2023~2024
Science, Technology and Innovation in Europe

and Joint Activities with South Korea

European Commission

2023~2024

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European Commission

EU,

The world's True Mecca of
Science, Technology and Innovation

Foreword

Back in 2021, the European Commission unveiled 'Horizon Europe'. Running over the period 2021-2027 and endowed with a budget of almost €100 billion, Horizon Europe is the world's largest transnational research and innovation programme.

Through this programme, we are investing in advanced knowledge and technologies to reach key climate action objectives, for instance, to find innovative solutions to reduce greenhouse gas emissions.

We are also supporting the EU digital transition to ensure European society and industry are fit to a new world more dependent on digital information.

Global challenges require global solutions. Horizon Europe strengthens the EU's international research and innovation cooperation in many key areas, such as renewable energies, food systems, cybersecurity, or global health.

We will also support actions to better collaborate with many partner countries that want to work with European researchers and innovators.

Sixty years ago, the EU and the Republic of Korea established diplomatic relations. Since then, the EU and Korea have become strategic partners and major international actors. Our cooperation has flourished and expanded to multiple fields.

In May 2023, President Yoon, President Michel, and President von der Leyen held the 10th Korea-EU Summit in Seoul. During this Summit, our leaders welcomed the opening of official negotiations on Korea's association to Horizon Europe and committed to building more vital interaction in science and innovation by boosting collaboration and investment in research and development, as well as researchers' mobility.

As a complement to Horizon Europe, each EU Member State runs its own tailor-made national research programme.

I commend the joint effort undergone by European Commission and EU Member States' science administrations, as materialised in this book. This book will help each of us get better acquainted with Europe-wide research and innovation programmes, and, eventually, will pave the way to establishing fruitful EU-Korea scientific cooperation.

Maria CASTILLO-FERNANDEZ
Ambassador of the European Union to the Republic of Korea

2023~2024
Science, Technology and Innovation in Europe
and Joint Activities with South Korea

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Why Cooperate with Europe?

Delegation of the
European Union to
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Why Cooperate with Europe?

The European Union is a **world leader in research and innovation**, responsible for 20% of world expenditure on research, 32% of high impact publications and 27% of patent applications.

With the largest internal market in the world the European Union is home to **many of the world's leading innovative companies**, and has a leading position in many fields of knowledge such as health, food, renewable energies, environmental technologies, transport, and key enabling technologies. It has untold wealth stemming from its highly educated workforce and its leading talent in creative industries.

Research and innovation are increasingly **interlinked internationally**. The number of internationally co-authored scientific publications and the mobility of researchers are increasing. Research organisations are establishing offices abroad and companies are investing outside their home countries.

Global challenges are important drivers for research and innovation. Our planet has finite resources which need to be cared for sustainably; climate change and infectious diseases do not stop at national borders, food security needs to be ensured across the globe. The European Union are strengthening its dialogues with international partners to build critical mass for tackling these challenges.

New growth opportunities come from providing new products and services derived from technological breakthroughs, new processes and business models, non-technological innovation and innovation in the services sector, combined with and driven by creativity, flair and talent, or, in other words, from innovation in its broadest sense.

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HORIZON EUROPE

Delegation of the
European Union to
the Republic of Korea

PART 1

Horizon Europe
Fact Sheet

#HorizonEU

THE EU RESEARCH AND INNOVATION PROGRAMME (2021-27)

FOR A GREEN, HEALTHY, DIGITAL AND INCLUSIVE EUROPE

Research and innovation provide new knowledge and innovative solutions to overcome our societal, ecological and economic challenges. Horizon Europe helps researchers and top class innovators to develop and deploy their ideas. It supports excellent science by teaming up the best talent and equipping them with world-class infrastructures. Moreover, it supports breakthrough innovations and helps to create new services and markets.

Keeping the EU at the forefront of global research and innovation

Horizon Europe will:

- **Maximise** its impact and deliver on the EU's strategic priorities, such as the recovery, green and digital transitions, and tackles global challenges to improve the quality of our daily lives;

- **Foster** the EU's industrial competiveness and its innovation performance, notably supporting market-creating innovation via the European Innovation Council and the European Institute of Innovation and Technology;

- **Strengthen** excellent EU science and technology by increasing investment in highly skilled people and cutting-edge research;

- **Enhanc** e access to excellence for researchers across Europe to foster participation and collaboration, as well as promoting gender balance.

Novelties to advance progress

Support breakthrough innovation > European Innovation Council: One-stop shop to bring the most promising ideas from lab to real world application and support the most innovative SMEs, including start-ups, to scale up their ideas.

Deliver targeted solutions to societal challenges together with citizens > EU missions: Ambitious, bold goals to tackle issues that affect our daily lives, ranging from fighting cancer to adapting to climate change, living in greener cities, ensuring soil health for food, nature, people and climate, and protecting our waters and ocean.

Rationalise the funding landscape > Streamlined approach to European Partnerships: Streamlined number of partnerships while encouraging wide participation of partners from public and private sectors.

Strengthen international cooperation > extended association possibilities: Extended openness to association for non-EU countries (third countries) with good capacity in science, technology and innovation.

Reinforce openness > Open Science policy: Mandatory open access to publications, open access to research data ensured. Use of European Open Science Cloud as appropriate.

Encourage participation and decrease the R&I gap in Europe > widening participation and spreading excellence: A wide spectrum of measures to support lower R&I performing countries, to build up excellence centres, to improve their capacity and facilitate collaborative links.

Increase the R&I impact > synergies with other EU programmes and policies: A set of practical solutions to implement Horizon Europe and relevant R&I-related programmes and policies in synergy, for example InvestEU, Erasmus+, EU Cohesion Policy, Digital Europe, European Structural and Investment Funds, Connecting Europe Facility, and the Recovery and Resilience Facility, to promote faster dissemination at national and regional level, and uptake of research and innovation results.

Reduce administrative burden > simpler rules: To increase legal certainty and reduce administrative burden for beneficiaries and programme administrators.

Enhancing impact

Horizon Europe aims to boost growth, trade and investment and to create a significant social and environmental impact.

Up to €11 of GDP gains over 25 years can be potentially generated by each euro invested at EU level in R&I

Over 35% of Horizon Europe **spending** will contribute to **climate objectives**

To create **300.000 jobs by 2040,** of which **40%** will be **highly skilled** jobs
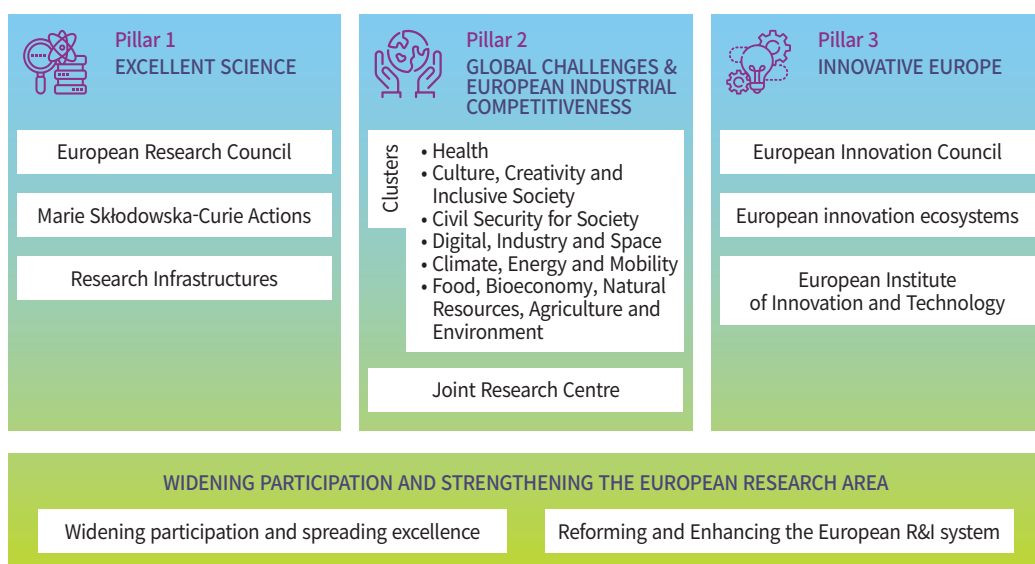
A BUDGET & STRUCTURE FIT FOR ITS AMBITIONS

Horizon Europe will have a budget of around **€95.5 billion** for 2021-2027 (current prices). This includes €5.4 billion (current prices) from **NextGenerationEU** to boost our recovery and make the EU more resilient for the future, as well as an additional reinforcement of €4.5 billion (current prices).

