

RESEARCH INFRASTRUCTURE DEVELOPMENT ROADMAP OF THE REPUBLIC OF CROATIA

2023 –2027



Ministry of Science and Education

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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

ESF – European Social Fund

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 – *Hrvatska agencija za malo gospodarstvo, inovacije i investicije*, Croatian Agency for SMEs, Innovations and Investments

HPC – High Performance Computing

HRK – Croatian Kuna

ICT – Information and Communications Technologies

RDI – Research, Development, Innovation

ITER – International Thermonuclear Experimental Reactor

MZO – *Ministarstvo znanosti i obrazovanja*, Ministry of Science and Education

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 – Operational Programme Competitiveness and Cohesion 2021–2027

R&D – Research and Development

RI – Research Infrastructure

S3 – Smart Specialisation Strategy 2021–2029

SMP – Symmetric Multiprocessing Unit

TB – Terabyte

UN – United Nations

ZCI – *Znanstveni centar izvrsnosti*, Centre of Research Excellence

Foreword

In addition to human capital, research infrastructures are the basis of excellence in science. World-class research infrastructures provide essential services to research and innovation communities. Therefore, they play an irreplaceable role in broadening the boundaries of knowledge and function as key drivers of research and innovation. They are a fundamental requirement for assuring the quality of basic and applied research and are a platform for networking, developing skills, and attracting talent.

The Member States of the European Union, encouraged by the European Strategy Forum on Research Infrastructures and the European Commission, periodically draw up national plans for research infrastructures. In 2014, the Republic of Croatia drafted its first National Research Infrastructure Development Roadmap, which was updated in 2016. The aim of this third Croatian Research Infrastructure Development Roadmap 2023 –2027 is to provide a comprehensive overview of the national research infrastructure and the international infrastructures and organisations in which Croatia participates so as to use this infrastructure for the benefit of the Croatian society and economy. The Roadmap sets out priorities and development paths based on existing European and national strategic documents in order to help address global challenges and further improve the national science sector, making it more internationally recognizable. This document supports the development of Open Science based on excellence and international competitiveness, which is the foundation for the development of an innovative and prosperous Croatian society. It also promotes excellence, cooperation, and internationalisation, as well as the provision of services to the community in different sectors, such as industry, education and business.

The national research infrastructure clearly demonstrates the great potential of the Republic of Croatia to contribute to a more competitive European Research Area. In order to better align our scientific development with European and global trends as well as respond to all challenges in a timely manner, this document will be continuously revised in line with the needs of the national research area and the objectives of European research policy. An investment into research infrastructures is an investment into our future and a prerequisite for excellent and ground-breaking research that can deliver knowledge-based solutions to global societal challenges and economic needs.

I am certain that the Croatian Research Infrastructure Development Roadmap 2023 –2027 will contribute to the sustainable and long-term development of the Croatian research and innovation system and allow for improved capacities and performance of Croatian scientists in research, development, and innovation, while further strengthening international cooperation.

Minister of Science and Education
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 belonging to different laboratories or 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.

One of the more important forms 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 in 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.

ESFRI methodology recognises six main stages in the life cycle of research infrastructures¹.

1) **Concept development** – usually originates from scientific communities gathered around common scientific needs and goals. 2) **Infrastructure design phase** – the scientific concept and technical feasibility of the infrastructure are assessed and initial analyses (of potential users, costs, political and financial support, etc.) are carried out. 3) **Preparatory phase** – may include development of project-technical documentation (e.g., main project), a feasibility study with a cost-benefit analysis and other activities necessary for successful project implementation. 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 circulation of researchers and the establishment of start-ups and spin-offs, attracting companies with significant innovation development 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.

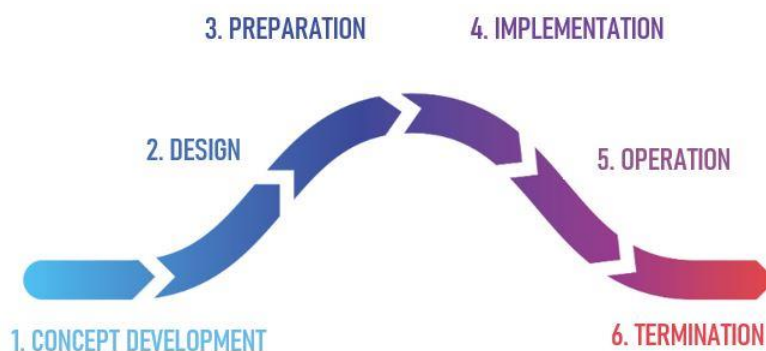


Figure 2 Life cycle of research infrastructures

¹ [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 Infrastructures² is an advisory and coordinating body of the Ministry of Science and Education with 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 interested public and the expert community could make their contributions.

A comprehensive update of the Research Infrastructure Development Roadmap is planned in 2025.

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 strategy-led 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 making Strategy Reports on Research Infrastructures (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 Roadmap, from 2021, gives an overview of 41 ESFRI Landmarks – research infrastructures that have been implemented or have reached a high level of implementation and present one of the main elements

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

of the competitiveness of the European Research Area. It also contains an overview of the Projects that were added to the Roadmap in 2010 and 2016, as well as an evaluation of new project proposals, 11 of which were added. ESFRI Projects are research infrastructures in the preparation phase selected for their excellence, maturity, and the expectation that the Project will reach the Implementation Phase within a ten-year term.

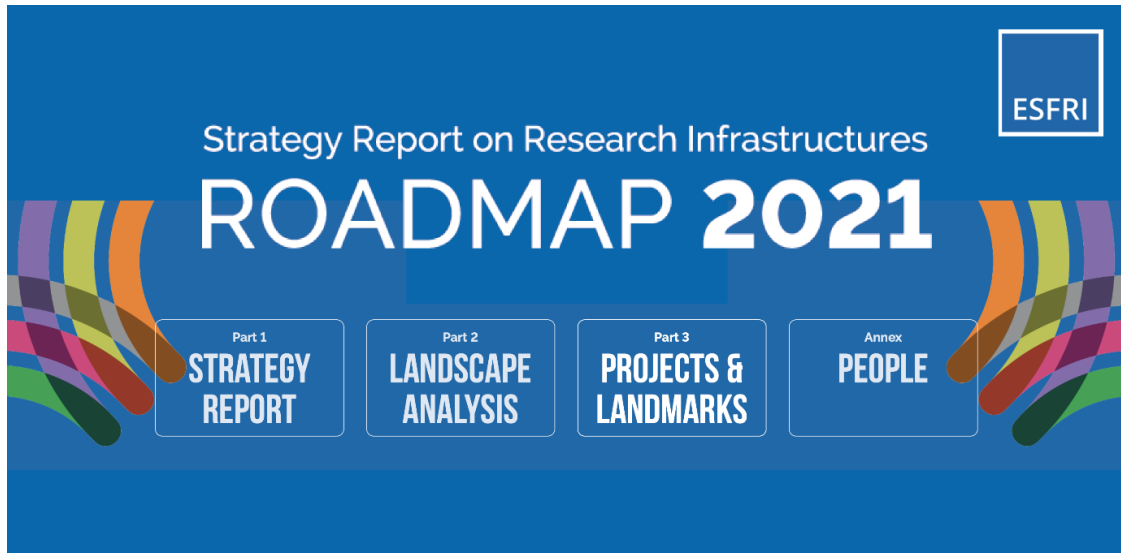


Figure 3 Overview of the ESFRI Roadmap published in 2021

The European Commission and ESFRI encourage Member States and Associated Countries to develop national roadmaps for research infrastructures. Even though these roadmaps are not obligatory, most EU countries have developed them as a blueprint for setting national priorities and securing funding. 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 2030 (NDS). Specifically, the Development Direction 1 (DD1) – Sustainable Economy and Society and the Development Direction 4 (DD4) – Balanced Regional Development, which are linked to investments in science, technology and regional competitiveness.

The Smart Specialisation Strategy (S3) is also closely connected to this Roadmap.

2 Overview of the state of research infrastructures in Croatia

2.1 System overview

Research infrastructures are formally supervised by the Ministry of Science and Education, but its reach 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 strong influence on the development of research infrastructure projects, as well as on their strategies and users. The past preference for the public funding model for non-economic research infrastructure activities has in fact limited their economic activities, and research infrastructure projects have to be financially viable and raise funds for reinvestment in equipment from their own resources, collaborative research projects, or national resources. 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 leaders, institutions from the science sector³ develop, design and submit project proposals and, after funding approval, 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.

³ Institutions from the science sector are higher education institutions, research institutes, and other legal entities and their organizational 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 (2016) and Horizon 2020 priorities. As part of these calls, a total of 141 projects were funded, 70 of which were primarily related to the development of research infrastructure⁴, and 71 were mainly related to RDI 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
Energy and Sustainable Environment	32	22	54
Food and Bioeconomy	10	11	21
Health and Quality of Life	22	26	48
Interdisciplinary	5	8	13
Security	1		1
Transport and Mobility	1	3	4
Total	71	70	141

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

Thematic priority area	RDI activities	Research infrastructure	Total
Energy and Sustainable Environment	172,245,147	355,087,102	527,332,249
Food and Bioeconomy	83,980,813	81,137,247	165,118,060
Health and Quality of Life	253,772,891	1,018,324,916	1,272,097,807
Interdisciplinary	186,668,727	1,209,354,620	1,396,023,347
Security	5,290,428		5,290,428
Transport and Mobility	6,044,277	10,447,207	16,491,485
Total	708,002,283	2,674,351,093	3,382,353,376

The Horizon 2020 funded 484 projects in thematic priorities that largely overlap with the TPAs. The number of projects by area and the amount of funding is shown in Table 3.

Table 3 Horizon 2020 number of funded projects by thematic priorities (Source: Horizon Dashboard 2021)

Priority area	No. of projects	Funding (EUR)
Health, demographic change and well-being	56	11,706,177
Food security, sustainable agriculture and forestry, marine, maritime and inland water research, and the bioeconomy	70	11,241,804
Secure, clean and efficient energy	156	23,340,606
Smart, green and integrated transport	78	8,285,641
Climate action, environment, resource efficiency and raw materials	64	10,787,358
Inclusive, innovative and reflective societies	32	4,853,773
Secure societies	28	4,545,510
Total	484	74,760,869

⁴These projects also include 36 projects funded under the call KK.01.1.1.09. Preparation of RDI infrastructural projects, through which funds have been allocated for the preparation of project documentation needed for the implementation of research infrastructure projects (e.g., feasibility study, technical documentation, etc.).

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 policies 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 infrastructure, as defined in the proposal for a new Community framework for State aid for research and development and innovation, and the Commission Staff Working Document titled “Technology Infrastructures”⁵. 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 technology transfer, in order to respond to the needs of industry 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 that are also inaccessible due to their limited resources, thereby reducing the risk of their investment in R&D. The introduction of the concept of technology infrastructure will promote the establishment and functioning of non-profit research and technology organisations⁶ for applied research as owners and/or managers of technology

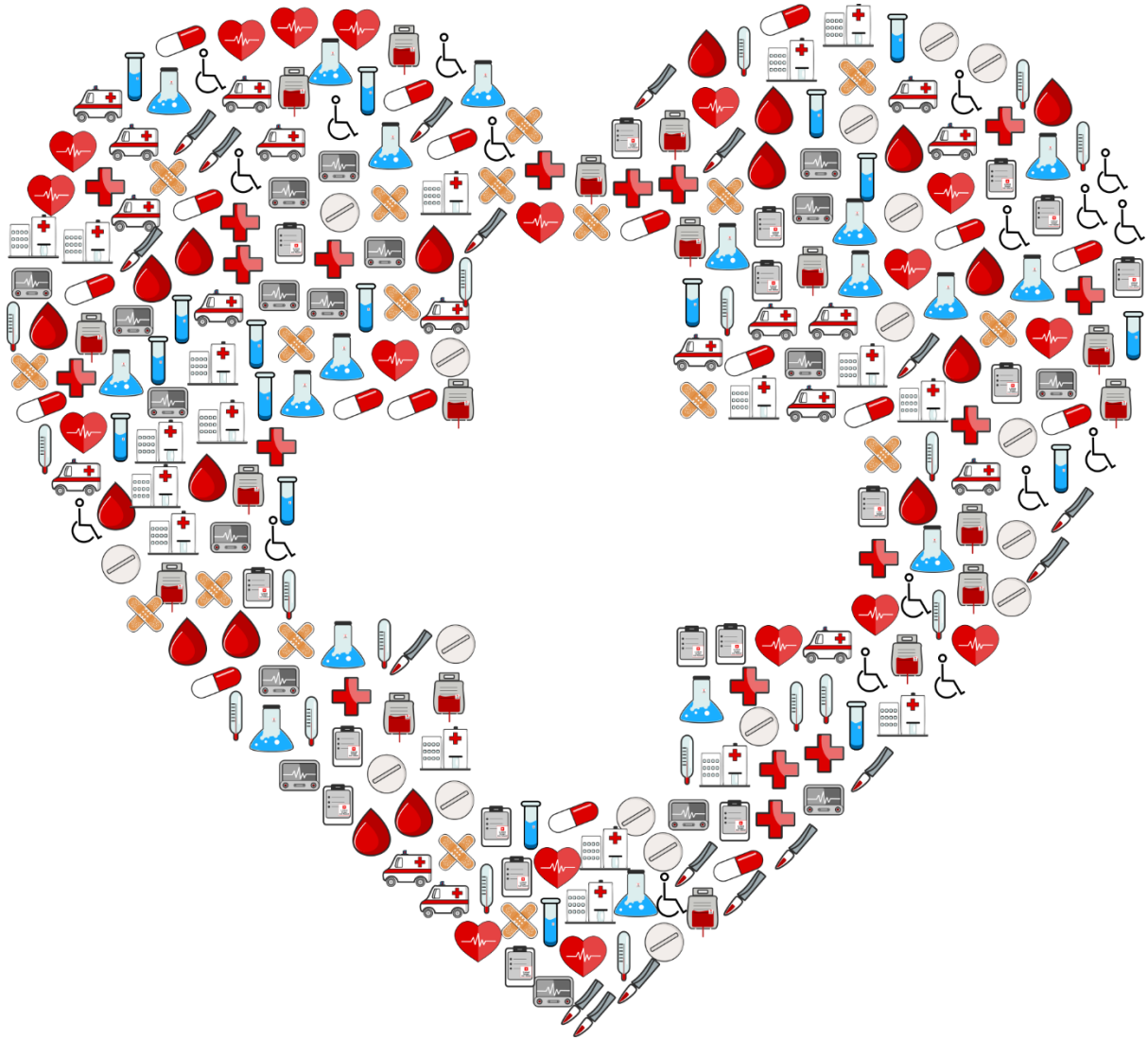
⁵ ‘technology infrastructures’ refer to facilities, equipment, capabilities and related support services required to develop, test and upscale technology to advance through industrial research and experimental development activities from validation in a laboratory to a validation representative of the operational environment, and the users of which are mainly industrial players, including SMEs, which seek support to develop and integrate innovative technologies for the development of new products, processes and services, whilst ensuring feasibility and regulatory compliance.

