awareness, and the popularisation of science, as well as to the creation of resources (e.g. data and knowledge) for evidence-based policy-making. In addition, new products, services and processes resulting from research conducted using research infrastructures provide direct benefits to society, particularly where new solutions contribute to addressing major societal challenges such as health, quality of life, the environment and the Sustainable Development Goals. Other impacts may include the development of local infrastructure, community-based services, and the revitalisation of local areas.

### **3) Scientific impacts**

The main scientific impacts typically reflect the fundamental strategic objective of research infrastructures – conducting research, i.e. producing and accumulating new knowledge, skills and methodologies. Although these impacts are most relevant for the research community, scientific impacts can also have a significant effect on society as a whole.

### **4) Technological and innovation impacts**

Technological and innovation impacts reflect the driving role of research infrastructures for innovative business activities. Cooperation between research organisations and companies results in new and innovative solutions, prototypes, patents, and the general use of research infrastructure by the business sector. When results and innovations are commercialised, they also generate indirect economic impacts through job and revenue creation in spin-offs and start-ups, as well as through new jobs and increased sales due to the commercialisation of new products in established companies.

### **5) Impacts on human resources**

Research infrastructures also have a significant impact on human capital development, training, and the development of knowledge and skills. They also contribute to attracting and retaining quality researchers, technicians and students and encourage the commercialisation of skills in local innovation systems. However, to achieve a significant impact on human resources development, active cooperation is required between the research-performing organisation managing the research infrastructure and stakeholders in the academic and business environment.

### **6) Expected and unexpected impacts**

Although research infrastructures are mainly established for scientific purposes, most of them also generate major social and economic impacts, as (un)expected by-products of scientific activities. When assessing the socio-economic impacts of research infrastructures, it is not possible to predict all impacts that will arise as a result of the operation of research infrastructure. It is therefore important to regularly monitor the socio-economic impacts of publicly funded research infrastructures, allowing for a comprehensive analysis of their impact on society and the economy, collecting the data needed for evidence-based policy-making, and deepening the understanding of how the outcomes of publicly funded research drive socio-economic development.

**Assessing the socio-economic impacts of research infrastructures is a mandatory step of the decision-making process when allocating public funds to build new or upgrade existing research infrastructures.** In the preparatory phase of project development, the expected socio-economic impacts of research infrastructures should be identified as part of the feasibility study with a cost-benefit analysis. Publicly funded research infrastructures are also required to regularly report on their results and achieved socio-economic impacts.

### 4.3 Selection of international science and research bodies for participation

We can distinguish between three levels of membership in international research infrastructures and bodies; their overview can be found in Table 4.

*Table 4 Level of membership in international science and research bodies*

| Membership level                                                                                                                                                                                                | Description of membership level                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>1 Memberships of strategic interest to Croatia as recognised and approved by the Government</b> (e.g. ERIC, CERN, ESA, etc.)<br>— funded by MSEY                                                             | <ul style="list-style-type: none"> <li>• meets Croatia's strategic interests and priority policies</li> <li>• participation has a significant scientific and economic potential</li> <li>• membership provides clear benefits and savings, stemming from the memberships of multiple scientific organisations</li> <li>• membership is used by the best institutions from the science sector and individuals whose activities have a great impact on the national system of science and higher education</li> <li>• membership clearly contributes to a higher number of project applications</li> <li>• this type of membership generally creates significant and long-term financial obligations</li> <li>• applications for these memberships are considered by the Strategic Committee on Research Infrastructures</li> </ul> |
| <b>2 Membership in international science and research bodies for which institutions and organisations are nominated</b><br>— funded by the institution/organisation itself (university, institute, association) | <ul style="list-style-type: none"> <li>• individual institutions/organisations clearly benefit from membership</li> <li>• corresponds with institutional or professional membership</li> <li>• membership clearly contributes to the development and work of researchers in a particular scientific area, field, or branch;</li> <li>• membership clearly contributes to more project applications by the institution/organisation</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>3 Individual membership in international science and research bodies</b><br>— funded by a natural person or institution in which they are employed                                                           | <ul style="list-style-type: none"> <li>• natural person benefits from membership</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |

**When planning participation in, or assessing an application** by an institution or organisation for membership of an international scientific research organisation of strategic interest, a cost-benefit analysis will be carried out, taking into account:

- The number of potential users (the number of faculties and research institutes in the relevant field, the number of researchers, enterprises that could potentially benefit, etc.).
- Identified gaps and development needs in specific scientific and technological fields at national level.
- The alignment of the infrastructure with, and its relevance to, national development priorities and its uniqueness at national level.