Horizon Europe will be implemented also through the **European Defence Fund** and complemented by the **Euratom Research and Training Programme.**

THREE PILLARS FOR IMPLEMENTATION

Pillar 1 EXCELLENT SCIENCE	Pillar 2 GLOBAL CHALLENGES & EUROPEAN INDUSTRIAL COMPETITIVENESS	Pillar 3 INNOVATIVE EUROPE
European Research Council	Clusters: • Health • Culture, Creativity and Inclusive Society • Civil Security for Society • Digital, Industry and Space • Climate, Energy and Mobility • Food, Bioeconomy, Natural Resources, Agriculture and Environment	European Innovation Council
Marie Skłodowska-Curie Actions		European innovation ecosystems
Research Infrastructures		European Institute of Innovation and Technology
	Joint Research Centre	

WIDENING PARTICIPATION AND STRENGTHENING THE EUROPEAN RESEARCH AREA

Widening participation and spreading excellence	Reforming and Enhancing the European R&I system

● **The Excellent Science pillar** aims to increase the EU's global scientific competitiveness. It supports frontier research projects defined and driven by top researchers themselves through the **European Research Council,** funds fellowships for experienced researchers, doctoral training networks, exchanges for researchers and entices more young people to a career in research, through **Marie Skłodowska-Curie Actions,** and invests in **world-class research infrastructures.**

● **The Global Challenges and European Industrial Competiveness pillar** supports research relating to societal challenges and reinforces technological and industrial capacities through clusters. It sets **EU-missions** with ambitious goals tackling some of our biggest problems. It also includes activities pursued by the **Joint Research Centre** which supports EU and national policymakers with independent scientific evidence and technical support.

- **The Innovative Europe pillar** aims to make Europe a frontrunner in market-creating innovation via the **European Innovation Council.** It also helps to develop the overall European innovation landscape, by developing European Innovation ecosystems and through the **European Institute of Innovation and Technology (EIT)** which fosters the integration of the knowledge triangle of education, research and innovation.

- **Widening Participation and Strengthening the European Research Area (ERA)** increase support to EU Member States in their efforts to make the most of their national research and innovation potential and promote an ERA where researchers, scientific knowledge and technology circulate freely.
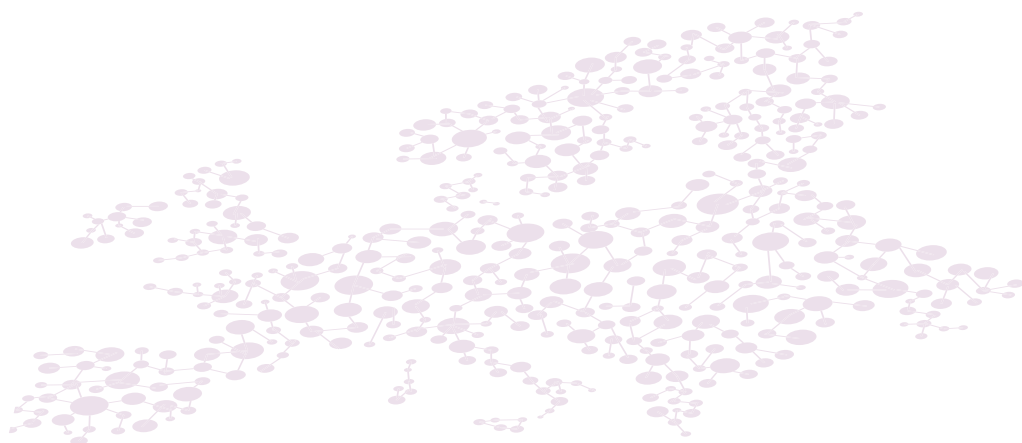
HOW TO APPLY

Work programmes announce the specific research and innovation areas that will be funded. The forthcoming calls for proposals will be accessible through the one-stop-shop Funding and Tenders Portal. When ready each call gives more precise information on the research and innovation issues that applicants for funding should address in their proposals.

MORE INFORMATION

http://ec.europa.eu/horizon-europe   #HorizonEU

PART **2**

Horizon Europe
Programme Guide

Horizon Europe (HORIZON)

Programme Guide

Version 1.2
04 October 2021

HISTORY OF CHANGES

Version	Publication date	Changes
1.0	17.06.2021	• Initial version
1.1	19.07.2021	• Updated section 'Other third countries'
1.2	04.10.2021	• Updated section 'Other third countries legal agreements

Table of contents

Abbreviations and acronyms

AC	Associated country/countries associated to Horizon Europe
ERA	European Research Area
ERC	European Research Council
EIC	European Innovation Council
EIT	European Institute of Innovation and Technology
FP	HE Framework Programme
FR	EU Financial Regulation
GA	Grant agreement
HE	Horizon Europe Programme
IP(R)	Intellectual property (rights)
JRC	European Commission Joint Research Centre
KIC	Knowledge and innovation community
MFF	EU's Multi-annual financial framework
MS	EU Member State(s)
MSCA	Marie Skłodowska-Curie Actions
OS	Open science
NCP	National contact point
PCP	Pre-commercial procurement
PPI	Public procurement of innovative solutions
RRI	Responsible research and innovation
SMEs	Small and medium-sized enterprises
SP	HE Specific Programme
SSH	Social sciences and humanities
WP	EU work programme

1. Introduction

This Programme Guide contains detailed guidance on the structure, budget and political priorities of Horizon Europe. It also includes details on how to prepare proposals.

The purpose of this document is to help users understand the programme and its calls and prepare their proposals, by avoiding technical vocabulary, legal references and jargon, and seeking to help readers find answers to any practical questions they may have about particular parts of the proposal.
The guide will be periodically updated with new guidance and explanations, based on practical experience and on-going developments.

Potential applicants are invited to read the call documentation on the topic page in the Funding & Tenders Portal ('Portal') carefully, and in particular this Horizon Europe Programme Guide, the General Annexes, the EU Funding & Tenders Portal Online Manual and the EU Grants AGA — Annotated Grant Agreement. These documents provide clarifications and answers to questions relating to preparing the proposal:

- the Programme Guide provides:
    - detailed guidance on the structure, budget and political priorities and other relevant background of the Horizon Europe programme relevant for preparing the proposal

- the General Annexes outline the:
    - admissibility and eligibility conditions, and the criteria for financial and operational capacity and exclusion (Annexes A-C)
    - award criteria, mandatory documents and evaluation procedure (Annexes D-F)
    - legal and financial set-up of the grant agreements (Annex G)
    - specific conditions applying to actions which include pre-commercial procurement or procurement of innovative solutions (Annex H)

- the Online Manual outlines the:
    - procedures to register and submit proposals online via the EU Funding & Tenders Portal and recommendations on preparing the proposal1

- the AGA — Annotated Grant Agreement contains:
    - detailed annotations on all the provisions in the grant agreement to be signed to obtain the grant.

Please note that calls launched by the European Research Council (ERC), the European Innovation Council (EIC), the European Institute of Innovation and Technology (EIT), the Institutionalised European Partnerships based on Articles 185 and 187 of the Treaty on the Functioning of the European Union (TFEU), calls under the Euratom Research and Training Programme and the activities of the European Commission Joint Research Centre (JRC) are subject to separate work programmes and thus not entirely covered by this Programme Guide. This also applies to Marie Skłodowska-Curie Actions (MSCA).

For calls launched by EIC, please consult https://eic.ec.europa.eu for specific guidance.
For calls launched by EIT, please consult https://eit.europa.eu for specific guidance.
For calls launched by ERC, please consult https://erc.europa.eu for specific guidance.

For calls launched under the MSCA WP part, please find specific guidance under the relevant call topic pages on the Portal.
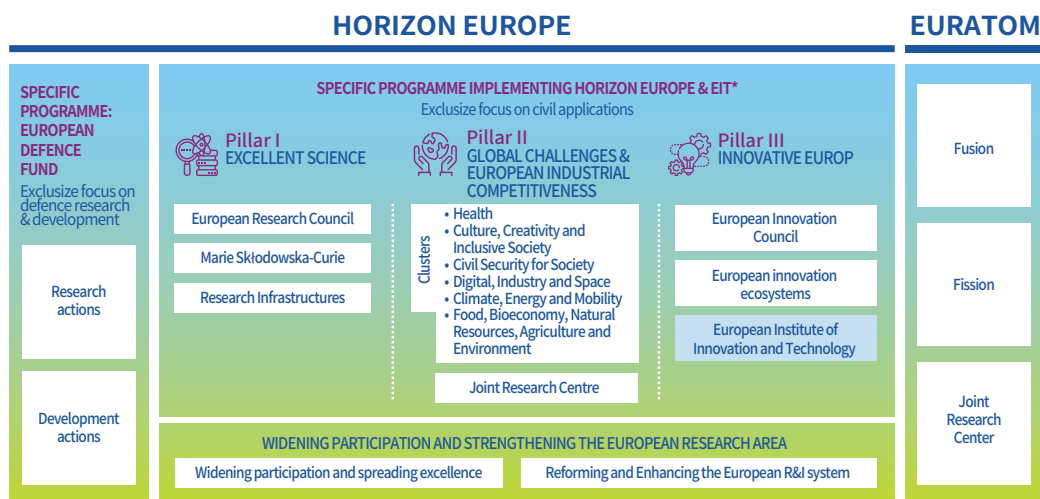
For calls launched by the other programme components and parts listed above, guidance will be published on dedicated websites together with the calls.