⁶ Abbreviated as RTO.

infrastructure. 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 founded 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 priority 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.

HEALTH





3.1 Health

This area focuses on health and healthcare services as well as their cross-sectoral linkages. Health is a key prerequisite for economic and social development, so allocating funds to the healthcare sector is an investment rather than an expense.

On a global scale, this priority area is characterised by economic and social challenges that provide a wide range of growth opportunities, such as the following: a growing global population, demographic ageing, an increase in multimorbidity, an increasing burden on healthcare systems combined with limited and stagnant financing of public healthcare systems. Adverse conditions, coupled with technological advancements, initiate the development of innovative solutions related to the prevention and personalisation of healthcare

and eHealth. These areas have become increasingly important in the context of the global COVID-19 pandemic, which has put additional strain on healthcare systems around the world and limited access to healthcare services. Availability, quality, and efficiency of healthcare are the fundamental values of modern healthcare systems which are being developed in cooperation with patients.

Biomedicine and health have traditionally been the most significant scientific field in Croatia (SCImago, 2021). In 2019, there were 2,565 researchers employed in the biomedicine and health sector, representing around 18% of all employed researchers (CBS, 2021). Croatia has a strong potential and capacities for research, development and innovation within this field.

INVESTMENT PRIORITY WILL BE GIVEN TO RESEARCH INFRASTRUCTURES THAT WILL:

- Improve the quality of life and health of each individual and the entire population of Croatia, as well as develop and provide personalised healthcare services.
- Encourage the development of technologies and solutions that support the shift towards tailored, cross-sectoral and integrated solutions.
- Significantly strengthen responses to emerging health challenges and the needs of the population, guided by research-based knowledge in the process.
- Focus on disease prevention.
- Encourage translational research.
- Integrate digital technologies and eHealth.
- Address the challenges identified in the ESFRI Roadmap 2021 in the field of health.
- Make a clear contribution to emerging fields referred to in the ESFRI Roadmap 2021 within the field of health.



EATRIS ERIC

eatris

European infrastructure
for translational medicine

European Infrastructure for Translational Medicine



Type: ERIC

Headquarters: Amsterdam, NL

Founded in: 2013

Croatian membership since: 2021

Contact person in HR: Jelena Ilić-Dreven,
MSE

National beneficiary:
University of Zagreb, School of Medicine

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

European Advanced Translational Research Infrastructure in Medicine provides access to a wide range of preclinical and clinical expertise available in more than 144 leading academic centres in 14 EU countries. It brings together European Centres of Excellence in translational research in the field of medicines, diagnostics, and medical devices. Through EATRIS-ERIC, academia and the industry can gain access to various resources needed for the translational development of new medicines, such as: existing infrastructures, specialised equipment, expertise, education, sample bases, and guidelines for the regulatory process. Its operation is focused on preclinical and early clinical development of medicinal products, vaccines and diagnostics.

It offers its members access to platforms that jointly cover translational medical research: advanced therapy medicinal products, biomarkers, small molecules, imaging & tracing, and vaccine development. They also provide training, education, and mentoring to their members.

ELIXIR

Distributed Infrastructure for Life-Science Data



Type: International Organisation

Headquarters: Cambridgeshire, UK

Founded in: 2013

Croatian membership since: 2023

Contact person in HR: Fran Borovečki,
University of Zagreb, School of Medicine

National beneficiary:
University of Zagreb, School of Medicine

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

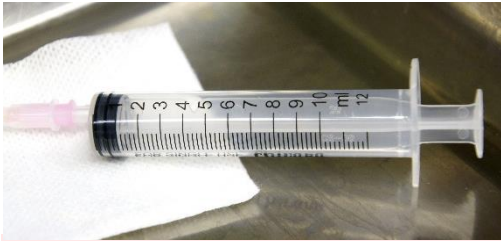
The distributed infrastructure for life-science data currently encompasses 23 member countries with over 180 scientific organisations. It brings together resources such as databases, software tools, training materials, cloud storage, and supercomputers from all over Europe. Its goal is to coordinate available resources so as to form a unique infrastructure that helps scientists finding and sharing data, exchange knowledge, etc. ELIXIR operates within five separate areas or platforms: data, tools, interoperability, computing, and training.

The ELIXIR Board approved the candidacy of the Republic of Croatia and invited it to complete the necessary procedures to become a full member of the consortium.

CerVirVac



Centre of Research Excellence for Virus Immunology and Vaccines



Location: Zagreb, Rijeka

Beneficiary:

University of Rijeka, Faculty of Medicine
Centre for Research and Knowledge
Transfer in Biotechnology, University of
Zagreb

University Hospital for Infectious Diseases
“Dr Fran Mihaljević”

Life cycle stage: Active

Contact:

Prof. Stipan Jonjić, PhD
+385 51 651 235,
stipan.jonjic@medri.uniri.hr

Prof. Vanda Juranić Lisnić, PhD
+385 51 651 156,
vanda.juranic@medri.uniri.hr

Website: <https://zci-cervirvac.hr/hr/>

CerVirVac conducts research aimed at developing a vaccine that will stimulate a strong immune response, better than the one triggered by a natural infection or tumour. It explores interactions between viruses and host immune systems, especially those that contribute to the development of effective vaccines. Its main focus is the creation of several “smart” live recombinant vaccines and vaccine vectors.

Their effectiveness is tested on preclinical models, which is a prerequisite for their human testing in clinical trials. Its ultimate goal is to design and produce vaccines/vector vaccines that will significantly help in the prevention or treatment of infectious diseases and tumours, which are among today’s most important public health concerns.



Neuro

Centre of Research Excellence for Fundamental, Clinical and Translational Neuroscience



Location: Zagreb

Beneficiary:
University of Zagreb

Life cycle stage: Active

Contact:
Prof. Miloš Judaš, PhD
+ 385 1 45 96 801,
mjudas@hiim.hr

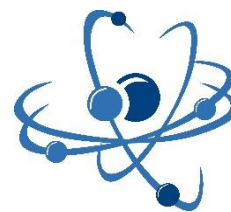
Website: <http://zci.hiim.hr/index.php/en/>

The development of an innovative, systematic and integrated approach to early detection, treatment, outcome assessment and rehabilitation of patients with hypoxic-ischemic and haemorrhagic brain damage, in adulthood and during development. The Centre combines basic and clinical research and has six main directions of research (research groups):

- 1) Developmental origin of paediatric neurological disorders following perinatal hypoxic-ischemic brain lesions;
- 2) New biomarkers of ageing, Alzheimer's disease, vascular dementia and insulin-resistant brain conditions;
- 3) Clinical and experimental studies of cerebral hypoxic-ischemic and haemorrhagic lesions and their relationship with changes in movement and pressure exerted by intracranial fluids;
- 4) Preclinical studies of hypoxic-ischemic lesions in rodent experimental models;
- 5) Cognitive and linguistic analysis of language disorders and recovery after hypoxic-ischemic brain lesions;
- 6) Innovative therapeutic response biomarkers in patients with mental disorders.

The research programme is partly interdisciplinary/multidisciplinary, as it combines different fields of fundamental neuroscience and clinical neuroscience.

Scientific Centre of Excellence for Personalized Health Care



Location: Osijek

Beneficiary:

The J. J. Strossmayer University of Osijek

Life cycle stage: Under implementation

Contact:

+385 31 22 41 04,
zci@unios.hr

Website: <http://zci-personhealth.unios.hr/>

An interdisciplinary Centre of Excellence in the field of biotechnical and biomedical sciences. It is designed as an efficient way of transferring knowledge and competences acquired in biotechnical sciences to basic and applied biomedical research encompassing complementary research groups in which research groups are complementary. The main research issues addressed by the Centre are understanding the role of glycans in the pathology of diseases associated with changes in glycosylation (e.g. autoimmune and inflammatory diseases, diabetes and neurological diseases), the development of high-throughput glycomic and finding of identifying or prognostic markers and researching the impact of consuming functional food of animal origin (eggs, chicken) developed and produced as part of the activities of this ZCI on health in the general population and in populations with special requirements (athletes and cardiovascular patients).

ENVIRONMENT AND FOOD





3.2 Environment and Food

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, environmental pollution prevention, and the conservation and sustainable use of natural resources. The policy response to these challenges must be decisive and comprehensive, seeking to maximise the benefits for health, quality of life, resilience, and competitiveness. Anthropogenic pressure plays a prominent role in the most pressing global challenges humanity is currently facing. The causes of climate change and biodiversity loss are global and cannot be pinpointed within national borders, so it is essential that policy responses and infrastructure actions are in strong synergy.

Due to its specific geographical location, **Croatia is characterised by a great wealth of biological, geological and landscape diversity.** However, it is also exposed to high risks posed by human activity and climate change. Our food production

continues to contribute to biodiversity loss and climate change and consume excessive amounts of natural resources, while a significant amount of food is wasted. Therefore, we should direct our efforts towards developing bioeconomy. The values of a healthy and functional ecosystem and preserved biodiversity have not been fully recognised for the time being, despite the fact that we achieve significant economic benefits from our natural capital, primarily through the blue economy sector.

More than 400 researchers are directly employed in the field of environmental research, with over 150 of them working in marine and environmental sciences (World Bank, 2017). Moreover, Croatia is among the top 50 producers of research in environmental science. Croatian scientists had a total of 3,417 publications, with 28,489 citations and an H-index of 66, which places Croatia among the 50 leading countries in the field of environmental science.

INVESTMENT PRIORITY WILL BE GIVEN TO RESEARCH INFRASTRUCTURES THAT WILL:

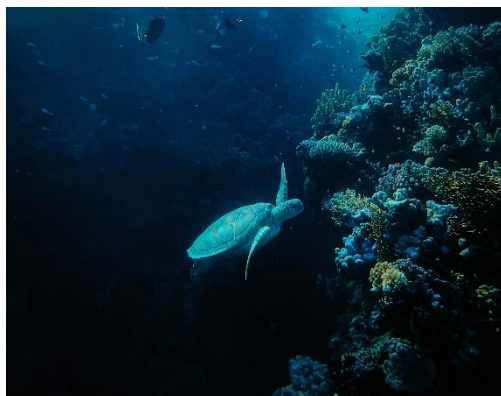
- Focus on the preservation of biological and landscape diversity and exceptional natural and water resources.
- Make a clear contribution to the mitigation of climate change and anthropogenic impact and foster sustainable development and bioeconomy.
- Ensure a high level of food and animal feed safety.
- Focus on functional and value-added food.
- Increase the efficiency and added value of agricultural production and aquaculture.
- Enable better waste management and reduce food waste throughout the food supply chain.



CIESM



Mediterranean Science Commission



Type: International Organisation

Headquarters: Monaco

Founded in: 1919

Croatian membership since: 1992

Contact person in HR:

Ivica Vilibić, PhD, Institute of Oceanography and Fisheries

Sandi Orlić, PhD, Ruđer Bošković Institute

National beneficiary:

Institute of Oceanography and Fisheries
Ruđer Bošković Institute

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

An independent organisation established to promote international research in the Mediterranean and the Black Sea. It acts as a focal point for the exchange of ideas and the development of scientific standards. At the moment, it consists of 24 countries, hundreds of marine research institutes and thousands of marine researchers.

It covers a wide range of marine research: geophysical, chemical and biological processes, together with high-resolution seabed mapping for better understanding, monitoring, and protection of the sea. Structured in six committees and various taskforces. Their activities include expert workshops, collaborative programs and regular congresses, delivering authoritative, independent advice to national and international agencies. CIESM monitors and analyses changes in the Mediterranean Sea such as: the impact of global warming on the sea-level and water masses, changes in marine biodiversity, morphological changes in coastlines, accumulation of trace metals in marine food chains, etc. In addition, through its various monitoring programmes, it monitors sensitive indicators of changes at the regional level and records warming trends, seasonal changes in absolute sea level, trace contaminants, exotic species introduced, port biodiversity, and zooplankton indicators.