#### 4.4 Monitoring and updating the Research Infrastructure Development Roadmap

**A comprehensive and reliable monitoring and evaluation system will ensure the regular and effective collection of all relevant data, the monitoring of national research infrastructure achievements, as well as the increased visibility of various benefits of participating in international science and research bodies.** The monitoring and evaluation system will allow for the timely identification of problems and the introduction of corrective measures. Predefined reporting arrangements will enable the regular collection of relevant data from research infrastructures in the form of consolidated reports, accompanied by a business plan for the research infrastructure. These will serve as a management tool for research infrastructures and as a source of data for the Ministry of Science, Education and Youth (Annex 1 – Content of the report). For the leadership of a higher education institution and/or a scientific institute that manages research infrastructure, reporting will enable improvements in governance structures, processes, and methods. On the other hand, planned, systematic and regular monitoring enables informed strategic planning and evidence-based public policy making, as well as an assessment of the effectiveness of public investments and planning of future investments.

**The monitoring and evaluation system is essential in the process of identifying the most efficient use of resources, as well as evaluating the performance of research infrastructure.** Some of the key issues that monitoring will enable stakeholders to track and assess include (ResInfra@DR, 2019<sup>7</sup>):

- Are the activities set out in the strategic plan being carried out as described, with appropriate justification?
- What services are provided (e.g. research and development, education, knowledge and technology transfer)? Who are the users? When are the services available? How frequently are they used, for how long and in what context?
- Is there ongoing work on improving the visibility of the available services? How did the users rate the quality of the services provided? Have the target groups/stakeholders been reached?
- Were there unforeseen circumstances as a result of the implemented activities?
- Do the activities lead to the desired results?
- Should the conditions or management decisions and activities of the research infrastructure be changed in any way?

**The Republic of Croatia Research Infrastructure Development Roadmap provides for the monitoring of research infrastructures in accordance with their life cycle, which includes:**

- **Ex ante assessment of research infrastructures**, carried out during the preparatory phase of a research infrastructure and including a feasibility study with a cost-benefit analysis and a project application on the basis of which the infrastructure is included in the Research Infrastructure Development Roadmap. The cost-benefit analysis is used to justify investment and ensure sound management. This analysis makes it possible to quantify the expected benefits in monetary terms and to assess whether these benefits outweigh the costs associated with the research infrastructure, making it a valuable tool for prior assessment of research infrastructures.

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<sup>7</sup> Source: [https://www.interreg-danube.eu/uploads/media/approved\\_project\\_output/0001/32/8944de08315bc53e8f659fb6e131f2d602279905.pdf](https://www.interreg-danube.eu/uploads/media/approved_project_output/0001/32/8944de08315bc53e8f659fb6e131f2d602279905.pdf)

- **Business plan for research infrastructures**, used as a management tool and as a framework for collecting, analysing and using operational data during the implementation and operational phases. It is also the basis for monitoring project progress and its possible interim evaluation. The business plan provides a clear overview of the resources required and supports effective planning of activities and cash flow. Business plans will cover a five-year period and will be reviewed annually to reflect the actual situation. Research infrastructures will report annually to the Ministry of Science, Education and Youth on the implementation of their business plans.
- **Socio-economic impact assessment**, to be carried out annually. The assessment provides the leadership of research infrastructures with a practical tool to measure progress towards the goals, identify problems, and develop the necessary corrective actions. Reporting on socio-economic impacts is mandatory for all publicly funded research infrastructures and follows the cycle of regular updates of the Republic of Croatia Research Infrastructure Development Roadmap, which will facilitate the monitoring of the research infrastructure system and the identification of future investment priorities.

In order to enable efficient and sustainable investment of public funds in research infrastructure, it is necessary to have a continuous high-quality insight into the institutional framework and the national and European environment. Therefore, it is necessary to regularly update the data on existing research infrastructure and identify needs, gaps, and development opportunities.