2. Terminology explained

Critical risk	A critical risk is a plausible event or issue that could have a high adverse impact on the ability of the project to achieve its objectives. Level of likelihood to occur (Low/medium/high): The likelihood is the estimated probability that the risk will materialise even after taking account of the mitigating measures put in place. Level of severity (Low/medium/high): The relative seriousness of the risk and the significance of its effect.
Deliverable	A report that is sent to the Commission or Agency providing information to ensure effective monitoring of the project. There are different types of deliverables (*e.g. a report on specific activities or results, data management plans, ethics or security requirements*).
Impacts	Wider long term effects on society (including the environment), the economy and science, enabled by the outcomes of R&I investments (long term). It refers to the specific contribution of the project to the work programme expected impacts described in the destination. Impacts generally occur some time after the end of the project. Example: *The deployment of the advanced forecasting system enables each airport to increase maximum passenger capacity by 15% and passenger average throughput by 10%, leading to a 28% reduction in infrastructure expansion costs.*
Milestone	Control points in the project that help to chart progress. Milestones may correspond to the achievement of a key result, allowing the next phase of the work to begin. They may also be needed at intermediary points so that, if problems have arisen, corrective measures can be taken. A milestone may be a critical decision point in the project where, for example, the consortium must decide which of several technologies to adopt for further development. The achievement of a milestone should be verifiable.

Objectives	The goals of the work performed within the project, in terms of its research and innovation content. This will be translated into the project's activities. These may range from tackling specific research questions, demonstrating the feasibility of an innovation, sharing knowledge among stakeholders on specific issues. The nature of the objectives will depend on the type of action, and the scope of the topic.
Outcomes	The expected effects, over the medium term, of projects supported under a given topic. The results of a project should contribute to these outcomes, fostered in particular by the dissemination and exploitation measures (including the uptake, diffusion, deployment, and/or use of the project's results by direct target groups). Outcomes generally occur during or shortly after the end of the project. Example: *9 European airports adopt the advanced forecasting system demonstrated during the project*.
Pathway to impact	Logical steps towards the achievement of the expected impacts of the project over time, in particular beyond the duration of a project. A pathway begins with the projects' results, to their dissemination, exploitation and communication, contributing to the expected outcomes in the work programme topic, and ultimately to the wider scientific, economic and societal impacts of the work programme destination.
Research output	Results generated by the action to which access can be given in the form of scientific publications, data or other engineered outcomes and processes such as software, algorithms, protocols and electronic notebooks.
Results	What is generated during the project implementation. This may include, for example, know-how, innovative solutions, algorithms, proof of feasibility, new business models, policy recommendations, guidelines, prototypes, demonstrators, databases and datasets, trained researchers, new infrastructures, networks, etc. Most project results (inventions, scientific works, etc) are 'Intellectual Property', which may, if appropriate, be protected by formal 'Intellectual Property Rights'. Example: *Successful large-scale demonstrator: trial with 3 airports of an advanced forecasting system for proactive airport passenger flow management*.

3. Structure and budget

HORIZON EUROPE   **EURATOM**

SPECIFIC PROGRAMME: EUROPEAN DEFENCE FUND — Exclusize focus on defence research & development	SPECIFIC PROGRAMME IMPLEMENTING HORIZON EUROPE & EIT* — Exclusize focus on civil applications	EURATOM
Research actions	**Pillar I — EXCELLENT SCIENCE**: European Research Council; Marie Skłodowska-Curie; Research Infrastructures. **Pillar II — GLOBAL CHALLENGES & EUROPEAN INDUSTRIAL COMPETITIVENESS**: Clusters — Health; Culture, Creativity and Inclusive Society; Civil Security for Society; Digital, Industry and Space; Climate, Energy and Mobility; Food, Bioeconomy, Natural Resources, Agriculture and Environment; Joint Research Centre. **Pillar III — INNOVATIVE EUROP**: European Innovation Council; European innovation ecosystems; European Institute of Innovation and Technology.	Fusion; Fission; Joint Research Center
Development actions	**WIDENING PARTICIPATION AND STRENGTHENING THE EUROPEAN RESEARCH AREA**: Widening participation and spreading excellence; Reforming and Enhancing the European R&I system	

* The European Institute of Innovation & Technology (EIT) is not part of the Specific Programme

European Commission

Horizon Europe is divided into three pillars and one part, corresponding to its main priorities

- The Excellent Science pillar aims to increase the EU's global scientific competitiveness. It supports frontier research projects defined and driven by top researchers themselves through the European Research Council, funds fellowships for postdoctoral researchers, doctoral training networks and exchanges for researchers through Marie Skłodowska-Curie Actions, and invests in world-class research infrastructures.

- The Global Challenges and European Industrial Competiveness pillar supports research relating to societal challenges and reinforces technological and industrial capacities through clusters. It sets EU-missions with ambitious goals tackling some of our biggest problems. It also includes activities pursued by the Joint Research Centre which supports EU and national policymakers with independent scientific evidence and technical support.

- The Innovative Europe pillar aims to make Europe a frontrunner in market-creating innovation via the European Innovation Council. It also helps to develop the overall European innovation landscape through the European Institute of Innovation and Technology (EIT) which fosters the integration of the knowledge triangle of education, research and innovation.

- The part Widening Participation and Strengthening the European Research Area (ERA) increase support to EU Member States in their efforts to make the most of their national research and innovation potential.

Finally, Horizon Europe will be implemented also through the European Defence Fund and complemented by the Euratom Research and Training Programme.

Horizon Europe will have a budget of around €95.5 billion for 2021-2027 (current prices). This includes €5.4 billion (current prices) from NextGenerationEU to boost recovery and make the EU more resilient for the future, as well as an additional reinforcement (i.e. in addition to the MFF agreement in July 2020) of €4.6 billion (current prices).

4. What is the Strategic Plan and why is it important?

The Horizon Europe strategic plan sets out overarching strategic orientations for EU research and innovation investments over the period 2021-2024. Focusing on the second pillar of Horizon Europe, 'Global challenges and European industrial competitiveness', it also covers relevant activities in the first pillar, 'Excellent Science', and the third pillar, 'Innovative Europe', and the 'Widening Participation and Strengthening the European Research Area' part.

Overall, the aim of the strategic plan is to ensure an effective interface between EU policy priorities, and programme activities and ultimately, the research and innovation projects funded by Horizon Europe. The intention is to stimulate research and innovation investments where they are particularly needed to address the challenges we are facing, and, most importantly, deliver results.

The Horizon Europe strategic plan defines four **key strategic orientations**:

- **Promoting an open strategic autonomy by leading the development of key digital, enabling and emerging technologies, sectors and value chains** to accelerate and steer the digital and green transitions through human-centred technologies and innovations.

- **Restoring Europe's ecosystems and biodiversity, and managing sustainably natural resources** to ensure food security and a clean and healthy environment.

- **Making Europe the first digitally enabled circular, climate-neutral and sustainable economy** through the transformation of its mobility, energy, construction and production systems.

- **Creating a more resilient, inclusive and democratic European society**, prepared and responsive to threats and disasters, addressing inequalities and providing high-quality health care, and empowering all citizens to act in the green and digital transitions.

Each of the key strategic orientations encompasses three to four cross-cutting **impact areas**, which in turn link to a number of **expected impacts**. The key strategic orientations and impact areas are formulated on the basis of the expected impacts, which have been defined with input from stakeholders, largely bottom-up, during the strategic planning process. The expected impacts are structured by the six **clusters** that make up Horizon Europe's second Pillar, 'Global Challenges and European Industrial Competitiveness'. The expected impacts define the wider effects on society, the economy and science to be targeted by research and innovation activities, but not the manner in which to achieve them. This is up to the applicants when designing their project proposals. In total, the strategic plan defines 32 expected impacts that cover a wide range of social, economic, ecological and scientific

aspirations. Each expected impact serves as the foundation for a corresponding destination in the relevant work programme parts.

Furthermore, the strategic plan identifies European co-programmed and co-funded partnerships, as well as the EU missions and contains orientations regarding cross-cutting elements of Horizon Europe related to **areas for international cooperation, and key specific issues, such as gender, social sciences and humanities integration, key enabling technologies, ethics, open science practices, as well as social innovation and the EU taxonomy**.

The Horizon Europe strategic plan is the product of a series of intense co-creation activities among Commission services and co-design activities with Member States, members of the European Parliament, stakeholders and citizens at large. This has taken place through successive rounds of public consultations, web surveys and interactive workshops, in particular during the annual Research and Innovation Days.

5. Horizon Europe, an impact-driven framework progamme

The impact-driven design of Horizon Europe[1] aims at maximising the effects of Research and Innovation investments, ensuring their contribution to the Commission's policy priorities.

It marks a paradigm change in the design of the EU R&I Framework Programmes from an activity-driven to an impact-driven programme.

One of the novelties in the implementation of the Horizon Europe programme which facilitates such an impact-driven approach is the strategic planning process (as described above), which identifies the expected impacts of the first four years of Horizon Europe.