ICGEB



ICGEB

International Centre for Genetic Engineering and Biotechnology



Type: International Organisation

Headquarters: Trieste, IT

Founded in: 1994

Croatian membership since: 1998

Contact person in HR:

Prof. Kristian Vlahoviček, PhD, University of Zagreb, Faculty of Science

National beneficiary:

University of Zagreb, Faculty of Science

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

Established in 1983 as part of the United Nations Industrial Development Organisation (UNIDO) special programme, it has been an autonomous intergovernmental organisation in permanent cooperation with the UN since 1994. Its main activity is the application of advanced research and education in molecular biology and biotechnology, as well as the development of knowledge and modern techniques in biomedicine, environmental protection/remediation, crop improvement, biopharmaceutics, and biopesticides and biofuel production. It operates more than 45 state-of-the-art laboratories and forms an interactive network comprising almost 70 member states. ICGEB provides a scientific environment of world-class international standards for advanced research and education and for the development of biotechnology products.

EMBO

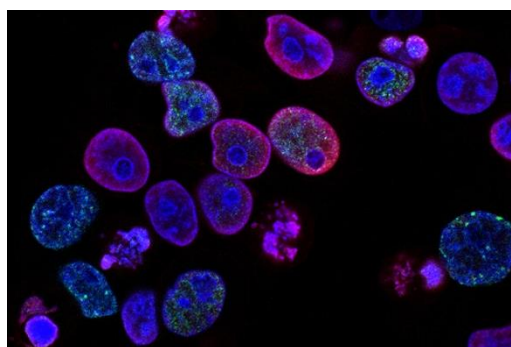


European Molecular Biology Organization

European Molecular Biology Laboratory



European Molecular Biology Conference



Type: International Organisation

Headquarters: Heidelberg, DE

Founded in: 1964

Croatian membership since: 1997

Contact person in HR:

Lovorka Barač Lauc, PhD, Croatian Science Foundation

Prof. Vesna Boraska Perica, PhD,
University of Split, School of Medicine

National beneficiary:

Croatian Science Foundation
University of Split, School of Medicine
University of Rijeka, Faculty of Medicine
University of Zagreb, School of Medicine

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

An academy of life sciences that currently brings together more than 1,900 leading researchers in Europe and around the world. It aims to promote natural sciences and facilitate international cooperation and exchange. It co-finances courses, workshops and conferences and publishes five scientific journals.

Its main programmes and activities are funded by the European Molecular Biology Conference (EMBC), which was founded in 1969 and is made up of 30 member states. Through its General Programme, the EMBC provides a framework for European co-operation in molecular biology and closely related research areas.

The EMBL is Europe's leading natural science laboratory that currently brings together 27 countries. It operates six laboratories in Europe, employs 1,800 people and publishes hundreds of scientific articles each year. Each laboratory is dedicated to a specific research area, making EMBL-EBI a hub for bioinformatics research and services as well as for maintenance of numerous scientific databases. It helps its members develop services, new methods and technologies. Croatia has been a member since 2006.

ICC



International Association for Cereal Science and Technology



Type: International Organisation

Headquarters: Vienna, AT

Founded in: 1955

Croatian membership since: 1998

Contact person in HR:

University of J.J. Strossmayer, Faculty of
Food Technology Osijek

National beneficiary:

University of J.J. Strossmayer, Faculty of
Food Technology Osijek

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

One of the most prominent international organisations dedicated to the improvement of safety and quality in cereal-based foods. It currently brings together 18 member states from five continents and is committed to international cooperation through disseminating knowledge, conducting research and developing standard methods that contribute to the improvement of innovation, food quality, and food safety for the health and well-being of all people.

ICC membership provides a wide range of benefits including, among others, free online access to the ICC standard analytical methods and discounts on the co-organisation of scientific meetings and participation in conferences organised by this association.

BIOCentre



Incubation Centre for Biosciences and Commercialisation of Technology



Location: Zagreb

Beneficiary:

Ministry of Science and Education

Croatian Agency for SMEs, Innovations and Investments

Life cycle stage: Active

Contact:

+ 385 1 6458 640

info@biocentre.hr

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

It was established in 2015 and was granted a licence for performing scientific activity in 2020. The BIOCentre was built as part of the future eastern campus of the University of Zagreb in Borongaj.

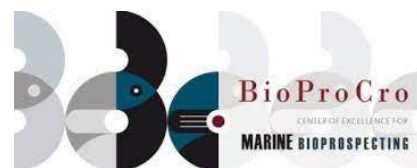
It operates through the following five programmes:

BIOIncubation and BIOFacility offer advisory services and rental of equipped or unequipped laboratory and office space.

BIONetwork enables new start-ups or already existing biotechnological companies to connect with universities, faculties, institutes and businesses in Croatia and abroad. Networking facilitates product development and faster and more efficient commercialisation.

BIOTransfer and BIOEducation operate in the field of biotechnology and chemistry. The programmes are carried out in The Central Laboratory consisting of 5 laboratory units: The Microbiology Laboratory, Cell Biology Laboratory, Downstream Processing Laboratory, Bioanalytical Laboratory I-Chemistry, Bioanalytical laboratory II-Proteomics.

BioProCro



Scientific Centre of Excellence for Marine BioProspecting



Location: Zagreb

Beneficiary:

Ruđer Bošković Institute

Life cycle stage: Active

Contact:

Rozelindra Čož-Rakovac PhD, Ruđer
Bošković Institute
+385 1 457 1232,
Rozelindra.Coz-Rakovac@irb.hr

Website: <http://bioprocro.zci.hr/>

BioProCro is a unique trans/multi-disciplinary centre for biotechnology research of the Adriatic Sea that is based on the application of biological knowledge and state-of-the-art techniques in researching the marine environment and its biological components, as a source of targeted biotechnological products and their application: new enzymes (biocatalysts), proteins and peptides, secondary metabolites, polysaccharides (bacteria, seaweed), fatty acids and lipids (algae). It is planned to introduce sophisticated analytical methods and develop new protocols for the extraction, isolation and enrichment of marine biomolecules and biomaterials, whose effectiveness and applicability potential in the food, cosmetics and pharmaceutical industries will be assessed. It consists of eight research units: Biodiversity; Chemical Diversity, Identification, Extraction, Optimisation and Purification of Biomolecules; Characterisation and Mode of Action of Bioactive Compounds; Bioorganic Synthesis; Testing on Model Organisms, Bioinformatics and Bioprocess Development; Sustainable Production and Benchmark Improvement.

CroP-BioDiv



Science Centre of Excellence for Biodiversity and Molecular Plant Breeding



Location: Zagreb

Beneficiary:

University of Zagreb, Faculty of Agriculture

Life cycle stage: Active

Contact:

Prof. Zlatko Šatović, PhD
+385 1 239 3935,
coebiodiv@agr.hr

Website:

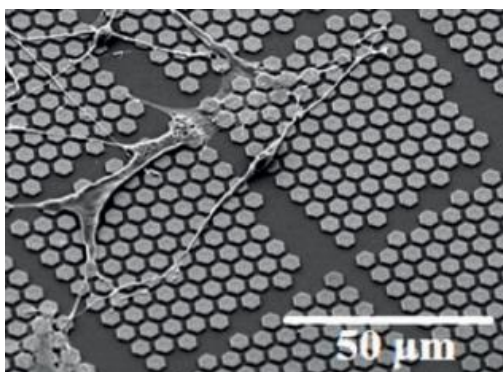
http://biodiv.iptpo.hr/?page_id=268&lang=hr

A research network focused on the transfer of knowledge and technology with the purpose of directly contributing to the advancement of agricultural research. The main activities of the centre are preservation of plant genetic resources, phenotyping, genotyping, and bioinformatics for the purpose of plant breeding development. Progress in breeding is based on the comprehensive collection, description and assessment of properties, the introduction of modern high-throughput phenotyping and genotyping techniques and the use of new approaches in data processing. Research is conducted on eight plant species that represent the country's main crops, as well as crops that could become valuable for agricultural production in Croatia in the future.

STIM



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



Location: Split

Beneficiary:
University of Split

Life cycle stage: Active

Contact:
+385 21 558 212

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

The Centre integrates research (R), innovation (I) and education (E) through three areas of improvement based on the international excellence of scientists and a selection of research directions of key importance for societal needs. These areas are: 1 Advanced nano-scale technology – focused on the improvement of renewable energy sources and medical diagnostics through the development of new materials for fuel cells and solar cells and the design of new nano-structured materials for biosensorics and biomedicine, 2 Water and the environment – includes research into the dynamics of pollution transmission, monitoring, and the impact of climate change on coastal areas and marine life through the characterisation of biologically active substances and biofilms, and 3 Education – providing young people with basic research education and knowledge and technology transfer through innovative linking of research results and their application in order to promote flexibility, creativity, and entrepreneurial spirit in young researchers.

Centre for Food Safety and Quality



Location: Zagreb

Beneficiary:

Teaching Institute of Public Health “Dr. Andrija Štampar”

Life cycle stage: Active

Contact:

Prof. Jasna Bošnjir, PhD, public health engineer
jasna.bosnir@stampar.hr

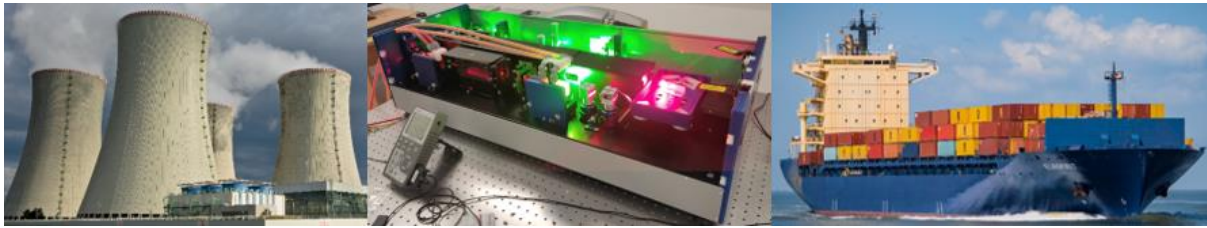
Website:

<https://www.stampar.hr/hr/projekti/centar-za-sigurnost-i-kvalitetu-hrane>

The Centre will focus on improving the quality, scale and relevance of research activities in the field of food safety and quality. The aim is to adopt new technologies that have not existed so far, namely technologies that can determine the geographical origin of food, whether it was produced organically, and which fertiliser was used in their production. This will contribute to the improvement of scientific and research infrastructure by strengthening research capacities open to innovation in order to improve the quality and availability of research in support of strengthening the competitiveness of the Croatian economy and societal development.

ENERGY AND TRANSPORT





3.3 Energy and Transport

This area includes modern energy technologies and efficient, environmentally friendly and remotely controlled solutions. The sector as a whole is rapidly evolving with growing shifts towards renewable energy use and smart grid technologies that have emerged as a means of interconnecting the entire energy system.

Croatia has extensive knowledge and experience in the energy sector, but the potential for production and use of renewable energy sources remains underexploited. There is good research, development and innovation potential, both in industry and in the public research sector. 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.

The Croatian transport sector consists of various actors in the automobile production and other vehicles, railway equipment, and maritime vessels. Research and development are becoming increasingly important in all areas, especially in the automotive sector. However, the relatively strong research and innovation potential is hampered by weak links between the public research sector and the industry. In addition, there is a lack of qualified human resources in the domestic labour market, with a skills gap observed in the area of environmental solutions for transport technologies, as well as in digitalisation and development of intelligent transport systems.

INVESTMENT PRIORITY WILL BE GIVEN TO RESEARCH INFRASTRUCTURES THAT WILL:

- 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.
- Promote the development of environmentally friendly, intelligent and digitalised transport solutions.
- Promote the improvement of transport safety.
- Make a clear contribution to reducing Croatia’s dependence on energy imports.
- Encourage the complete renovation of buildings, which, in addition to the energy aspect, will include fire safety and seismological protection.
- Enable the development of smart and sustainable cities.



IFMIF DONES



International Fusion Materials Irradiation Facility – DEMO Oriented NEutron Source



Type: Research infrastructure

Headquarters: Granada, ES

Founded in: 2018

Croatian membership since: 2018

Contact person in HR:

Tonči Tadić, PhD, Ruđer Bošković Institute
Stjepko Fazinić, PhD, Ruđer Bošković Institute

National beneficiary:

Ruđer Bošković Institute

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

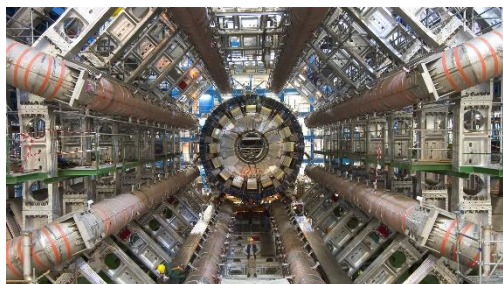
A European strategic project worth 707 million euros aimed at building a research infrastructure for an international fusion material irradiation device. As a joint Spanish-Croatian initiative, in 2018 it was included among ESFRI projects, which are of strategic importance for the EU.

The Demonstration Power Plant (DEMO) will be built ten years after the start of operation of the large International Thermonuclear Experimental Reactor (ITER) being built in Cadarache, France. A Memorandum of Cooperation on Fusion Research was signed in Madrid in 2018. The Memorandum formalises the cooperation between Croatia and Spain in the design of DONES. In 2022, a Memorandum of Understanding was signed between the Ministry of Science and Education of the Republic of Croatia and the Ministry of Science and Innovation of the Kingdom of Spain, on the subject of cooperation in the IFMIF-DONES Programme. Within the framework of the Memorandum, Croatia will deliver equipment worth 5% of the project, i.e., about EUR 35 million, thus acquiring the right to 5% of the experimental capacities on this unique device.