The Research Infrastructure Development Roadmap of the Republic of Croatia was adopted for the period 2023–2027. During the new programming period, a new roadmap will be prepared and subsequently updated periodically.

## Annexes

### 1 Content of the report

#### 1. Basic information

**ERIC name**

**Reporting period**

**National ERIC website**

**Service catalogue on the national ERIC website**

**Use of the national ERIC's social media channels for awareness-raising and dissemination of activities**

**Members of the national ERIC**

**Participation of the national ERIC coordinator or members of the national ERIC in the bodies of the ERIC's central organisation**

**Summary of cooperation with the ERIC's central organisation**

#### 2. Narrative report

**Indicators for assessing the economic and technological impact of research infrastructures**

**Number of full-time and part-time personnel involved in research infrastructure activities (FTEs)**

**Cooperation with the business sector (business and industry)**

Total number of companies with which cooperation has been established:

Forms and examples of cooperation (e.g. joint projects, work placements, consultancy services, etc.):

List of all companies with which cooperation has taken place, grouped by sector, size, technology group (low-tech/high-tech) and geographical scope (national, international, multinational):

Number and type of spin-offs and start-ups established as a result of participation in the research infrastructure:

**Number of collaborative projects in which companies were directly involved during the reporting period**

**Total number of patents related to the use of the research infrastructure in Croatia and in other countries**

**Number of patent applications filed:**

**Number of patents granted:**

**Research and development projects commissioned and funded by companies**

Number of company-funded projects: Prototypes  
of new products and services developed:

### **Indicators for assessing the social impact of research infrastructures**

**Is there a plan for increasing the visibility of the research infrastructure at national level?  
Please provide a link to the publicly available visibility plan, where applicable.**

**Does the research infrastructure contribute to public policy?**

Contracts, reports, strategies, recommendations and other sources of information  
contributing to public policy (including links, where available):

**Number of awareness-raising and educational events/activities carried out:**

**How has Open Research Data Management been implemented within the research infrastructure?**

**Please provide links to publications and dissemination activities of the national ERIC.**

**Users of the national ERIC:**

**In Croatia:**

**Outside Croatia:**

### **Indicators for assessing the scientific impact of research infrastructures**

**Overview of the work and activities of the national ERIC during the reporting period, with particular emphasis on key scientific and operational contributions**

**Total number of scientific publications produced during the reporting period through the use of the research infrastructure and indexed in the Web of Science or Scopus databases**

**Active national and international research projects in which the national ERIC participates**

**New collaborations established with other national and international research infrastructures**

### **3. Financial statement**

**Income during the reporting period (budget, projects, other)**

**Expenditure during the reporting period**

## Appendices

### 1. Infrastructure projects under the TPA: Personalised Healthcare

| Project and promoter                                                                                                                                                                                                                                | Grants awarded in EUR |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|
| <b>University of Zagreb, Faculty of Kinesiology</b><br>KINNOVATE – Investment in the Research and Innovation Infrastructure of the University of Zagreb, Faculty of Kinesiology to Support Interdisciplinary and Innovative STEM and ICT Projects   | 2,355,388.59          |
| <b>University of Zagreb, Faculty of Chemical Engineering and Technology</b><br>Investment in the Equipment and Adaptation of the Research and Innovation Infrastructure of the University of Zagreb, Faculty of Chemical Engineering and Technology | 2,198,324.28          |
| <b>University of Zagreb, Faculty of Pharmacy and Biochemistry</b><br>Enhancement of the Research and Innovation Infrastructure of the Faculty of Pharmacy and Biochemistry for Advanced Analytical and Biopharmaceutical Research                   | 655,496.25            |
| <b>University of Zagreb, School of Medicine</b><br>Adaptation of Premises and Equipment of the Centre for Electron Microscopy of the University of Zagreb School of Medicine (TEM Cen)                                                              | 1,269,000.00          |
| <b>TOTAL</b>                                                                                                                                                                                                                                        | <b>6,478,209.12</b>   |

### 2. Infrastructure projects under the TPA: Smart and Clean Energy

| Project and promoter                                                                                                                                            | Grant funding awarded (EUR) |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------|
| <b>Croatian Geological Survey</b><br>Infrastructure Renewal and Procurement of Instruments at the Croatian Geological Survey – Geoscience Laboratories (GEOLAB) | 7,408,540.66                |
| <b>Ruđer Bošković Institute</b><br>Enhancement of the Infrastructure for Materials Research at the Ruđer Bošković Institute's Accelerator Centre (UNIMAC)       | 433,937.50                  |
| <b>TOTAL</b>                                                                                                                                                    | <b>7,842,478.16</b>         |