This represents a paradigm change also for the work programmes, that henceforth builds on this strategic planning. The structure of Horizon Europe work programmes translates this impact-driven nature: they are organised around 'Destinations', describing the expected impacts identified in the Strategic Planning, and 'topics', describing the related expected outcomes critical to the achievement of such impacts.

This impact design is also translated at project level, with revamped proposal and reporting templates, allowing for a straightforward monitoring that aims at providing close-to-real-time information.

Horizon Europe ground breaking approach to monitoring, the Key Impact Pathways[2], aims at capturing and communicating impact around 9 key story lines during and after the

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1) See Horizon Europe Regulation, Article 50 and Annex V.
2) https://ec.europa.eu/info/research-and-innovation/strategy/support-policy-making/shaping-eu-research-and-innovation-policy/evaluation-impact-assessment-and-monitoring/horizon-europe_en#monitoring-horizon-europe.

Framework Programme implementation. Its objective is to allow policy makers and the wider public to get regular insights regarding the effects and benefits of the framework programme on European science, the economy and wider society[3].

6. European Partnerships

European Partnerships bring the Commission and private and/or public partners together to address some of Europe's most pressing challenges through concerted research and innovation initiatives. They are a key implementation tool of Horizon Europe, and contribute significantly to achieving the EU's political priorities.

By bringing private and public partners together, European Partnerships help to avoid the duplication of investments and contribute to reducing the fragmentation of the research and innovation landscape in the EU.

Find out more about European Partnerships in our infographic.

The aim of European partnerships with EU and associated countries, the private sector, foundations and other stakeholders is to deliver on global challenges and modernise industry.

The Horizon Europe proposal lays down the conditions and principles for establishing European Partnerships. There are 3 types:

- **European Co-programme Partnerships**
  These are partnerships between the Commission and private and/or public partners. They are based on memoranda of understanding.

- **European Co-funded Partnerships**
  Partnerships involving EU countries, with research funders and other public authorities at the core of the consortium.

- **European Institutionalised Partnerships**
  These are partnerships in the field of research and innovation between the Union, EU member states and/or industry. These partnerships require legislative proposals from the Commission and are based on a Council Regulation (on the basis of Article 187 TFEU) or a Decision by the European Parliament and Council (on the basis of Article 185 TFEU). They are implemented by dedicated structures created for that purpose. Institutionalised partnerships will only be implemented where other parts of the Horizon Europe programme, including other types of partnership, would not achieve the desired objectives or expected impacts. EIT Knowledge and Innovation Communities (KICs) are also institutionalised partnerships. EIT KICs aim to address skills shortages and are already established under Horizon 2020. Key partners in EIT KICs are higher education institutions, research organisations, companies and other stakeholders.

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3) https://ec.europa.eu/info/funding-tenders/opportunities/portal/screen/opportunities/horizon-dashboard.

Read more about the European partnerships in Horizon Europe here[4].

7. Missions

EU missions are commitments to solve some of the greatest challenges facing our world like fighting cancer, adapting to climate change, protecting our oceans, living in greener cities and ensuring soil health and food. They are an integral part of Horizon Europe.

Each mission will operate as a portfolio of actions – such as research projects, policy measures or even legislative initiatives - to achieve a measurable goal that could not be achieved through individual actions. EU missions will contribute to the goals of the European Green Deal, Europe's Beating Cancer Plan as well as the Sustainable Development Goals. A wide range of studies and reports informed this approach.

EU missions will
- be bold, inspirational and widely relevant to society
- be clearly framed: targeted, measurable and time-bound
- establish impact-driven but realistic goals
- mobilise resources on EU, national and local levels
- link activities across different disciplines and different types of research and innovation
- make it easier for citizens to understand the value of investments in research and innovation

Areas where there will be missions
- Cancer
- Adaptation to climate change including societal transformation
- Healthy oceans, seas coastal and inland waters
- Climate-neutral and smart cities
- Soil health and food

Read more about the EU Missions in Horizon Europe here[5].

8. International cooperation and association

In the context of Horizon Europe, international cooperation is about cooperation with legal entities established in non-EU countries (third countries). A non-EU country is any country or territory that is neither an EU Member State nor an overseas country or territory linked to an EU Member State. Non-EU countries are either associated or not associated to the Horizon Europe programme.

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4) https://research-and-innovation.ec.europa.eu/funding/funding-opportunities/funding-programmes-and-open-calls/
horizon-europe/european-partnerships-horizon-europe_en
5) https://commission.europa.eu/horizon-europe/missions-horizon-europe_en

Overseas countries and territories (OCTs) linked to Member States

Legal entities from OCTs can participate and receive funding under equivalent conditions as legal entities from Member States.

The OCTs (and their linked Member States) are:

> Aruba (NL), Bonaire (NL), Curação (NL), French Polynesia (FR), French Southern and Antarctic Territories (FR), Greenland (DK), New Caledonia (FR), Saba (NL), Saint Barthélemy (FR), Sint Eustatius (NL), Sint Maarten (NL), St. Pierre and Miquelon (FR), Wallis and Futuna Islands (FR).

Third countries associated to Horizon Europe

Association to Horizon Europe is governed by the Horizon Europe Regulation 2021/695[6]. Legal entities from Associated Countries can participate under equivalent conditions as legal entities from the EU Member States, unless specific limitations or conditions are laid down in the work programme and/or call/topic text. Such measures could include the limitation of participation in certain actions to legal entities established in the EU alone, or in the EU and specified non-EU countries, in order to safeguard the EU's strategic assets, interests, autonomy or security. Limitations or conditions may also be attached to the participation of legal entities established in an eligible country but which are controlled directly or indirectly by an ineligible country[7]. The eligibility will be clearly defined in the work programme. There could also be criteria on the place of establishment of the legal entity to take into account specific policy requirements or the nature and objectives of the action[8].

Association to Horizon Europe takes place through the conclusion of an international agreement between the EU and the non-EU country. All sixteen third countries associated to the previous programme, Horizon 2020, have also expressed interest to become associated to Horizon Europe. Other third countries have also expressed an interest in association.

The association agreements with the following countries have now started to produce legal effects (either through provisional application or their entry into force):

1. Iceland   2. Norway

Until association agreements start producing legal effects either through provisional application or their entry into force, the transitional arrangements set out in the General Annexes to the Horizon Europe Work Programme 2021-2022 is applicable (for the entire Programme, including ERC, EIC, EIT and the institutionalised European partnerships[9]) with regard to the following countries and legal entities established in these countries, with which

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6) Regulation (EU) 2021/695 of the European Parliament and of the Council of 28 April 2021 establishing Horizon Europe – the Framework Programme for Research and Innovation, laying down its rules for participation and dissemination, and repealing Regulations (EU) No 1290/2013 and (EU) No 1291/2013 (OJ 12.5.2021 L 170/1).

7) Based on Horizon Europe regulation article 22(5).

8) Based on Horizon Europe regulation article 22(6).

9) Subject to the adoption of the basic acts.

association negotiations are being processed or where association is imminent (listed in the alphabetical order):

1. Albania	2. Armenia	3. Bosnia and Herzegovina
4. Faroe Islands	5. Georgia	6. Israel
7. Kosovo[10]	8. Moldova	9. Montenegro
10. Morocco	11. North Macedonia	12. Serbia
13. Tunisia	14. Turkey	15. Ukraine
16. United Kingdom[11]		

Legal entities established in Switzerland are currently not covered by these transitional arrangements.

Liechtenstein does not intend to associate to Horizon Europe.

This list will be updated to reflect the status of the negotiations for association.

For the Euratom Research and Training Programme, Ukraine and United Kingdom are expected to become associated to Euratom. The transitional arrangement described above applies to legal entities established in these countries.

Other third countries

Most Horizon Europe calls are also open to participants from non-associated countries, unless specific limitations or conditions are laid down in the work programme and/or the call/topic text, such as those described for associated countries above.

Moreover, some Horizon Europe calls are particularly relevant for international cooperation, encouraging or even requiring the participation of entities from non-associated non-EU countries in the funded actions.

Participants from non-associated non-EU countries can take part in Horizon Europe actions — but not always with funding.
Participants from the following low to middle income countries are **automatically eligible** for funding:

- Afghanistan, Algeria, Angola, Argentina, Azerbaijan
- Bangladesh, Belarus, Belize, Benin, Bhutan, Bolivia, Botswana, Burkina Faso, Burundi
- Cabo Verde, Cambodia, Cameroon, Central African Republic, Chad, Colombia, Comoros, Congo (Democratic Republic), Congo (Republic), Costa Rica, Côte d'Ivoire, Cuba
- Djibouti, Dominica, Dominican Republic

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10) This designation is without prejudice to positions on status, and is in line with UNSCR 1244/1999 and the ICJ Opinion on the Kosovo declaration of independence.
11) The UK is associating to the full Horizon Europe programme with the only exception of the EIC Fund (which is the loan/equity instrument of the EIC).