CERN



European Organisation for Nuclear Research



Type: Research infrastructure

Headquarters: Geneva, CH

Founded in: 1952

Croatian membership since:
2019 (as an associated member country)

Contact person in HR:

Hrvoje Meštrić, PhD, MSE
Vuko Brigljević, PhD, Ruđer Bošković
Institute
Doris Jozić, MSE

National beneficiary:

Ruđer Bošković Institute
University of Zagreb
University of Split

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

The largest particle physics laboratory in the world. It comprises 23 member states and has cooperation agreements with 38 countries. Croatia has been continuously cooperating with CERN since its independence, and since 2019 it has been an associate member state. CERN employs about 2,500 people, and about 8,000 scientists from 580 institutions use its facilities and equipment for their research. CERN is managed by 20 European Union Member States. Its purpose is fundamental research.

Its main instruments are accelerators and particle detectors, along with other infrastructure needed to research high-energy physics. In accelerators, particles accelerate almost to the speed of light and are directed to collisions. By observing the collisions using the detectors, particle interaction data is obtained. The main project of CERN is the Large Hadron Collider (LHC), which uses collisions of protons and heavy ions at high energies to obtain data for the analysis of collision processes in order to answer some of the fundamental questions of modern science.

Today, groups of scientists from the Ruđer Bošković Institute, the University of Zagreb, the University of Split and the University of Rijeka are included in various CERN programmes.

IIR/IIF



International Institute of Refrigeration



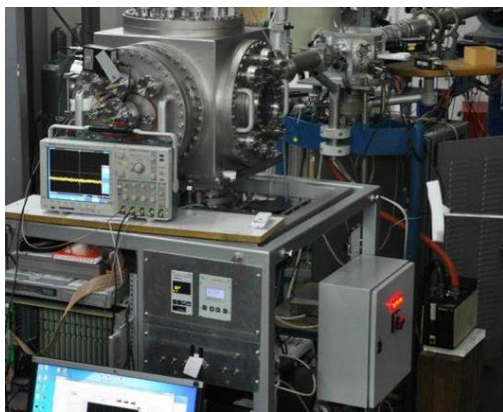
Type: International Organisation
Headquarters: Paris, FR
Founded in: 1908
Croatian membership since: 1998
Contact person in HR:
National beneficiary:
Website: <https://iifiir.org/en>

The only organisation in the world that collects scientific and technical knowledge in the sector of refrigeration. It currently brings together 59 member states and is committed to disseminating knowledge of refrigeration to improve quality of life, while respecting the environment in the following areas: quality and safety of food, comfort in homes and office buildings, health products and services, low temperature and liquefied gas technology, energy efficiency, and the use of cooling systems safe for the ozone and the environment.

CERIC-ERIC

CERIC

Central European Research Infrastructure Consortium



Type: ERIC

Headquarters: Trieste, IT

Founded in: 2014

Croatian membership since: 2017

Contact person in CroHRatia:
Milko Jakšić, Ruđer Bošković Institute

National beneficiary:
Ruđer Bošković Institute

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

The Central European Research Infrastructure Consortium connects the research infrastructures of many countries in the region, such as: Italy, Austria, Slovenia, Hungary, Romania, Serbia, etc. It covers a wide research area of materials science at the nano-scale, including linkages to biomaterials and structural biology. It enables research, analysis and synthesis of materials using technologies based on photons, electrons, neutrons and ions.

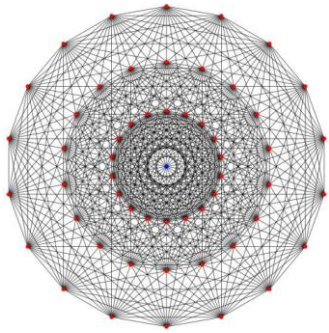
The Consortium's main partner institution is the Ruđer Bošković Institute with its accelerator system at the Division of Experimental Physics.

Due to the "equal partnership, no fee" approach, cooperation is primarily based on immaterial contributions (share of researchers' working hours). Access to the infrastructure is possible after proposing experiments (the call is open twice a year) which are evaluated by an international review. The best rated proposals get free access to CERIC-ERIC partners' equipment.

QuantiXLie



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



Location: Zagreb

Beneficiary:

University of Zagreb, Faculty of Science

Life cycle stage: Active

Contact:

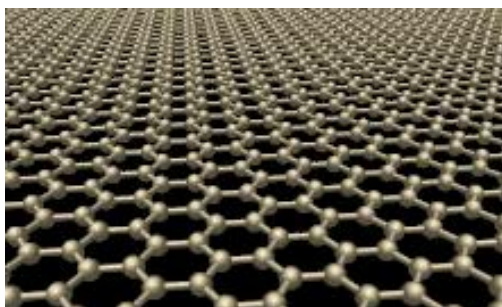
Website: <http://bela.phy.hr/quantixlie/hr>

The centre is organised in two units: (I) the Quantum and Complex Systems Theory unit and (ii) the Lie Algebras Representation Theory, Number Theory and Related Structures unit. In the initial phase of the centre's operation, the first unit's scientific programme will focus on the topics from atomic and nuclear physics, condensed matter physics, optics and photonics, and biophysics. The second unit's scientific programme can be divided into three main groups: a) Harish-Chandra modules and Dirac operators, b) Kac-Moody's Lie algebras, vertex algebras, W-algebras and conformal field theory, and c) number theory, elliptic curves and modular forms.

CEMS



Scientific Centre of Excellence for Advanced Materials and Sensing Devices



Location: Zagreb

Beneficiary:
Ruđer Bošković Institute

Life cycle stage: Active

Contact:

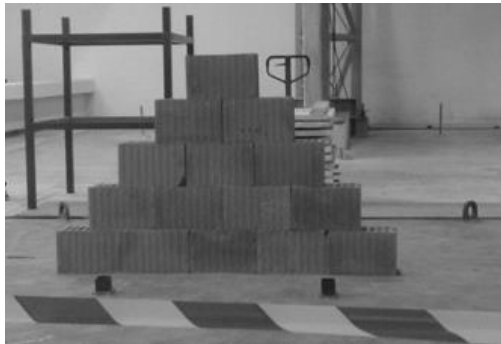
Website: <http://cems.irb.hr/hr/>

The centre is based on research units that have related expertise in research, development and application of novel materials and devices. Primary goal of the Centre is to synthesise advanced materials and structures, especially those that can be applied in other domains of basic and applied science, thus creating the basis for innovation and technology transfer. The Centre promotes interdisciplinary research through four key research units: ion beam physics and technology, new functional materials, graphene and related two-dimensional structures, photonics and quantum optics.

INFRA FGAG



Implementing modern science and research infrastructure to achieve smart specialisation in green and energy-efficient construction



Location: Split

Beneficiary:

University of Split, Faculty of Civil Engineering, Architecture and Geodesy

Life cycle stage: Active

Contact:

Website: <https://www.infra-fgag.eu/>

It contributes to solving the key problem of low competitiveness of the high-tech construction and environmental sectors in the Adriatic region and the low share of R&D activities in the GDP.

The aim is to significantly reverse the overall trends in these sectors in the Adriatic and neighbouring regions with an emphasis on smart specialisation in the field of environmentally friendly technologies, equipment, and advanced materials as well as environmentally friendly transport solutions; these will be the core activities of these sectors in the future. It is planned to step up the level of cooperation between the economic and scientific sectors.

CeNIKS



Centre for Advanced Research of Complex Systems



Location: Zagreb

Beneficiary:

University of Zagreb, Faculty of Science

Life cycle stage: Active

Contact: ceniks@phy.hr

Website:

<https://www.pmf.unizg.hr/phy/CeNIKS>

A set of laboratories in which interested institutions and the business sector can examine the properties of materials of interest, which will improve cooperation between science and industry. The purpose is to improve the research of materials and the observation of their properties. So far, only the dependence of properties on temperature and magnetic field could be observed, but now it will be possible to observe changes caused by controlling the electric field, doping, pressure, and the synthesis of new compounds. It will also be possible to achieve a wider range of measurement parameters.

CRTA

crtal

Regional Centre of Excellence for Robotic Technology



Location: Zagreb

Beneficiary:

University of Zagreb, Faculty of Mechanical Engineering and Naval Architecture

Life cycle stage: Active

Contact:

+ 385 1 6168 575,
crtal@fsb.hr

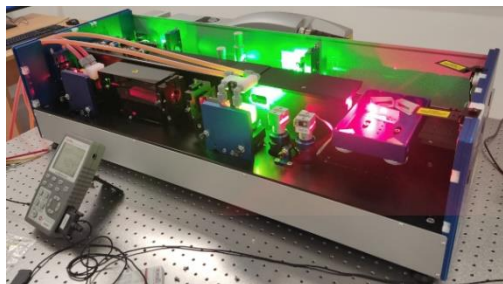
Website: <https://crtal.fsb.hr/>

A reference centre for research, development and educational activities in the field of robotics and artificial intelligence. The Centre's activities are focused on research and development of advanced robotic applications in industry and medicine, where traditional automation and human labour need to be replaced by flexible, versatile and adaptive robotic systems. It is open to the public as a place for the dissemination of technical and robotic culture, primarily for secondary and elementary school students, but also for everyone else. It is a place where the economy has the opportunity to be familiarised with new technologies and apply them.

CALT

CALT CENTAR
ZA NAPREDNE
LASERSKE TEHNIKE

Centre for Advanced Laser Techniques



Location: Zagreb

Beneficiary:
Institute of Physics

Life cycle stage: Active

Contact:
+385 1 4698 865
calt@ifs.hr

Website: <http://calt.ifs.hr/>

The aim of the Centre is to improve the existing scientific and research infrastructure and develop a new one based on advanced laser techniques. It enables new breakthroughs in the field of basic research and has great potential for the development of innovations and new technologies; in addition, the synergistic effect of the centre is especially important, which means that associates from different fields of research from the wider scientific community in Croatia and the wider region can be brought together on the use of new laser infrastructure. Its goal is to give access to modern laser techniques to all academics and economic entities in Croatia and the wider region, who can improve their operations by using modern laser techniques. The Centre is committed to scientific excellence in a wide range of fields, including nanotechnology and biotechnology, quantum technology, material science, plasma research, and interdisciplinary research.

Cryogenic Centre at the Institute of Physics



Location: Zagreb

Beneficiary:
Institute of Physics

Life cycle stage: Under implementation

Contact:
+385 1 469 8845
kacif@ifs.hr

Website: <http://kacif.ifs.hr/>

An infrastructure for conducting cutting-edge research in the field of condensed matter physics. It aims to improve the existing low temperature techniques and develop new ones. It will enable world-class fundamental research and the understanding of physical processes and phenomena related to condensed matter, as well as economically motivated material research. It will create technological solutions for the industry and develop innovation, while patent protection will guarantee intellectual property rights to new technological solutions and innovations, underpinning economically motivated scientific research and new spin-off initiatives in cooperation with economic partners.

CluK



Centre of Excellence in Chemistry



Location: Zagreb

Beneficiary:

University of Zagreb, Faculty of Science

Life cycle stage: Active

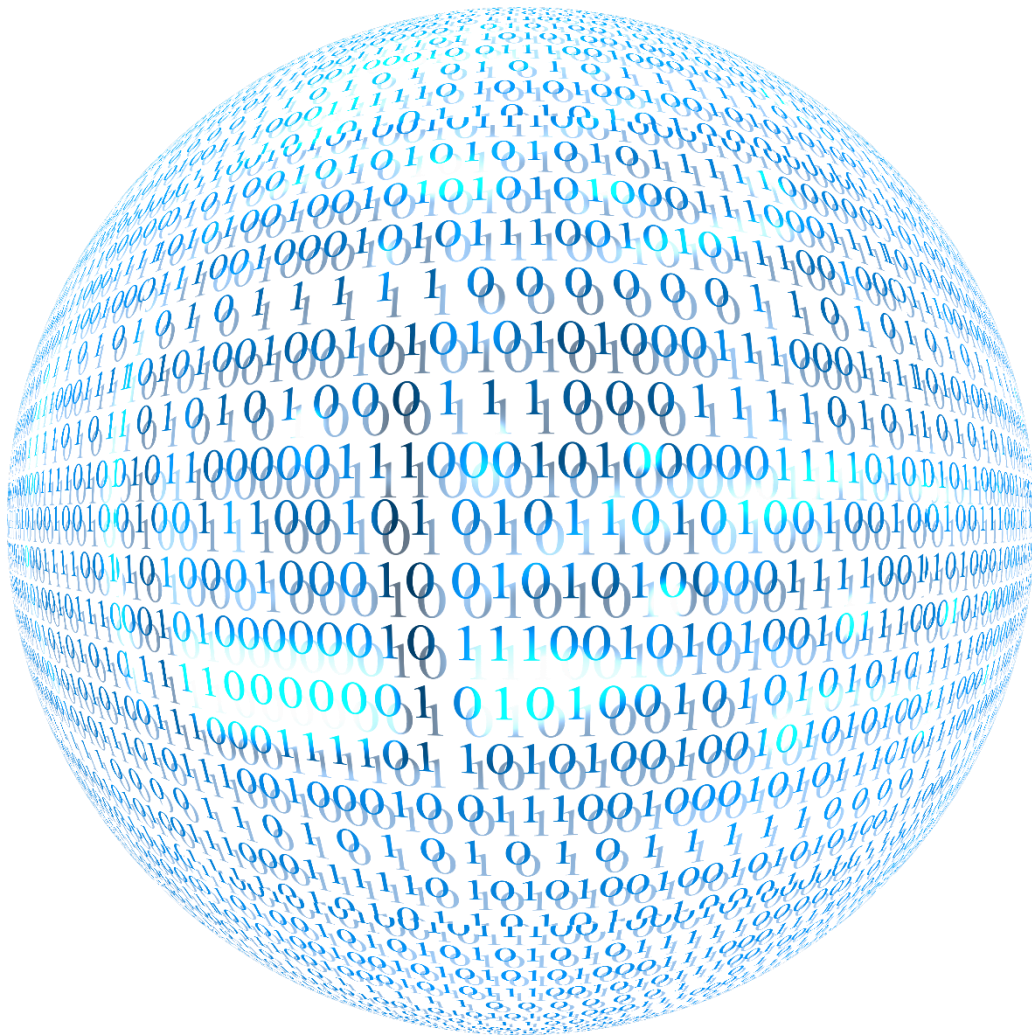
Contact:

ciuk@chem.pmf.hr

Website: <https://ciuk.hr/>

The activities of the Centre include research, education, and providing scientists and interested economic subjects with open access to research equipment. In addition to scientists and researchers, the Centre is a very attractive partner for the pharmaceutical, food, chemical, and petroleum industries and has a market niche for cooperation with the economy and it features state-of-the-art equipment for frontier innovative research in chemistry. Research conducted includes fundamental and applied research from all relevant fields of chemistry: design and synthesis of functional organic and inorganic compounds, structural and spectroscopic research of compounds and materials, thermodynamic and kinetic research of chemical reactions, research in the field of computational and theoretical chemistry, development of qualitative and quantitative chemical analysis methods, development of process analytical methods, and biochemical research.