### 3. Infrastructure projects under the TPA: Smart and Green Transport

| Project and promoter                                                                                                                     | Grants awarded in EUR |
|------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|
| <b>CoE MARBLE</b><br>Development and Equipping of a Smart Marina (CoE MARBLE Smart Marina)                                               | 822,289.65            |
| <b>CoE MARBLE</b><br>Construction and Equipping of an Autonomous Vessel Test Site (CoE MARBLE Autonomous Marine Vehicle Operation Site)  | 1,196,928.75          |
| <b>University of Dubrovnik</b><br>Multidisciplinary Research Centre for Maritime Affairs, Aquaculture and Sustainable Development (MARO) | 872,000.00            |
| <b>TOTAL</b>                                                                                                                             | <b>2,891,218.40</b>   |

#### 4. Infrastructure projects under the TPA: Sustainable and Circular Food

| Project and promoter                                                                                                                                                 | Grants awarded in EUR |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|
| <b>INSTITUTE FOR ADRIATIC CROPS AND KARST RECLAMATION</b>                                                                                                            |                       |
| Modernisation of the infrastructure of the Institute for Adriatic Crops and Karst Reclamation as a prerequisite for excellence in Mediterranean agriculture research | 20,566,517.09         |
| <b>CoE MARBLE</b>                                                                                                                                                    |                       |
| Construction and Equipping of a Smart Mussel Farm (CoE MARBLE Smart Mussel Farm)                                                                                     | 1,203,106.93          |
| <b>University of Zagreb, Faculty of Food Technology and Biotechnology</b>                                                                                            |                       |
| Multidisciplinary Infrastructure for Next-Generation Protein-Based Products                                                                                          | 2,270,548.10          |
| <b>TOTAL</b>                                                                                                                                                         | <b>24,040,172.12</b>  |

#### 5. Infrastructure projects under the TPA: Tailored and Integrated Wood Products

| Project and promoter                                                                                                | Grants awarded in EUR |
|---------------------------------------------------------------------------------------------------------------------|-----------------------|
| <b>Croatian Forest Research Institute</b>                                                                           |                       |
| Construction of New Laboratories and Reconstruction of Existing Buildings of the Croatian Forest Research Institute | 12,876,847.47         |
| <b>TOTAL</b>                                                                                                        | <b>12,876,847.47</b>  |

#### 6. Infrastructure projects under the TPA: Digital Products and Platforms

| Project and promoter                                                                                                         | Grants awarded in EUR |
|------------------------------------------------------------------------------------------------------------------------------|-----------------------|
| <b>University of Rijeka, Faculty of Engineering</b>                                                                          |                       |
| RITEH 'Open Innovation Gate' – STEM/ICT Innovation Laboratory for Industry 4.0                                               | 839,966.65            |
| <b>Catholic University of Croatia</b>                                                                                        |                       |
| UNICATH-RES – Research and Innovation Infrastructure of the Catholic University of Croatia for Applied STEM and ICT Research | 3,303,213.56          |
| <b>University of Split, Arts Academy</b>                                                                                     |                       |
| Modernisation of Infrastructure for Research, Analysis and Preservation of Cultural Heritage                                 | 872,204.50            |
| <b>VERN' University</b>                                                                                                      |                       |
| Investment in the Equipment and Adaptation of the Research and Innovation Infrastructure of VERN' University                 | 875,448.45            |
| <b>TOTAL</b>                                                                                                                 | <b>5,890,833.16</b>   |

#### 7. Interdisciplinary research infrastructures

| Project and promoter                                                                                           | Grant funding awarded (EUR) |
|----------------------------------------------------------------------------------------------------------------|-----------------------------|
| <b>Ruđer Bošković Institute</b>                                                                                |                             |
| Open Science Infrastructure Platforms for Innovative Applications in the Economy and Society – O-ZIP, Phase II | 88,702,213.00               |
| <b>TOTAL</b>                                                                                                   | <b>88,702,213.00</b>        |