- Ecuador, Egypt (Arab Republic), El Salvador, Equatorial Guinea, Eritrea, Eswatini, Ethiopia
- Fiji
- Gabon, Gambia, Ghana, Grenada, Guatemala, Guinea, Guinea-Bissau, Guyana
- Haiti, Honduras
- Indonesia, Iran (Islamic Republic), Iraq
- Jamaica, Jordan
- Kazakhstan, Kenya, Kiribati, Korea (Democratic People's Republic), Kyrgyz Republic
- Lao (People's Democratic Republic), Lebanon, Lesotho, Liberia, Libya
- Madagascar, Malawi, Malaysia, Maldives, Mali, Marshall Islands, Mauritania, Mauritius, Micronesia (Federated States), Mongolia, Mozambique, Myanmar
- Namibia, Nepal, Nicaragua, Niger, Nigeria
- Pakistan, Palestine[12], Papua New Guinea, Panama, Paraguay, Peru, Philippines
- Rwanda
- Samoa, São Tomé and Principe, Senegal, Sierra Leone, Solomon Islands, Somalia, South Africa, South Sudan, Sri Lanka, St. Lucia, St. Vincent and the Grenadines, Sudan, Suriname, Syrian Arab Republic
- Tajikistan, Tanzania, Thailand, Timor-Leste, Togo, Tonga, Turkmenistan, Tuvalu
- Uganda, Uzbekistan
- Vanuatu, Venezuela (Bolivarian Republic), Vietnam
- Yemen Republic
- Zambia, Zimbabwe.

Participants from other countries (i.e. countries that are not EU Member States, countries associated to Horizon Europe, or countries listed above) are not automatically eligible for funding and therefore by deafult have to participate at their own cost. These participants should explain in the proposal how their funding will be secured.
They can however receive exceptional funding, if:

- their country is explicitly identified in the Horizon Europe work programme and call for proposals as being eligible for funding

- the granting authority considers that their participation as a beneficiary is essential for implementing the project, for example in view of their:
  ° outstanding competence/expertise
  ° access to particular research infrastructures
  ° access to particular geographical environments
  ° access to particular data.

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12) This designation is not be construed as recognition of a State of Palestine and is without prejudice to the individual positions of the Member States on this issue.

⚠️ Please note that entities subject to EU restrictive measures under Article 29 of the Treaty on the European Union (TEU) and Article 215 of the Treaty on the Functioning of the EU (TFEU)[13] and entities covered by Commission Guidelines No 2013/C 205/05[14] are NOT eligible to participate in any capacity in Horizon Europe actions (including as beneficiaries, affiliated entities, associated partners, third parties giving in-kind contributions, subcontractors or recipients of financial support to third parties, if any).

International organisations

International European research organisations are automatically eligible to receive funding from Horizon Europe. International European research organisations are defined as international organisations, the majority of whose members are EU Member States or associated countries, and whose principal objective is to promote scientific and technological cooperation in Europe.

For what concerns participation in Horizon Europe actions, international European research organisations are deemed to be established in a Member State other than the ones in which the other legal entities participating in the action are established.

As regards all other international organisations:

- For European Research Council frontier research actions, training and mobility actions and when provided for in the work programme, international organisations with headquarters in a Member State or associated country are deemed to be established in that Member State or associated country, and thus automatically eligible for funding from Horizon Europe.

- In all other cases, international organisations are not automatically eligible for funding from Horizon Europe, and they may exceptionally receive funding only if:
  ° they are identified in the relevant Horizon Europe work programme as being eligible for funding or
  ° the granting authority considers that their participation is deemed essential for implementing the action, for example in view of their:
    a) outstanding competence/expertise
    b) access to particular research infrastructures
    c) access to particular geographical environments
    d) access to particular data.

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13) Please note that the EU Official Journal contains the official list and, in case of conflict, its content prevails over that of the EU Sanctions Map.

14) Commission guidelines No 2013/C 205/05 on the eligibility of Israeli entities and their activities in the territories occupied by Israel since June 1967 for grants, prizes and financial instruments funded by the EU from 2014 onwards (OJEU C 205 of 19.07.2013, pp. 9-11).

9. Gender equality and inclusiveness

Horizon Europe sets **gender equality as a cross-cutting principle and aims to eliminate gender inequality and intersecting socio-economic inequalities** throughout research and innovation systems, including by addressing unconscious bias and systemic structural barriers.

The strengthened provisions for gender equality under Horizon Europe address three different levels and include the following:

- A **new eligibility criterion** to get access to Horizon Europe funding: public bodies, research organisations and higher education establishments from Member States and Associated Countries are required, as of calls with deadlines in 2022, to have in place a **gender equality plan (GEP)**. Details on this requirement are specified in the General Annexes to the Work Programme (B—Eligibility, section 'Gender equality plans and gender mainstreaming') and additional guidance is available through this webpage, including a link to Frequently Asked Questions accessible through the Funding & Tenders Portal.

- The **integration of the gender dimension into research and innovation content** across the Programme is an operational objective for Horizon Europe, and **becomes a requirement by default**.

- Particular attention is being paid to ensuring **gender balance**, with a target of 50% women in Horizon Europe related advisory bodies such as boards and expert groups, as well as in evaluation panels. **Gender balance among researchers involved in projects** is strongly encouraged as well, and will be taken into account as a ranking criterion for ex aequo proposals.

- Researchers have the possibility to self-identify in proposals and project reporting according to three gender categories: woman, man, or non-binary.

In addition:

- Specific funding will be made available for actions supporting the development of inclusive gender equality plans in research and innovation organisations across Member States and associated countries, under the **Widening Participation and Strengthening the European Research Area** Programme Part.

- Specific funding will also be allocated to **gender studies and intersectional research**, in particular under Pillar II, Cluster 2 - Culture, Creativity and Inclusive Society.

- Flagship measures and activities for promoting gender equality are introduced under Pillar III, in particular through the **European Innovation Council** (EIC), including a target of 40% women-led companies invited to pitch their projects in the Accelerator instrument, a target of 50% women among members of EIC advisory structures, a dedicated initiative to support women-led deep-tech start-ups, and the continuation of the EU prize for women innovators.

These strenghtened provisions are also detailed on the Commission's Gender equality in research and innovation policy webpage, and summarised in the factsheet Gender equality: a strengthened commitment in Horizon Europe with a special focus on the new Gender Equality Plan (GEP) eligibility criterion.

In this Programme Guide, we focus more specifically on the integration of the gender dimension into research and innovation (R&I) content, and refer the reader to the links provided above and to the following webinar for further guidance on the other gender equality aspects addressed in Horizon Europe and to be taken into account by applicants.

Integration of the gender dimension into R&I content: a requirement under Horizon Europe

The integration of the gender dimension into R&I content is mandatory. It is a requirement set by default across all Work Programmes, destinations and topics, unless its non-relevance for a specific topic is specified in the topic description, e.g. by the mention "*In this topic the integration of the gender dimension (sex and gender analysis) in research and innovation content is not a mandatory requirement*".

This new requirement to integrate the gender dimension by default in R&I content in projects is recalled in the General Introduction to the Horizon Europe Work Programme, and in the General Annex D on Award Criteria (for Research and innovation actions, Innovation actions and Programme co-fund actions) and it is thus reflected in the corresponding application forms (proposal template) for Research and Innovation Actions, Innovation Actions and Programme Co-fund Actions under the Excellence evaluation criterion (under *Methodology*).

In the proposal template, applicants are invited to describe how the gender dimension (i.e. sex and/or gender analysis) is taken into account in the project's R&I content. If applicants do not consider such a gender dimension to be relevant in their specific project, they should provide a sound justification, which will be taken into account during evaluation of the proposal, *e.g. with appropriate scientific references*.

What does integrating the gender dimension in R&I content mean?

It is an umbrella term covering the integration of sex and/or gender analysis through the entire R&I cycle, from the setting of research priorities through defining concepts, formulating research questions, developing methodologies, gathering and analysing sex/gender disaggregated data, to evaluating and reporting results and transferring them to markets into products and innovations which will benefit all citizens and promote gender equality. Addressing **the gender dimension in research and innovation** thus entails **taking into account sex and gender** in the **whole R&I process**. It is different from addressing issues of gender balance and equal opportunities among the project's team members or among participants to events (*e.g. conferences*) organised by the project.

Definitions of key related terms:

- **_Sex_** refers to biology. Sex is determined by several biological features, according to functions that derive from the chromosomal complement, reproductive organs, or specific hormones or environmental factors that affect the expression of phenotypic traits (morphology) in sexually reproducing organisms. In humans, sex refers to the biological attributes that distinguish male, female, or intersex. _In non-human animals_, sex refers to biological attributes that distinguish male, female, or hermaphrodite. _In engineering & product design research_, sex includes anatomical and physiological characteristics that may impact the design of products, systems, and processes. Sex differences may be relevant for many R&I projects.