DIGITALISATION AND SPACE





3.4 Digitalisation and Space

The European Union in the framework of research and innovation is open science, which symbolises a transparent, open to public and collaborative scientific research process necessary to keep up with the rest of the world and to unambiguously contribute to the reliability of science and its visibility in public. There is no doubt that the needs of the digital services and e-Infrastructure sector are growing rapidly in Croatia and across the world. The COVID-19 pandemic has fundamentally changed the role and perception of digitalisation in our societies and economies.

Although Croatia has significant research, development and innovation capacities, they remain limited due to weak interconnection between public research organisations and

industry, as well as due to the size of enterprises in the sector. Insufficient interconnection results in a low level of technology transfer and practical application of research, which puts small companies with limited access to research capabilities and resources at further disadvantage.

A study conducted as part of the NI4OS-Europe project found that stakeholders from the science sector from South East European countries have a low level of awareness of the European Open Science Cloud and the FAIR principles. Figures 1 and 2 provide an overview of the received responses per country, indicating that there is a significant need for education and promotion of open science.

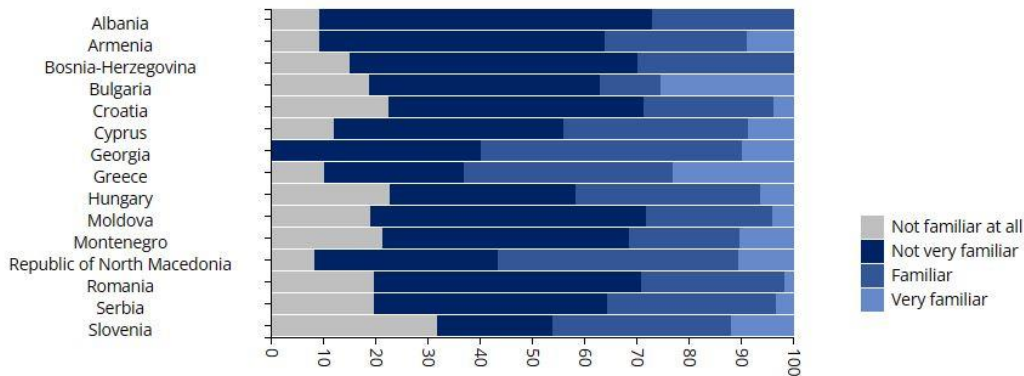


Figure 1 Answers to the question "How familiar are you with the European Open Science Cloud?"

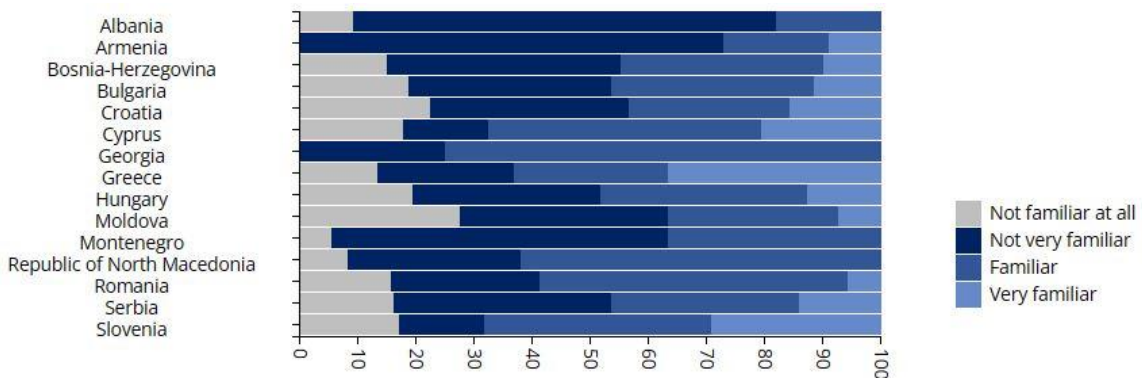


Figure 2 Answers to the question "How familiar are you with the concept of FAIR data?"

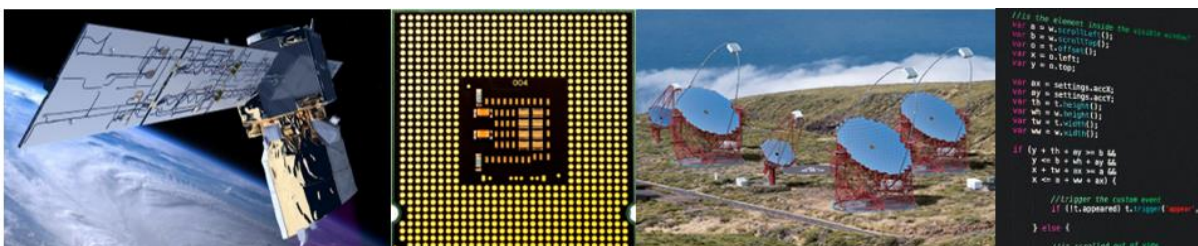
The international space context is changing rapidly – global competition is intensifying, with new players bringing new ambitions in **space technologies** with greater involvement of the private sector. The European space sector needs to be adjusted in order to take advantage of the business opportunities resulting from these changes and to encourage investments into the space ecosystem so that the EU remains a space force.

Space technologies shape the future and have a major impact on sustainable economic development. Space technologies are also reflected in the components of the Union Space Programme and indicate that there is almost no

sector that does not base much of its business on services related to technologies stemming from space exploration. Sectors that heavily rely on technologies developed in connection with space and data derived from space missions are, for example: energy, public health, climate, environmental protection, natural resources, rural development, cultural heritage, digitalisation, and security and defence, including cybersecurity. The green and digital transitions also entail the use of new technologies. It is precisely the new technologies, as well as those resulting from the study of space, that will enable the twin transition and affect societal transformation.

INVESTMENT PRIORITY WILL BE GIVEN TO RESEARCH INFRASTRUCTURES THAT WILL:

- Enable the development of space technologies by connecting academic, economic, and governmental sectors.
- Foster the development and application of artificial intelligence, high-performance computing, big data, blockchain technology, robotics, quantum computing and communication technologies, the Internet of Things, and cloud services as key solutions to current and future societal challenges.
- Connect scientific-research institutions and economic entities 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.



ESA



European Space Agency



Type: International Organisation

Headquarters: Paris, FR

Founded in: 1975

Croatian membership since: Cooperation Agreement signed in 2018

Contact person in HR:

Doris Jozić, MSE

National beneficiary:

academic and private sectors interested in space and space technologies

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

An intergovernmental organisation that brings together 22 Member States. Its mission is to shape the development of European space capabilities and ensure investment in space and space technologies for the benefit of all citizens. It aims to ensure and promote cooperation between European countries in space research and technology and their applications in space, for peaceful purposes only.

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 its peaceful use, and set out the conditions for the implementation of projects of mutual interest.

In 2020, the Implementing Arrangement for Technical Assistance and Expertise was signed, which includes the financing of activities/calls in the areas of: earth observation, space technology, situational awareness in space and space astronomy and astrophysics, and exploration of the solar system.

The European Cooperating State Agreement was signed in 2023, which enables better monitoring of space policies and participation in ESA programmes and projects.

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

EOSC



European Open Science Cloud

Croatian Open Science Cloud (HR Ooz)



Type: International Organisation

Headquarters: Brussels, BE

Founded in: 2020

Croatian membership since: 2020

Contact person in HR:

Ivan Marić, University of Zagreb, Srce University Computing Centre,
eosc@srce.hr

National Beneficiary (EOSC Mandated Organisation):
University of Zagreb, Srce University Computing Centre

Website:

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

<https://www.srce.hr/hr-ooz>

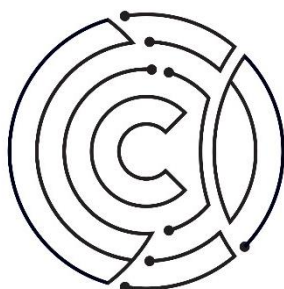
The European Open Science Cloud Association AISBL-EOSC was founded with 142 Members and 49 Observers. On behalf of Croatia, which is a full member, the Srce University Computing Centre participates in the management of the EOSC Association as a Mandated Organisation. The European Open Science Cloud is an initiative of the European Commission that supports the development of open science through research infrastructures and services. The ambition of the EOSC is to provide European researchers, innovators, businesses and citizens with a joint and open multidisciplinary environment in which they can publish, find, and reuse data, tools, and services for research, innovation, and education purposes. In the current phase of implementation (2021–2030) it acts as a co-programmed partnership.

In September 2021, the Croatian Open Science Cloud Initiative (HR-OOZ Initiative) was launched with the aim of establishing an organisational and technical model of a national open science cloud. The initiative currently brings together 21 institutions – leaders in open science in Croatia.

EuroHPC JU



European High Performance Computing Joint Undertaking



Type: International Organisation

Headquarters: Luxembourg

Founded in: 2018

Croatian membership since: 2020

Contact person in HR: hpc-cc@srce.hr

National beneficiary:

University of Zagreb, Srce University Computing Centre – head of the national consortium

University of Zagreb, Faculty of Electrical Engineering and Computing

J. J. Strossmayer University of Osijek, Faculty of Electrical Engineering, Computer Science and Information Technology

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

Ruđer Bošković Institute

University of Rijeka

University of Rijeka, Faculty of Engineering

Website:

https://eurohpc-ju.europa.eu/index_en

<https://www.hpc-cc.hr/>

The Joint Undertaking was set up for the purpose of coordinating joint efforts and pooling resources in order to make Europe a world leader in supercomputing. In the next few years, Europe's leading role in data economy, its scientific excellence, and its industrial competitiveness will increasingly depend on its ability to develop key HPC technologies, provide access to world-class supercomputing and data infrastructures, and preserve existing excellence in high-performance computing application. To this date, EuroHPC has acquired seven supercomputers: Lumi in Finland, Leonardo in Italy, MeluXina in Luxembourg, Vega in Slovenia, Karolina in the Czech Republic, Discoverer in Bulgaria, and Deucalion in Portugal.

In May 2020, a consortium of Croatian institutions was established to build the Croatian Competence Centre for High Performance Computing (HR HPC CC) as part of the National Competence Centres in the framework of EuroHPC (EUROCC) project.

Supek

Supek Supercomputer



Location: Zagreb

Beneficiary:

University of Zagreb, Srce University
Computing Centre

Life cycle stage: Active

Contact: +385 1 616 5555,
computing@srce.hr

Website:

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

The first petascale computer in Croatia, presented in 2023. 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. Supek was built using HPE Craya technology, with a total of 8384 processor cores and 81 graphics processors, as well as 32 TB of RAM, which compute at 1.25 PFLOPS. Users access the Supek supercomputer via remote network access from two access computers: one characterised by nodes with processing resources and the other characterised by nodes with graphics processors.

Vrančić

Advanced Cloud Computing Resource



Location: n/a

Beneficiary:

University of Zagreb, Srce University
Computing Centre

Life cycle stage: Active

Contact:

+385 1 616 5555,
computing@srce.hr

Website:

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

Based on cloud computing, which uses virtual resources instead of physical ones. Provides institutions with the possibility of installing additional infrastructure resources in accordance with their needs, without having to procure, install, configure and maintain physical devices. This way, institutions benefit from flexibility, scalability, and savings offered by cloud computing. Its main feature is flexibility in creating one's own virtual computer with the desired operating system, number of processor cores, RAM, and storage space. Users can run multiple copies of their software simultaneously on many different computers. Tasks that could take weeks on one computer now only take a few hours using this new resource. It is intended for users of less demanding applications that do not require HPC services, but who need flexibility and the ability to work interactively.

ACROSS-DataScience DATAACROSS

Napredne metode i tehnologije u znanosti
o podatcima i kooperativnim sustavima

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



Location: Zagreb

Beneficiary:

University of Zagreb, Faculty of Electrical Engineering and Computing

Life cycle stage: Active

Contact:

Prof. Sven Lončarić, PhD, University of Zagreb, Faculty of Electrical Engineering and Computing
sven.loncaric@fer.hr

Prof. Ivan Petrović, PhD, University of Zagreb, Faculty of Electrical Engineering and Computing
ivan.petrovic@fer.hr

Website:

<https://across-datascience.zci.hr/datacross>

The Centre deals with the research problems of the development of advanced methods and technologies of heterogeneous data analysis and the design of complex cooperative systems, with concrete applications of great social significance. The research issues under consideration include: (1) multi-modal data processing, (2) machine learning and data mining, (3) heterogeneous computing, (4) autonomous and cooperative robotic systems, (5) cognitive computer vision systems, (6) pervasive sensing and human-centric networked services, and (7) advanced control and estimation strategies for cyber-physical systems.

The Centre brings together thirteen prominent organisations including eleven higher education institutions from Zagreb, Split, Rijeka, Osijek and Dubrovnik, the Ruđer Bošković Institute, and Ericsson Nikola Tesla.

HR-ZOO



Croatian Scientific and Educational Cloud



Location: Zagreb

Beneficiary:

University of Zagreb, Srce University
Computing Centre

Life cycle stage: Under implementation

Contact:

hr-zoo@srce.hr

Website:

<https://www.srce.hr/hr-zoo/>

A computer and data cloud that will be a fundamental component of national research and innovation e-infrastructure, with the aim of providing the scientific and academic communities with the advanced computing and storage resources and network connectivity necessary for modern and multidisciplinary science, cutting-edge research and top-quality education system in the long term. It will serve as a distributed national e-infrastructure of computer, storage, and network resources with various purposes based on the principle of cloud computing. It will also enable connecting to European e-infrastructures. In addition to creating and improving the quality of preconditions for performing top-level research, it strengthens the possibilities for better cooperation with the business sector in view of an increasingly demanding and digitalised market.

The HR-ZOO service catalogue is the starting point for accessing advanced computer-related services such as: computing, which includes high-performance computing, elastic cloud computing and virtual data centres; big data storage; commercial scientific software necessary for conducting computer-intensive research; specialised customer support provided by a team of e-scientists to researchers with the aim of simple and efficient use of available HR-ZOO resources.

CroRIS

CROKIS INFORMACIJSKI
SUSTAV
ZNANOSTI RH

Croatian Research Information System



Location: Zagreb

Beneficiary:

Ministry of Science and Education

Life cycle stage: Under implementation

Contact:

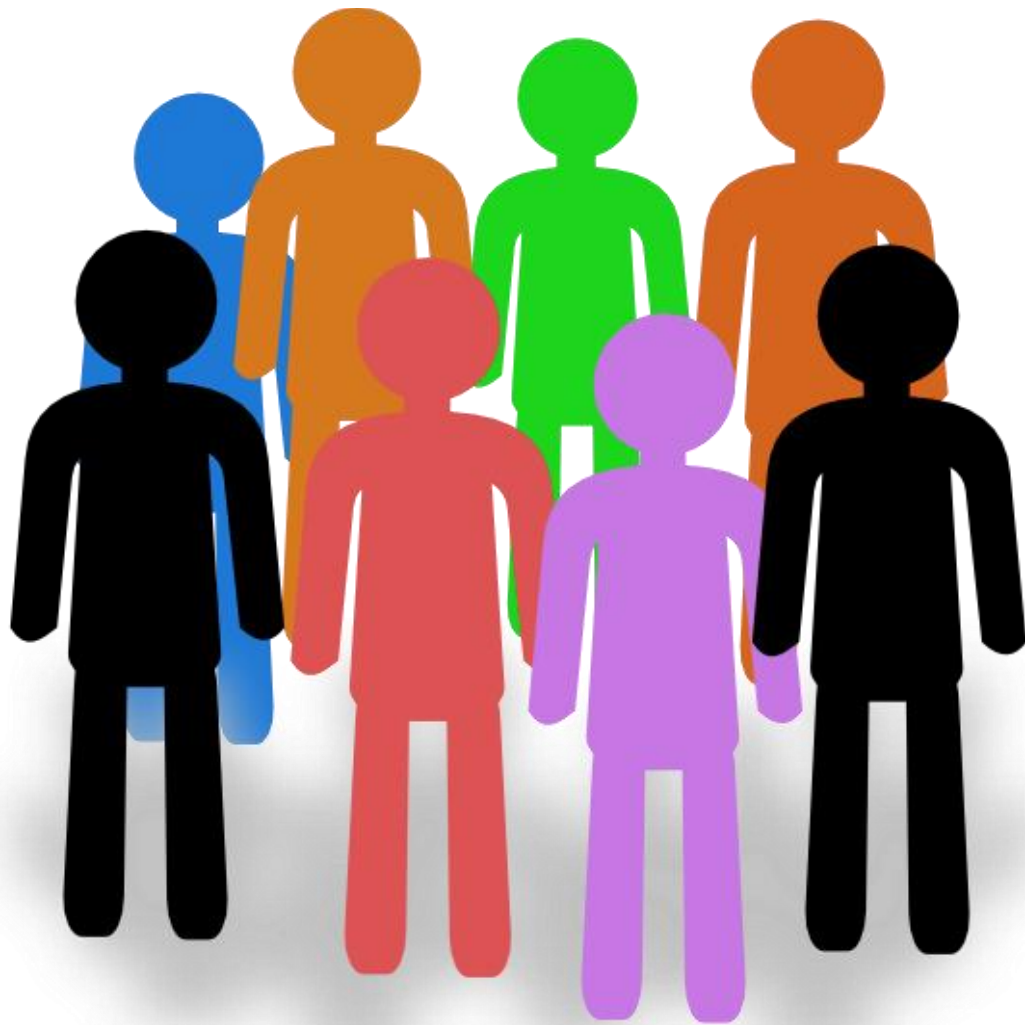
croris@srce.hr

Website:

<https://croris.hr/>

A national information system of science, abbreviated as CroRIS, is being constructed as part of the Scientific and Technological Foresight project. The development of CroRIS based on open access principles will simultaneously enable the digitalisation of the business processes of the MSE and scientific public organisations, as well as create a better environment for networking of academic and research community stakeholders, including the public and business sectors and the international community. CroRIS will contain structured information on scientific research work in Croatia and make these data available through a public portal. It will be a focal point that will provide comprehensive, complete and reliable information on all elements of the science system in Croatia, enable and promote open science, and be the basis for decision-making related to science and research.

SOCIETY FOR THE FUTURE





3.5 Society for the Future

This area offers new insights into cultural heritage, creative industries, education, health and well-being of citizens, as well as the functioning of democracies, social and economic policies and social trends in Croatia and across Europe. It provides a unique opportunity for understanding the society of the past, present and future and answers complex and challenging questions. In order to address global challenges, it is necessary to use the creative capacities of all researchers and society as a whole. Halting adverse impacts on the environment, the use of energy sources, sustainability, and many other challenges depend not only on science and technology, but also on changing human behaviour. When designing new technologies, it is necessary to be guided by an understanding of how society can use them and how they can contribute to them. Social sciences and humanities are essential for research, innovation and technology in order for them to achieve their full transformative impact.

INVESTMENT PRIORITY WILL BE GIVEN TO RESEARCH INFRASTRUCTURES THAT WILL:

- Make a clear contribution to addressing the demographic challenges Croatia faces.
- Enable the reduction of poverty and social exclusion.
- Decrease the significant regional disparities between certain parts of Croatia.
- Support the education system.



CLARIN ERIC



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



Type: ERIC

Headquarters: Utrecht, NL

Founded in: 2012

Croatian membership since: 2018

Contact person in HR:

Staša Skenžić, MSE

National beneficiary:

University of Zagreb, Faculty of Humanities and Social Sciences

Website:

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

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

CLARIN was established based on several initiatives in the field of computational linguistics, natural language processing, and digital humanities. Its aim is to apply language technologies as research infrastructures, primarily in the humanities and social sciences, and subsequently in other scientific fields. CLARIN provides easy and sustainable access to digital and digitalised language data (in written, spoken or multi-modal form) for researchers working in the humanities and social sciences and beyond. Furthermore, it also offers advanced tools for detecting, exploring, exploiting, marking, analysing, or combining such datasets, regardless of their location. This is made possible through a networked federation of centres: language data repositories, service centres and knowledge centres, with a unique application approach for all academics in all participating countries.

Survey of Health, Ageing and Retirement in Europe



Type: ERIC

Headquarters: Munich, DE

Founded in: 2011

Croatian membership since: 2014

Contact person in HR:

Jelena Ilić-Dreven, MSE

National beneficiary:

University of Zagreb, Faculty of Economics and Business

Website:

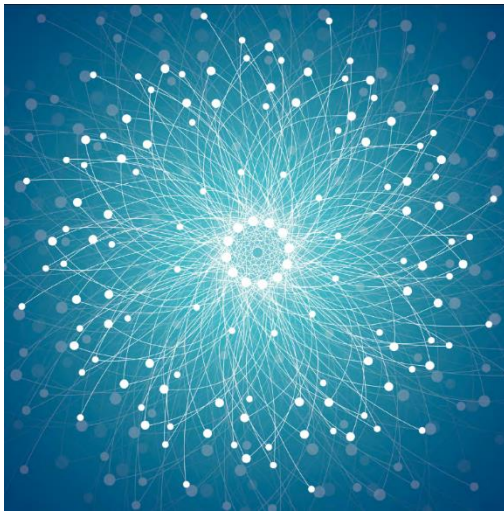
<https://share-eric.eu/>

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

The project is designed to help researchers understand the impact of population ageing on European societies, providing the basis for health, social, and economic policy making. SHARE is a multidisciplinary and multinational database of microdata on health, socio-economic status, and social and family relationships for more than 85,000 people aged 50 and over and their partners, from 19 European countries and Israel. It was the first project to achieve ERIC status in 2011. Today it covers 27 European countries and Israel.

SHARE is aligned with the Health and Retirement Study conducted in the US and the English Longitudinal Study of Ageing (ELSA) and has become a model for conducting more ageing research worldwide for all academics in all participating countries.

Digital Research Infrastructure for the Arts and Humanities



Type: ERIC

Headquarters: Paris, FR

Founded in: 2014

Croatian membership since: 2014

Contact person in HR:

Koraljka Kuzman Šlogar, PhD, Institute of Ethnology and Folklore Research

National beneficiary:

Institute of Ethnology and Folklore Research

Website:

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

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

DARIAH now has 20 members, with Croatia as one of the 15 founding countries. This consortium consists of a network of people, expertise, information, knowledge, content, methods, tools, and technologies provided by the member states. 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.

European Social Survey



Type: ERIC

Headquarters: London, UK

Founded in: 2013

Croatian membership since: 2019

Contact person in HR:

Staša Skenžić, MSE

National beneficiary:

University of Zagreb, Faculty of
Humanities and Social Sciences

Website:

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

In 2001, the European Science Foundation launched a European project called the European Social Study (ESS) with the purpose of continuous monitoring of changes in and survey research of the socio-political attitudes and value system of citizens of European countries.

The European Social Study illustrates the interaction between changing institutions and attitudes, beliefs, and behaviour patterns in different European populations. This infrastructure is of particular importance for political scientists, sociologists, psychologists, economists, and demographers. The survey is conducted every two years in order to get a better insight into the course of these changes and to enable comparisons between European countries.



Type: ERIC

Headquarters: Bergen, NO

Founded in: 2017

Croatian membership since: 2019

Contact person in HR:

Staša Skenžić, MSE

Jelena Ilić-Dreven, MSE

National beneficiary:

University of Zagreb, Faculty of
Humanities and Social Sciences

Website:

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

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

A distributed research infrastructure in the field of social sciences. It provides comprehensive, integrated and sustainable data services for social sciences. It connects social science data archives across Europe with the aim of promoting the results of social science research as well as supporting national and international research and cooperation. The CESSDA Strategy (2018–2022) has 4 pillars: Building on TRUST, Renown for TRAINING, Proficient in TECHNOLOGY and User-friendly TOOLS & SERVICES. The Croatian service provider for CESSDA ERIC is CROSSDA – Croatian Social Science Data Archive, operating at the Faculty of Humanities and Social Sciences of the 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.

Generations & Gender Programme

**Type:****Headquarters:** Hague, NL**Founded in:** 2000**Croatian membership since:** 2022**Contact person in HR:**

Ivan Čipin, University of Zagreb, Faculty of Economics and Business

National beneficiary:

University of Zagreb, Faculty of Economics and Business

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

This programme provides high-quality (longitudinal) data to researchers and other stakeholders interested in addressing demographic challenges. The programme is run by a network of leading European research centres in the field of demography, with a focus on contemporary demographic trends. It strives to stimulate cutting-edge and innovative research by creating high-quality data for scientific and educational purposes, which would be used to measure the impact of public policies on demographic processes. A key part of the Generations & Gender Survey (GSS) project is multidisciplinary and multi-national longitudinal research. It consists of an initial questionnaire and two additional waves of surveys. 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 of Demography and Youth in cooperation with the University of Zagreb, Faculty of Economics and Business in the period from 2022 to 2028.