- **_Gender_** refers to sociocultural norms, identities and relations that categorise people, structure societies and organisations, and shape behaviours, products, technologies, environments, and knowledge. Gender attitudes and behaviours are complex and change across time and place, as cultural norms and values change. How we speak, our mannerisms, the things we use and our behaviours all signal who we are and establish rules for interaction. Gender is an organising principle that structures behaviours, attitudes, physical appearance and habits. We generally consider three related dimensions of gender: gender norms (socio-cultural expectations of what is appropriate for women, men or gender-diverse individuals, often relying on gender stereotypes), gender identities (how individuals or groups perceive and present themselves in relation to gender norms, with most commonly used categories including: woman, man, and non-binary or gender-diverse) and gender relations (how sex and gender shape social interactions in families, schools, workplaces and public settings, often involving power relations). As such, gender can be an important aspect of research and design.

- **_Intersectionality_** describes overlapping or intersecting categories such as gender, ethnicity/racial origin, age, socioeconomic status, sexual orientation and geographic location, that compound to determine the identities and experiences of individuals. Researchers and innovators should not consider gender in isolation. Gender identities, norms and relations both shape and are shaped by other social attributes.

Why is the gender dimension important?

An increasing body of studies shows that the quality, reproducibility and accountability of research and innovation are affected by not taking into account sex and gender analysis. And in many fields, it is crucial to explore whether research outcomes may affect women and men differently. For instance:

- Why do we observe differences between women and men in infection levels and mortality rates in the COVID-19 pandemic? Does it make sense to study cardiovascular diseases only on male animals and on men, or osteoporosis only on women? And did you know that pheromones given off by men experimenters, but not women, induce a stress response in laboratory mice sufficient to trigger pain relief?

- Did you know that many aspects of taxation have a substantial effect on gender-related socioeconomic inequalities, but that when designing tax laws, policymakers still rarely consider gender inequalities?

- Does it make sense to design car safety equipment only on the basis of male body standards?

- Did you know that almost 3/4 of women Internet users worldwide have experienced some form of cyberviolence?

- Why do household travel surveys, and thus mobility analysis and transport planning, underrate trips performed as part of caring work, which are predominantly undertaken by women?

- Is it ethical to develop AI products that could spread gender and racial biases due to a lack of diversity in the data used in training AI applications?

- Did you know that climate change is affecting sex determination in a number of marine species and that certain populations are now at risk of extinction?

Integrating sex and gender analysis into R&I content **improves the scientific quality and societal relevance of the produced knowledge, technologies and innovation**. It:

- adds value to research and innovation in terms of excellence, creativity, rigor, reproducibility and business opportunities

- helps researchers and innovators question gender norms and stereotypes, and rethink standards and reference models

- leads to an in-depth understanding of all people's needs, behaviours, and attitudes

- contributes to the production of goods and services better suited to new markets

- is crucial to secure Europe's leadership in science & technology and support inclusive and sustainable growth.

Therefore, when drafting a proposal, you should in particular:

- ➢ **Reflect on why sex and/or gender could matter**: Think about and present the ways in which taking into account the gender dimension will provide added value in terms of creativity, excellence, and return on investment, both from public and private perspectives.

- ➢ **Consider the production of new knowledge on gender**: Consider what is already known in your area in terms of the gender dimension (*e.g. related scientific literature*) and identify what is missing. In many areas, gender knowledge still needs to be generated.

- ➢ **Include sex and gender aspects as part of a multidisciplinary approach**: Reflecting on sex and gender considerations in relation to health, transport, energy, security, etc. is

a great opportunity to foster cooperation between scientists with gender expertise and others. It helps concepts cross the borders of scientific fields and encourages research methods to evolve.

➢ **Consider social categories/factors intersecting with sex and gender**: the way a research problem is formulated will determine which intersecting variables are relevant for analysis. Intersectional research should be designed to illuminate the multiplicative effects of different, but interdependent, categories and factors.

Guidance and concrete examples (including those mentioned above) on how to better integrate sex and gender based analyses into R&I content under Horizon Europe have been developed by the Commission's Expert Group on Gendered Innovations under the coordination of DG R&I's Gender Sector.

A full policy report has been prepared and is available to support applicants. Entitled *Gendered Innovations 2: How inclusive analysis contributes to research and innovation* and publicly released by the European Commission on 25 November 2020, it is available here[15], through the Europa website dedicated to gender equality policy in R&I.

The report contains: full definitions of terms; both general and field-specific methods for sex analysis, gender analysis and intersectional approaches; fifteen case studies covering health, climate change, energy, agriculture, urban planning, waste management, transport, artificial intelligence (AI) and digital technologies, taxation, venture funding, as well as COVID-19; and policy recommendations to address the global challenges, targeted impacts and key R&I orientations of the six Horizon Europe Clusters, as well as Mission Areas, and European partnerships.

More information and examples on how to integrate the gender dimension into R&I content in different fields of research and innovation may be found here:

- Website developed by the EU-supported Expert Group on Gendered Innovations, featuring latest material presented in the 2020 EC policy report *Gendered Innovations 2: How inclusive analysis contributes to research and innovation*, as well as previous case studies developed through EC support

- Factsheets:
   ◦ factsheet summarising the EC policy report's contents
   ◦ factsheet on the impact of sex and gender in the COVID-19 pandemic
   ◦ factsheet on gender and intersectional bias in AI
   ◦ factsheet on general provisions for gender equality under Horizon Europe

- MSCA-developed video on Understanding the gender dimension for MSCA projects

- GENDER-NET ERA-NET's online tool for integrating gender analysis into research (IGAR Tool)

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15) https://research-and-innovation.ec.europa.eu/news/all-research-and-innovation-news/gendered-innovations-2-2020-11-24_en

- ERC seminar on Sex and gender dimension in frontier research (16/11/2020)

- Interview of Commissioner Mariya Gabriel on the release of the new EC policy report on Gendered Innovations, in the Norwegian KILDEN online news magazine (25/11/2020)

- Nature magazine editorial on the release of the new EC policy report on Gendered Innovations and the new Horizon Europe requirements on the integration of sex and/or gender analysis (09/12/2020)

- See also: Tannenbaum, C., Ellis, R. P., Eyssel, F., Zou, J., & Schiebinger, L. (2019). Sex and gender analysis improves science and engineering. Nature, 575(7781), 137-146.

10. Social Science and Humanities (SSH)

SSH in the R&I chain

Under Horizon Europe, the effective integration of social SSH in all clusters, including all Missions and European partnerships, is a principle throughout the programme. The aim of SSH integration is to improve our assessment of and response to complex societal issues. Thus, SSH are a key constituent of research and innovation, especially regarding the twin green and digital transitions.

Therefore, where relevant, the R&I chain should **include contributions from SSH disciplines** such as sociology, economics, psychology, political science, history, cultural sciences or/and the arts. *See the list of SSH disciplines below*.

Project requirements - SSH flagged topics

Many topics invite contributions from the SSH, often in collaboration with non-SSH disciplines such as natural and physical sciences, health sciences or technology. These topics have been 'flagged' and can be found on the Funding & Tenders Portal.

Proposals under these topics are expected to integrate the SSH perspective (social, economic, behavioural, institutional, historical and/or cultural dimensions etc), as appropriate. Applicants should therefore ensure that:

- contributions from SSH disciplines are integrated throughout their proposed project, and

- the actions required, participants and disciplines involved as well as the added value of SSH contributions are clearly stated in the proposal.

The SSH methodologies used in the projects should be described, or if the applicant consortium considers that SSH is not relevant to their particular proposal, they should explain why.

Where relevant, applicants are also encouraged to include contributions from the SSH in a project proposal under any call, even if it is not SSH-flagged.

Evaluation

When evaluating a proposal submitted to a topic that was 'flagged' for SSH contributions, experts will first refer to the topic description to identify what the expected contributions are. With this in mind, they will evaluate the contributions from SSH in the proposal, according to the criteria.

Experts should be mindful that a successful contribution from SSH, depending on the topic, may require collaboration among various SSH disciplines and/or between SSH and non-SSH disciplines.

A proposal without a sufficient contribution/integration of SSH research and competences will receive a lower evaluation score.

Even if proposals do not belong to a topic 'flagged' for SSH contributions, they may contain contributions from the SSH disciplines, which should be evaluated with other relevant aspects of the proposal.

List of SSH disciplines

Social sciences, education, business and law

Social and behavioural sciences: economics, economic history, political science, sociology, demography, anthropology (except physical anthropology), ethnology, futurology, psychology, geography (except physical geography), peace and conflict studies, human rights.

Education science: curriculum development in non-vocational and vocational subjects, educational policy and assessment, educational research.

Journalism and information: journalism, library and museum sciences, documentation techniques, archival sciences.

Business and administration: retailing, marketing, sales, public relations, real estate, finance, banking, insurance, investment analysis, accounting, auditing, management, public and institutional administration.

Law: law, jurisprudence, history of law.

Humanities and the arts

Humanities: religion and theology, foreign languages and cultures, living or dead languages and their literature, area studies, native languages, current or vernacular language and its literature, interpretation and translation, linguistics, comparative literature, history, archaeology, philosophy, ethics.