Summary of infrastructure

ABBREVIATION	INFRASTRUCTURE NAME	LOCATION
EATRIS ERIC	European Infrastructure for Translational Medicine	Amsterdam, NL
ELIXIR	European life-sciences infrastructure for biological information	Hinxton, UK
CerVirVac	Centre of Research Excellence for Virus Immunology and Vaccines	Zagreb, Rijeka
Neuro	Centre of Research Excellence for Fundamental, Clinical and Translational Neuroscience	Zagreb
	Scientific Centre of Excellence for Personalised Health Care	Osijek
CIESM	Mediterranean Science Commission	Monaco
ICGEB	International Centre for Genetic Engineering and Biotechnology	Trieste, IT
EMBO	European Molecular Biology Organization	Heidelberg, DE
ICC	International Association for Cereal Science and Technology	Vienna, AT
BIOCentre	Incubation Centre for Biosciences and Commercialisation of Technology	Zagreb
BioProCro	Scientific Centre of Excellence for Marine BioProspecting	Zagreb
CroP-BioDiv	Scientific Centre of Excellence for Biodiversity and Molecular Plant Breeding	Zagreb
STIM	Centre of Excellence for Science and Technology – Integration of the Mediterranean Region	Split
	Centre for Food Safety and Quality	Zagreb
IFMIF DONES	International Fusion Materials Irradiation Facility – Demo Oriented NEutron Source	Granada, ES
CERN	European Organisation for Nuclear Research	Geneva, CH
IIR/IIF	International Institute of Refrigeration	Paris, FR
CERIC-ERIC	Central European Research Infrastructure Consortium	Trieste, IT
QuantiXLie	Scientific Centre of Excellence for Quantum and Complex Systems and Representations of Lie Algebras	Zagreb
CEMS	Scientific Centre of Excellence for Advanced Materials and Sensing Devices	Zagreb
INFRA FGAG	Implementing modern science and research infrastructure to achieve smart specialisation in green and energy efficient construction	Split
CeNIKS	Centre for Advanced Research of Complex Systems	Zagreb
CRTA	Regional Centre of Excellence for Robotic Technology	Zagreb
CALT	Centre for Advanced Laser Techniques	Zagreb
KaCIF	Cryogenic Centre at the Institute of Physics	Zagreb
CluK	Centre of Excellence in Chemistry	Zagreb
ESA	European Space Agency	Paris, FR
EOSC	European Open Science Cloud	
EuroHPC	European High Performance Computing Joint Undertaking	
Supek	Supek Supercomputer	Zagreb
Vrančić	Advanced Cloud Computing Resource	
ACROSS-DataScience	Centre of Research Excellence for Advanced Methods and Technologies in Data Science and Cooperative Systems	Zagreb
HR-ZOO	Croatian Scientific and Educational Cloud	Zagreb
CroRIS	Croatian Research Information System	Zagreb
CLARIN ERIC	Common Language Resources and Technology Infrastructure (for humanities and social sciences)	Utrecht, NL
SHARE ERIC	Survey of Health, Ageing and Retirement in Europe	Munich, DE
DARIAH ERIC	Digital Research Infrastructure for the Arts and Humanities	Paris, FR
ESS ERIC	European Social Survey	London, UK
CESSDA ERIC	Consortium of European Social Science Data Archives	Bergen, NO
GGP	<i>Generations & Gender Programme</i>	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 use of FAIR principles** for research data, i.e., making them Findable, Accessible, Interoperable and Reusable, and promoting the implementation of Open Research Data Management (DATA);
- **providing open and transparent access to the infrastructure** to all relevant stakeholders on equal terms;
- **strengthening international cooperation and visibility of Croatian scientists** and their success on international projects;
- **fostering excellence in science**
- **consolidating the research community** at the national level
- **sustainable development**, circular economy, and bioeconomy
- **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 R&I 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 in use, 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 infrastructure will be guided by an open access policy guided by the FAIR principles for research data, which stipulate that data need to be: 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 with contact information 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 language containing basic information (contact information, 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 their strategies, resources and objectives, but also to enable their missions to be linked to the national and strategic programmes of the European Union.
- The business plans of research infrastructures will be used as management tools, in the form of a living document, with the aim of achieving long-term sustainability of the 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. The proposals for research infrastructures will be assessed against the following sets of criteria, covering the scientific, governance and sustainability, strategic, and socio-economic 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 will also be taken into account, as well as the overall development of the science and innovation system in Croatia, i.e., the need to avoid overlaps and to promote synergies, excellence, and regional development. As part of the project selection process, project proposals will be grouped into categories ranging from research infrastructure to technology infrastructure in order to assess their suitability for specific funding frameworks.

The evaluation and selection will be organised in several phases. The **first phase** entails the submission and evaluation of project summaries. The projects whose summary has been approved will proceed to the **preparatory phase** in which it will be necessary to submit and defend a feasibility study, together with a cost-benefit analysis, as well as a draft project application. **The final phase** will include the submission and evaluation of a revised feasibility study with a cost-benefit analysis, the final version of the project application, and a business plan for the first 5 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 guidelines⁷ and includes an analysis of the following main determinants of the research infrastructure:

- **The scientific dimension**, including: scientific and technological excellence, national and international cooperation, and the degree of internationalisation.
- **The governance and sustainability dimension**, relating to: management, governance and human resources; the strategic plan, the financial plan and the financing framework, the expected return on investment period, the strategy of attracting beneficiaries and an open access policy; risk monitoring and management.
- **The strategic dimension** that assesses the relevance of infrastructure in relation to national and EU development goals and priorities and uniformity at the national or European level.
- **The socio-economic dimension** refers to: the contribution of the research infrastructure to the Sustainable Development Goals; socio-economic impact assessment; assessment of the interest of the business community; impact assessment 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

⁷ [Towards better Synchronisation of Priority Settings and Evaluation Mechanisms for Research Infrastructures Beyond National Relevance](#)

and assessment of research infrastructure projects, as well as for monitoring the funded 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, which points to the importance of identifying and analysing their socio-economic impact so that the management and implementation of individual research infrastructures is optimal and consistent with the responsibility for the public funding provided. Research infrastructure projects can also contribute to the development of public policies and programmes at the 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 from the operational phase of the infrastructure typically include jobs for scientists, technicians, administrative and support staff, and companies and institutions that participate in the science sector and use the infrastructure, the number of software solutions developed, new projects resulting from the use of the infrastructure, and increased spending during the operational phase (purchasing goods and services, maintenance, etc.), which in turn generate a multiplier effect on 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 arising from research conducted in research infrastructure directly benefit the society, especially when new solutions contribute to addressing important societal challenges (health, quality of life, environment, sustainable development goals, etc.). 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 have a significant impact on human capital development, training, and knowledge and skills development. They also contribute to attracting and retaining quality researchers, technicians and students and encourage the commercialisation of skills in local innovation systems. However, the relevant impact on human resources development requires active collaboration between the relevant institution from the science sector managing research infrastructure and stakeholders from 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, as this process allows for a comprehensive analysis of their impact on society and the economy, collects the data needed for evidence-based policy-making, and deepens 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. Methodological guidelines and the list of common indicators for this purpose can be found in Annex 1 – Methodology for assessing the socio-economic impact of research infrastructures.

4.3 Selection of international science and research bodies for participation

There are three different levels of membership in international research infrastructures and bodies; their overview is given in Table 4.

Table 4 Level of membership in international science and research bodies

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

When planning the approach or assessing the application of an institution/organisation for membership in an international science and research body of strategic interest, a cost-benefit analysis will be prepared, taking into account the following:

- The number of potential users (the number of faculties and scientific institutes in the that scientific area, the number of scientists, the interest of foreign partners, companies that might benefit, etc.).
- Identified gaps in certain areas at the national level.
- The relevance of the infrastructure in relation to national development goals and priorities and uniqueness at a 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 methods will enable the regular collection of relevant data from research infrastructures in the form of consolidated reports, accompanied by a research infrastructure business plan, which will serve as a means of managing research infrastructures and also a source of data for the Ministry of Science and Education (Annex 2 – Content of the report). For the governance of a higher education institution and/or a scientific institute that manages research infrastructure, reporting will enable improvements in governing 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 public investment effectiveness and the 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 basic issues that can be monitored and assessed include (ResInfra@DR, 2019⁸):

- Are the proposed activities in the strategic plan being carried out in the manner outlined, with an explanation.
- What services are provided (e.g., R&D, education, knowledge and technology transfer) – their users, availability, as well as the frequency, duration, and context of their use?
- 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 any unforeseen circumstances as a result of the implemented activities?
- Are activities leading to expected results??
- Do assumptions or RI management decisions and operations need to be amended 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:

- **Prior assessment of research infrastructures**, which is carried out in the preparatory phase of the research infrastructure and includes a feasibility study with a cost-benefit analysis as well as a project application on the basis of which the infrastructure is included in the Research Infrastructure Development Roadmap. A cost-benefit analysis is used to justify investments and manage responsibly. 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.
- **The business plan of research infrastructures**, which is used as a management tool, i.e., as a framework for the collection, analysis, and use of business data in 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 picture of the resources needed and supports the

⁸ Source: https://www.interreg-danube.eu/uploads/media/approved_project_output/0001/32/8944de08315bc53e8f659fb6e131f2d602279905.pdf

efficient planning of activities and cash flow. Business plans will be drawn up for a period of five years and revised each year so as to take into account the actual situation. Research infrastructures will report annually to the Ministry of Science and Education on the execution of the business plan.

- **Socio-economic impact assessment**, to be carried out on an annual basis. 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 into research infrastructure, it is necessary to have a continuous and quality insight into the institutional framework and the national and European environment. Therefore, it is necessary to regularly update the data on the existing research infrastructure and identify needs, gaps, and development opportunities.

The Croatian Research Infrastructure Development Roadmap will be revised in 2025 and 2027. The relatively frequent updates will be useful for the gradual development of a comprehensive database of research infrastructure in Croatia, which will contribute to the effective prioritisation and future development of infrastructure projects, as well as to the efficient planning of future public investments.

Annexes

1. Indicators for assessing the impact of research infrastructures

Indicators for assessing the economic impact of research infrastructures

Indicator	Required data	Phase
Commercial suppliers for RI design and construction	<ul style="list-style-type: none"> • Total number of suppliers • Overview of suppliers by sector, field of activity, size, technology group (low-tech/high-tech), geographic scope (national, international, multinational) • Increase in supplier turnover due to RI • Increase in supplier employment due to RI 	Design and preparatory
Overall economic impact on the wider area	<ul style="list-style-type: none"> • Total amount of purchases from suppliers • Value of contracts with suppliers and other • Taxes and social contributions paid by RI and its employees 	All
Overall economic impact in the local area	<ul style="list-style-type: none"> • Purchase from local suppliers • Contracts with local suppliers and enterprises 	All
Public procurement and contracts	<ul style="list-style-type: none"> • Number and types of procurement operations and contracts signed 	All
Employment in RI	<ul style="list-style-type: none"> • Number of FTE personnel in RI 	All
Directly created jobs	<ul style="list-style-type: none"> • Number of new jobs by type (scientific/technical/administrative staff) and wage level 	All
Expenditure for personnel, operations and maintenance	<ul style="list-style-type: none"> • Total cost for personnel, operations and maintenance 	All
Students and researchers using RI	<ul style="list-style-type: none"> • Number of scientists, researchers and students with access to equipment, tests, contract-based research, etc. 	Operational
Companies using RI	<ul style="list-style-type: none"> • Overview of companies by sector, area, size, technology group (low-tech/high-tech), geographic scope (national, international, multinational) • Total number of companies 	Operational
Projects based on RI results	<ul style="list-style-type: none"> • Number and type of projects 	Operational
Cooperation with the businesses	<ul style="list-style-type: none"> • Number of medium- and long-term collaborative R&D contracts with business partners • Contribution of firms to development of the RI • Patents and licenses created in cooperation between RI and firms • Patents sold to the businesses by RI 	Operational
Sales and profit by firms as result of cooperation with RI	<ul style="list-style-type: none"> • Increase in sales and profits of firms stemming from new products, services, production processes developed, and other types of innovations generated using research results of the RI 	Operational
Spin-offs	<ul style="list-style-type: none"> • Number and type of spin-off companies created as a result of RI operation 	Operational
Jobs	<ul style="list-style-type: none"> • Number and type of jobs created due to the presence of RI 	Operational
Start-ups	<ul style="list-style-type: none"> • Number and type of start-ups using RI 	Operational
Boost to economic development	<ul style="list-style-type: none"> • New sectors created and/or new markets opened as a result of RI research results 	Operational

Indicators for assessing the social impact of research infrastructures

Indicator	Required data	Phase
Number of employees	<ul style="list-style-type: none"> • Number of engineers, scientists, administrative and technical staff • Age and gender distribution and nationality of employees 	All
Contribution to public policies	<ul style="list-style-type: none"> • Number and type of reports, recommendations and other information resources in support of public policies • Databases/IT resources, and other resources useful for evidence-based policy making • Number of contracts with public bodies for consulting services • Expert reports and expert advice • Contributions to regulatory or legal texts, conferences, etc. • Number of meetings with policy makers 	Operational
Open days	<ul style="list-style-type: none"> • Number of public events • Number of visitors to RI (per target group) 	Operational
Educational and informative activities carried out	<ul style="list-style-type: none"> • Number of workshops carried out for high school and university students • Number of students that visited and used RI • Education of students on participation in research projects carried out in RI • Use of RI to teach students as part of their curricula 	Operational
Career of students trained within the RI	<ul style="list-style-type: none"> • Number of students employed by another RI • Number of students employed by firms • Number of students employed by public scientific organisations 	Operational
Educational activities for employees	<ul style="list-style-type: none"> • Trainings and courses held by RI employees 	Operational
Use of open data	<ul style="list-style-type: none"> • Information on accessible open data • Usability of open data 	Operational
Public awareness	<ul style="list-style-type: none"> • Number of visitors to websites, social media, etc. • Number of visitors on open days, seminars, lectures, etc. 	Operational
Visibility of RI	<ul style="list-style-type: none"> • Appearance of RI in print, electronic and online media (local, national, international) • Monitoring media posts/online content related to RI 	Operational
Public approval of the RI	<ul style="list-style-type: none"> • Available data from satisfaction surveys and feedback from participants of RI events 	Operational
New products, services and solutions	<ul style="list-style-type: none"> • Number of improved or new products, services, and solutions currently used in the society stemming from the RI results 	Operational