Arts: fine arts, performing arts, graphic and audio-visual arts, design, crafts.

The list is adapted from the UNESCO International Standard Classification of Education (ISCED 2011).

11. Social Innovation

Innovations originate from many sources. They stem not only from advances in science and technology, but also from creative uses of existing knowledge and technologies as well as inventiveness in the non-technical and social spheres.

Social innovation concerns the development of new products, methods, and services for and with society involving citizens, public authorities, business and industry, and academia — the Quadruple Helix — in their design, development, and implementation. Social innovation engages and empowers citizens, enhances the resilience of communities, increases the relevance, acceptance and uptake of innovation, and helps foster lasting changes in social practices, therefore acting as a system changer.

It thus helps answering societal and environmental challenges, connecting society with innovation.

Social Innovation in Horizon Europe

Social innovation has been identified as a cross-cutting specific issue in Horizon Europe and concerns all programme parts. Indeed, it holds potential to develop solutions answering at once multiple interconnected challenges. Moreover, embedding social innovation into the scope of a topic enhances the chances of uptake of the results of the project by involving intended users from the beginning of the project to listen to them, understand their needs, and benefit from their knowledge and creativity. Therefore, it increases the delivery of the outcomes and impact expected from the project.

In Horizon Europe, social innovation will serve the environmental, economic, digital, cultural, sovereignty, and democratic priorities set by the von der Leyen Commission. In particular, social innovation will support changes towards socially, environmentally, and economically sustainable social practices. More specifically, the integration of social innovation on Horizon Europe is relevant to address global challenges – including in areas such as health and care, also in the light of the COVID-19 pandemic, the twin green and digital transitions, climate change mitigation and adaptation or citizen engagement and deliberative democracy.

The above has been reflected by flagging specific topics and encouraging applicants to consider social innovation as a way to meet the topic's objectives, and by dedicating topics to social innovation.

Reference Documents
- Bureau of European Policy Advisors, Empowering people, driving change, 2011, p. 9.
- Oslo Manual, 2018, p. 252.

12. Ethics and integrity

For all activities funded by the EU, the ethical dimension is an integral part of research from beginning to end, and ethical compliance is seen as pivotal to achieve real research excellence. There is a clear need to make a thorough ethical evaluation from the conceptual stage of the proposal not only to respect the legal framework but also to enhance the quality of the research. Ethical research conduct implies the application of fundamental ethical principles and legislation to scientific research in all possible domains of research. This includes the adherence to the highest standards of research integrity as described in the European Code of Conduct for Research Integrity.

The process to assess and address the ethical dimension of activities funded under Horizon Europe is called the **Ethics Appraisal Procedure.**

Objectives

In addition to the scientific evaluation focusing on the scientific merit, the quality of the management and the potential impact, the Ethics Appraisal ensures that all research activities carried out under Horizon Europe are conducted in compliance with fundamental ethical principles.

Ethics Appraisal Procedure

The Ethics Appraisal Procedure concerns all activities funded in Horizon Europe and includes the Ethics Review Procedure, conducted before the start of the project, as well as Ethics Checks, Reviews and Audits conducted during the project.

When preparing a proposal, it is required to conduct an Ethics Self-assessment starting with the completion of an **Ethics Issues Table**. You can read further practicalities in the How to complete your ethics self-assessment guide.

Ethics Review Procedure

All proposals above threshold and considered for funding will undergo an Ethics Review carried out by independent ethics experts. The Review starts with the Ethics Screening which can include, in the cases where there is no ethics issue identified in the proposal, a pre-screening to confirm or not the absence of ethics issues (this check can be conducted by qualified staff). If appropriate a further analysis called the **Ethics Assessment** is conducted. The Ethics Assessment can lead to **ethics requirements** that become **contractual obligations**.

The Ethics Review Procedure focusses on the compliance with ethical rules and standards, relevant European legislation, international conventions and declarations, national authorisations and ethics approvals, proportionality of the research methods and the applicants' awareness of the ethical aspects and social impact of their planned research.

The ethics review covers issues as:

- human rights and protection of human beings
- animal protection and welfare
- data protection and privacy
- health and safety
- environmental protection
- artificial intelligence

It may also cover issues of research integrity, including, fabrication, falsification and plagiarism in proposing, performing, or reviewing research or in reporting research results; this includes misrepresenting credentials and improprieties of authorship.

Ethics Screening

The Ethics Screening is carried out during the scientific evaluation or soon after. The ethics experts are asked to flag the proposals that have serious or complex issues (on the basis of the Guidelines on serious and complex ethics issues) that will be the subject of a more in-depth analysis (Ethics assessment). Proposals involving the use of human Embryonic Stems Cells (hESCs) or human Embryos (hE) automatically proceed to the second step, the Ethics Assessment.

Further to the Ethics screening, the proposals that will be funded and are not flagged as serious or complex must handle the ethics issues in the proposed activities in line with National and European legislation and practice and the How to complete your ethics self-assessment guide. The ethics summary report will list the main ethics issues identified in your proposal. Ethics screening will not issue ethics requirements but can lead to the obligation to nominate an external independent ethics advisor or board to assist the project in adhering to the relevant ethical and legal standards.

Ethics Assessment

For the limited number of proposals flagged as serious or complex and for all the proposals involving the use of hESCs or hE, the Ethics Screening is followed by an Ethics Assessment prior to the signature of the grant agreement.

The Ethics Assessment is an in-depth analysis of the ethical issues of the proposals, taking into account the analysis made during the Ethics screening. The Ethics Assessment can lead to ethics requirements that are inserted as obligations in the grant agreement.

If the proposal undergoes an Ethics Assessment, you will receive an ethics summary report with an ethics opinion on your proposal. The possible outcomes of the ethics assessment are:

1. **Ethics clearance**

    The ethics issues are appropriately addressed. The ethics section in the proposal can be transferred mostly unchanged to the ethics section in Part B of the description of the action (DoA).

2. Conditional ethics clearance

In this case clearance is subject to conditions. Your ethics summary report will list one or more 'ethics requirements'. These may include:

- regular reporting to the Commission or the agency concerned

- appointing an independent ethics advisor or ethics board (possibly with a task to report on compliance with ethics requirements)

- supplying further information/documents

- adjusting methodology so as to comply with ethical principles and relevant legislation

Ethics requirements must be implemented during grant preparation or during the grant implementation.

- Ethics requirements **due before grant signature** normally require that you update the ethics section in the narrative part (Part B) of the DoA (Annex 1). However, other parts of Annex 1 may also be affected. Exceptionally, additional supporting documents may be required before the grant agreement can be signed.

- Ethics requirements **due after project start** are automatically included in the grant agreement in the form of 'ethics deliverables'.

Tasks of the coordinator or sole applicant:

- update the DoA whenever appropriate to address the ethics requirements and describe how they are to be met in the course of the project

- provide supporting documents if exceptionally requested before grant signature

- take into account any recommendations set out in the ethics summary report.

3. Request for additional information (intermediate outcome)

You may be asked to provide additional information if this is needed to complete the ethics assessment (*e.g. in case of serious or complex ethics issues or missing information*).

4. No ethics clearance

After the second ethics assessment, if your proposal is not given ethics clearance, it is not eligible for funding and will be rejected.

You will be informed of
- the decision to reject your proposal
- the reasons for the decision
- how you can appeal against it.

Ethics requirements and ethics work package

Ethics deliverables: All ethics requirements due after project start are automatically included in the grant agreement in the form of deliverables. These deliverables are known as 'ethics deliverables' and will be placed in an automatically generated work package called 'ethics requirements'.

Work package 'ethics requirements' - if applicable - is added to your grant agreement as soon as the ethics assessment has been completed. At this point in time it will appear as the last work package in the list of work packages (WP). During grant preparation you can move this WP to any other position in the list by drag & drop. It is recommended to keep the 'ethics requirements' WP at the end of the list where it will not affect the numbering of the other work packages.

Ethics checks, reviews and audits

During the Ethics Screening or the Ethics Assessment, the experts identify the projects that need an Ethics Check or Review, which are executed during the course of the research project. The procedure can also be initiated by the Commission services.

The objective of the procedure is to assist the beneficiaries to deal with the ethics issues raised by their research and if necessary to take preventive or/and corrective measures. The Ethics check is an internal check by the project officer or ethics officer who may be supported by ethics experts and the Ethics Review is an elaborate review and in-depth procedure carried out by up to 5 external ethics experts. They are both conducted on the basis of the information provided by the concerned beneficiaries, who may be invited to a meeting in Brussels to discuss the issues at stake. Onsite visits can also be organised during the Ethics Reviews.

In case of substantial breach of ethical principles, research integrity or relevant legislation, the Commission can carry out an Ethics Audit following the provisions and procedures laid down in the grant agreement.

The checks, post-grant reviews and audits can result in an amendment of the grant agreement. In severe cases, it can lead, upon the decision of the Commission services to a reduction of the grant, its termination or any other appropriate measures, in accordance with the provisions of the grant agreement.