Indicators for assessing the scientific impact of research infrastructures

Indicator	Required data	Phase
Bibliometrics	<ul style="list-style-type: none"> Number of scientific papers and articles published in the WoS or Scopus database as a result of RI use Citation of publications created as a result of RI use 	Operational
Scientific productivity	<ul style="list-style-type: none"> Number of developed methodologies/designs Number of patents granted in Croatia due to RI Number of patents granted in other countries 	Operational
Generation of knowledge	<ul style="list-style-type: none"> Number of PhD dissertations defended which were mainly or partially based on RI use 	Operational
Mutual learning and knowledge exchange	<ul style="list-style-type: none"> Number of scientific events organised on topics directly related to services provided by the RI Number and type of events Data on participants (scientific institution, scientific field, city/country, gender) National and international collaboration by RI researchers Repetition of experiments or reuse of experimental equipment in other, similar RI 	Operational
Networking & collaboration	<ul style="list-style-type: none"> Number of national & international projects implemented 	Operational
Awards and honours	<ul style="list-style-type: none"> Scientific prizes 	Operational

Indicators for assessing the technological impact of research infrastructures

Indicator	Required data	Phase
Novel technical solutions for construction of the RI	<ul style="list-style-type: none"> Joint development activities with suppliers 	Preparatory & implementation
Impact on learning and skills development amongst suppliers	<ul style="list-style-type: none"> Number of contracts concluded for high-tech or specialised services that require development or calibration of designs/equipment to meet specific requirements 	Preparatory & implementation
Patents	<ul style="list-style-type: none"> Number of patents granted in Croatia Number of patents granted in other countries 	Operational
Innovations co- developed with businesses	<ul style="list-style-type: none"> Number of innovations developed in cooperation with businesses 	Operational
Joint technology development projects between RI and businesses	<ul style="list-style-type: none"> Number of joint technological development projects between RI and businesses 	Operational
Collaborative projects with business partners	<ul style="list-style-type: none"> Number of collaborative projects with a direct involvement of business partners 	Operational
R&D projects commissioned and funded by companies	<ul style="list-style-type: none"> Number of projects funded by companies Prototypes of new products and services developed Size and type of "client base" 	Operational
Commercial development of prototypes	<ul style="list-style-type: none"> Number of technological prototypes and industrial designs developed and transferred into production 	Operational
Commercialisation of research results	<ul style="list-style-type: none"> Number of feasibility studies or market studies for private investments and application of technologies Actual investment in the application of new technologies by businesses (tracked over time, 5-10 yr) 	Operational
Procurement contracts signed development & upgrade of equipment	<ul style="list-style-type: none"> Number and type of procurement contracts for the development of innovative instruments and products 	Operational

2. Content of the report

- Number of requests received for the use of RI/number of realised requests for the use of RI.
- Breakdown of the total number of hours of RI use (staff/external users).
- User overview (type of user, scientific institution, scientific field, city/country).
- Purpose of RI use (scientific research work, student internship, etc.).
- Breakdown of the utilisation of the services provided by the RI.
- Customer satisfaction with the services provided.
- Number of bachelor's/master's/doctoral theses for which RI was used.
- Number of collaborations with business sector and industry.
- Number of papers/articles published as a result of RI use and their citations.
- Number of RI participations in national/international projects.
- Number of intellectual property rights recognised due to RI use.
- Number of educations provided.
- Number of collaborations with other research infrastructures.
- Number of awards received.
- Regular updates of the RI website.
- Number of visits to the RI website and social networks.
- Number of open days/public events held and visitor overview.
- Number of conferences/seminars/meetings held.
- Number of media appearances related to RI.
- Is there a newsletter and a number of its subscribers.
- Number of employee trainings provided.

Appendices

1. Infrastructure projects in the Health and Quality of Life TPA

Project and promoter	Grants awarded in HRK
Dr. Andrija Štampar Teaching Institute of Public Health Centre for Food Safety and Quality	61,303,629
Ministry of Science and Education, HAMAG-BICRO, BICRO BIOCENRE d.o.o. Incubation Centre for Biosciences and Commercialisation of Technology – BIOCentre	141,179,968
Catholic University of Croatia Research Infrastructure Project of the Institute for Complex Systems of the Catholic University of Croatia	1,103,391
Srebrnjak Children's Hospital Children's Centre for Translational Medicine at the Srebrnjak Children's Hospital (CCTM)	432,176,116
University Hospital Centre Osijek Research and diagnostics of malignant, infectious, and rare metabolic diseases based on MALDI TOF technology	16,129,024
Sestre Milosrdnice University Hospital Centre Bank of tumour tissue – basis for biomedical research centre of Sestre Milosrdnice University Hospital Centre (BaTT)	1,518,497
Modernisation and expansion of scientific research activities of the Clinical Institute of Chemistry at the Sestre Milosrdnice University Hospital Centre	21,341,123
Development and modernisation of scientific and research activities of the Clinical Institute for Diagnostic and Interventional Radiology, at Sestre Milosrdnice University Hospital Centre	428,146
Establishment of an integrated brachytherapy unit for applied prostate cancer research	2,045,942
University Hospital Centre Zagreb Centre for genome research in oncology and perinatology	503,300
Centres for Research and Early Detection of Lung Cancer	1,531,457
National centre for people with multiple sclerosis	813,030
Institute for Anthropological Research Centre for Applied Bioanthropology	26,472,967
Institute for Medical Research and Occupational Health Research and Education Centre for Health and Medical Ecology and Radiation Protection – Reconstruction and upgrading of the Institute for Medical Research and Occupational Health in Zagreb	232,602,281
Juraj Dobrila University of Pula Strengthening research capacities to achieve scientific propulsion of the Juraj Dobrila University of Pula	2,484,188
University Hospital Centre Split Medical Research Centre Split (IMCS)	7,853,431
Mediterranean Institute for Life Sciences Research on the biology of ageing and ageing-related diseases at MedILS	348,261
Merkur University Hospital Translational Research Centre at Merkur UH (CTIM)	742,382
University of Rijeka Centre for Preclinical Development and Drug Research (CEPRIL)	837,317
University of Split Putting into service the newly built experimental animal housing at the University of Split	17,996,048
Faculty of Humanities and Social Sciences, University of Zagreb Establishment and equipping of the Centre for Advanced Research in Social Sciences and Humanities	1,768,901
Faculty of Science, University of Zagreb Centre for Development, Application and Transfer of Biological Research – BIOCRIPT	846,469
Faculty of Veterinary Medicine, University of Zagreb Omics approach in veterinary molecular medicine	1,499,845
Faculty of Humanities and Social Sciences, University of Zagreb Centre for Intermolecular Interactions in Pharmacy	867,153
Faculty of Pharmacy and Biochemistry, University of Zagreb Strengthening of scientific research and innovation capacities of the Faculty of Pharmacy and Biochemistry, University of Zagreb (FarmInova)	34,812,123
School of Medicine, University of Zagreb Biomedical Research Centre Šalata – BIMIS	9,119,930

2. Infrastructure projects in the Energy and Sustainable Environment TPA

Project and promoter	Grants awarded in HRK
Croatian Geological Survey Infrastructure renewal and instrument procurement at the Croatian Geological Survey – Geoscience Laboratories (GEOLAB)	664,229
Institute of Physics Cryogenic Centre at the Institute of Physics	39,558,640
Josip Juraj Strossmayer University of Osijek Science and Research Centre of Electrical Engineering and Computing – ZICER	9,118,350
Faculty of Mechanical Engineering in Slavonski Brod, Josip Juraj Strossmayer University of Osijek, Centre for Research, Development and Innovation (CIRI)	2,498,138
Juraj Dobrila University of Pula Development of science and research infrastructure at the Juraj Dobrila University of Pula	871,321
Međimurje County Development and Educational Centre for the Metal Industry – Metal Centre	31,290,223
Međimurje University of Applied Sciences in Čakovec Centre of Sustainable Development	10,828,867
Ruđer Bošković Institute Synergy for excellence in research and development of detectors, sensors and electronics	1,495,850
Synergy for success: RBI-T-WINNING and ESIF joined in strengthening the excellence of the Institute for Theoretical Physics at the Ruđer Bošković Institute (RBI-TWINN-SIN)	1,439,634
Faculty of Civil Engineering, Architecture and Geodesy, University of Split Implementing modern science and research infrastructure at FGAG Split to achieve smart specialisation in green and energy efficient construction	82,772,610
Faculty of Science, University of Zagreb CeNIKS – Centre for Advanced Research of Complex Systems	57,806,125
Centre for Advanced Materials and Nanotechnology	4,621,840
Faculty of Architecture, University of Zagreb Centre of Smart Urban and Rural Areas – Innovative urban and architectural solutions for increasing energy efficiency in traditional and protected units	1,176,458
CIRI – Centre for Research, Development and Innovation	552,230
Faculty of Mechanical Engineering and Naval Architecture, University of Zagreb Centre for Research and Development of Safe and Sustainable Built Environment	4,779,394
Faculty of Mining, Geology and Petroleum Engineering, University of Zagreb VIRTULAB – INTEGRATED LABORATORY FOR PRIMARY AND SECONDARY RAW MATERIALS	11,499,539
Faculty of Textile Technology, University of Zagreb Modernisation of the Textile Science and Research Centre (MI-TRSC) infrastructure	10,642,529
Faculty of Mechanical Engineering and Naval Architecture, University of Zagreb Centre of Excellence for Advanced Manufacturing Systems	691,349
Infrastructure strengthening of RDI capacities in the field of energy and transport	4,050,193
Drawing up of project documentation for the establishment of the Centre for Advanced Materials and Coatings	1,333,672
Regional Centre of Excellence for Robotic Technology	36,994,416
Faculty of Metallurgy, University of Zagreb Centre for Foundry – SIMET	40,401,494
Total	355,087,102

3. Infrastructure projects in the Transport and Mobility TPA

Project and promoter	Grants awarded in HRK
Faculty of Electrical Engineering and Computing, University of Zagreb Laboratory for Underwater Systems and Technologies (INFRA-LAPOST) research infrastructure	1,500,000
Faculty of Mechanical Engineering and Naval Architecture, University of Zagreb Laboratory for emissions and energy efficiency of vehicles	1,917,879
Equipping of the Regional Centre for Laboratory Tests in Hydromechanics – Implementation Stage	7,029,328
Total	10,447,207

4. Infrastructure projects in the Food and Bioeconomy TPA

Project and promoter	Grants awarded in HRK
Croatian Forest Research Institute Construction and equipping of new laboratories and reconstruction of existing buildings of the Croatian Forest Research Institute	2,961,318
Institute for Adriatic Crops and Karst Reclamation Modernisation of the infrastructure of the Institute for Adriatic Crops and Karst Reclamation as a prerequisite for excellence in Mediterranean agriculture research	2,670,557
Institute of Agriculture and Tourism Scientific platform for research and development of innovation in sustainable agriculture – upgrading and equipping of the Institute for Agriculture and Tourism	4,503,842
Faculty of Agrobiotechnical Sciences Osijek, Josip Juraj Strossmayer University of Osijek Development and Research Biopark for Animal Production and Biotechnology	3,608,327
Mandićevec Science and Research Centre for Grape Vines and Wine	768,646
Karlovac University of Applied Sciences Atrium of Knowledge	37,837,729
Faculty of Agriculture, University of Zagreb Ampelographic-Pomological Research Centre	1,012,093
Modernisation and expansion of scientific research activities of the Reference Laboratory for Milk and Milk Products	466,166
Establishment of the Laboratory for Archaeogenetics at the Faculty of Agriculture, University of Zagreb	1,498,595
Faculty of Food Technology and Biotechnology, University of Zagreb Equipping a semi-industrial laboratory for the development of new food technologies	8,250,550
Virovitica-Podravina County Technological and Innovation Centre Virovitica	17,559,424
Total	81,137,247

5. Interdisciplinary research infrastructures

Project and promoter	Grants awarded in HRK
Faculty of Science, University of Zagreb Centre of Excellence in Chemistry (CluK)	71,620,006
University of Zagreb, Sre University Computing Centre Croatian Scientific and Educational Cloud (HR-ZOO)	196,802,438
University of Split Functional integration of the University of Split – its Faculty of Science, its Faculty of Maritime Studies, and its Faculty of Chemistry and Technology – by developing science and research infrastructure in the building of the three faculties	82,870,870
Science and Innovation Centre of the University of Split – (ZIC)	7,911,504
University of Rijeka Development of Research Infrastructure at the University of Rijeka Campus	180,182,049
Ruđer Bošković Institute Open scientific infrastructure platforms for innovative applications in the economy and society (O-ZIP)	547,200,000
Institute of Physics Centre for Advanced Laser Techniques – (CALT)	121,297,812
Institute of Economics, Zagreb Establishment of a multifunctional classroom at the Institute of Economics, Zagreb – EIZmetrics	1,469,940
Total	1,209,354,620