Summary of the Ethics appraisal steps

Activity	Who?	When?	How?
Ethics Self-assessment	Applicant	Application phase	Consideration of ethical issues of the proposal
Ethics Screening	Ethics experts (and/or qualified staff in case a pre-screening is conducted)	Evaluation phase	Review of application material
Ethics Assessment (for proposals involving hESC/hE or flagged as serious or complex)	Ethics experts	Evaluation/ Grant preparation phase	Review of application material
Ethics check/review/audit	Project Officer and/or Ethics officer and/or Ethics experts	Implementation phase	Review of project deliverables/ interview with applicants/onsite visit

For assistance please contact us at the Ethics Review Helpdesk (select subject 13. Ethics in the enquiry form).

Reference documents

Rules & codes of conduct

- HE Framework Programme Regulation 2021/695: Eligible actions and ethical principles (Article 18) and Ethics (Article 19)

- HE Model Grant Agreement: Ethics (Article 14 and Annex 5)

- Statement by the Commission on research activities involving human embryos or human embryonic stem cells

- EU Charter of Fundamental Rights

- ALLEA European Code of Conduct for Research Integrity

- Global Code of Conduct for Research in Resource-poor Settings

General guidance

- How to complete your ethics self-assessment
- Guidelines on serious and complex ethics issues

Standard operating procedures

- Guidelines for Promoting Research Integrity in Research Performing Organisation
- Standard Operating Procedures for Research Integrity
- Data Protection Decision Tree

Domain-specific guidance

- Guidance note on potential misuse of research results
- Guidance note on research focusing exclusively on civil applications
- Guidance note on research on refugees, asylum seekers and migrants
- Ethics and data protection
- Ethics in Social Science and Humanities
- Position of the European Network of Research Ethics Committees (EUREC) on the Responsibility of Research Ethics Committees during the COVID-19 Pandemic
- Functional Magnetic Resonance Imaging
- Research Ethics in Ethnography/Anthropology
- Roles and Functions of Ethics Advisors/Ethics Advisory Boards in EC-funded Projects
- SIENNA Ethical guidance for research with a potential for human enhancement
- Guidelines on ethics by design/operational use for Artificial Intelligence

Ethics and Research Integrity Networks

- European Network of Research Ethics Committees – EUREC
- European Network of Research Ethics and Research Integrity – ENERI
- The Embassy of Good Science
- The European Network of Research Integrity Offices – ENRIO

13. Security

Activities carried out under the programme must comply with the applicable security rules and in particular, rules on the protection of classified information against unauthorised disclosure, including compliance with any relevant Union and national law. Where appropriate, the actions carried out under the Horizon Europe Programme must comply with Commission Decision (EU, Euratom) 2015/444, and its implementing rules. The Horizon Europe Model Grant Agreement includes specific security related obligations (Article 13 and Annex 5). The Horizon Europe Programme Security Instruction (PSI) has to be followed in case a proposal selected for funding will lead to a project that involves classified information.

The process to assess and address the security dimension of activities funded under Horizon Europe is called the **Security Appraisal Procedure**.

Security Appraisal Procedure

The Security Appraisal Procedure concerns all activities funded under Horizon Europe and includes three main steps: the Security Self-assessment, performed by the applicants at the proposal preparation stage, the Security Review Procedure, conducted before the start of the project, as well as the Security checks, conducted during or after the life of the project.

Security Self-assessment

When preparing a proposal to be submitted under any of the Horizon Europe calls, the applicant is required to conduct a Security Self-assessment starting with the completion of a Security Issues Table. In case the proposal is submitted under a call or topic, which is a priori flagged by the Commission as security sensitive, the applicant is also required to complete a Security Section. Further information and guidance can be found in the *How to handle security-sensitive projects* guide.

Security Review

Only proposals above threshold and considered for funding will undergo a Security Review carried out by granting authority and Commission qualified staff, as well as by national security experts.

The Security Review includes three steps: the Security Pre-screening performed by the granting authority, the Security Screening performed by the Commission and the Security Scrutiny conducted by national security experts. The Security Review is organised based on whether the call or topic, under which a proposal is submitted, is security sensitive or not and it can lead to security requirements that become contractual obligations.

The Security Review Procedure focusses on the compliance with security rules and in particular, on the protection of sensitive and classified information against unauthorised disclosure. The objective of the Security Review is to identify and address security issues that could emerge from the research by adopting appropriate mitigation measures.

Security Pre-screening

The first phase of the Security Review Procedure, the Security Pre-Screening, is carried out by qualified staff of the granting authority, during the scientific evaluation or soon after, in the following cases:

- If the proposal has been submitted under a call or topic not flagged as security sensitive and the applicant has replied positively to at least one of the questions in the Security Issues table.

- If the proposal has been submitted under a call or topic not flagged as security sensitive and the applicant has replied negatively to all the questions in the Security Issues table, but the granting authority has, nevertheless, detected security issues.

Security Screening

The Security Screening is performed by qualified staff of the Commission. All the proposals that have gone through the Security Pre-screening will be automatically sent to the second phase of the Security Review. During this phase, the Commission (DG HOME) will assess the results of the pre-screening and decide whether the launch of the third phase of the procedure, the Security Scrutiny, is needed.

Security Scrutiny

The Security Scrutiny is the last phase of the Security Review and it is conducted by the Security Scrutiny Group, comprised of national security experts appointed in close cooperation with the relevant Programme Committee and the competent National Security Authorities. It is chaired by the Commission. The Security Scrutiny will be carried out prior to the signature of the grant agreement in the following cases:

- Automatically, if the proposal has been submitted under a call or topic flagged as security sensitive.

- In other cases, if the Security Screening has concluded that the proposal is very likely to raise security issues for which mitigation measures should be proposed.

The **objective of the Security Scrutiny** is to identify security concerns in a certain proposal, assess if sensitive or classified information will be used or produced by a certain project, verify whether the security issues have been properly addressed by the applicant and propose recommendations in order to properly address the identified security issues. The purpose of the Security Scrutiny is to address potential misuse of project results (e.g. results that could be channelled into crime or terrorism or results that could adversely affect critical infrastructure). For additional information, *see the Guidance note on potential misuse of research*. The information is classified according to the *Guidelines on the classification of information in Horizon Europe projects*.

The Security Scrutiny may result in **security requirements** that, in principle, will have to be fulfilled by the beneficiaries before the signature of the Grant Agreement. The security requirements may include limiting the dissemination level of certain deliverables for security

reasons, classifying certain deliverables or other security recommendations. Other security recommendations may include appointing a Project Security Officer, establishing a Security Advisory Board, ensuring that personnel has followed security trainings, limiting the level of detail, using a fake scenario, excluding the use of classified information, adjusting the scope of a certain work package etc.

As the result of the Security Scrutiny a security summary report will be produced. It will contain the security opinion and security recommendations. It will be provided to the applicants at the stage of the grant preparation in order to implement the security requirements.

The possible outcomes of the Security Scrutiny are:

a) No security concern

No security issues were identified in the proposal. No need for the Grant Agreement to include a security section.

b) Security recommendations and/or security classification

The security summary report will list one or more security requirements. These requirements should be set out in the security section of Part B of the DoA of the Grant Agreement and may include:

- security recommendation to limit the dissemination level of certain deliverables for security reasons

- classification of certain deliverables at a certain level (the classification levels applied in Horizon Europe research projects are RESTREINT UE/EU RESTRICTED, CONFIDENTIEL UE/EU CONFIDENTIAL and SECRET UE/EU SECRET)

- appointment of a Project Security Officer in case of classified deliverables

- establishment of a Security Advisory Board

- other security recommendations.

The security requirements must be **implemented** during grant preparation and **before grant signature**. You will be required to update the security section in the narrative part (Part B) of the DoA (Annex 1). In certain exceptional cases, security requirements will be implemented during the grant implementation, *e.g. issue of Personnel Security Clearance*.

c) Proposal too sensitive to be funded

The Security Scrutiny may reveal that the information to be used or generated by the project is too sensitive, or that the applicants lack the right experience, skills or authorisations to handle classified information at the appropriate level. In such cases, funding is refused and the proposal is rejected.

If this happens, your report will contain the following information:

- the decision to reject your proposal;
- the reasons for the rejection, except if they are classified;
- the way to appeal against it.

Security Checks

Where appropriate, the Commission or the relevant funding body may carry out security checks.

Reference documents

Rules

- HE Framework Programme Regulation 2021/695: Security (Article 20)
- HE Model Grant Agreement: Confidentiality and security (Article 13 and Annex 5)
- Commission Decision 444/2015 on the security rules for protecting EU classified information
- Commission Decision 2021/259 on implementing rules for classified grants
- Commission Recommendation on internal compliance programmes for controls of research involving dual-use items

Guidance

- How to handle security-sensitive projects
- Guidelines on the classification of information in Horizon Europe projects
- HE Programme security instruction (PSI)
- Guidance note on potential misuse of research results
- Guidance note on research focusing exclusively on civil applications

14. Dissemination and exploitation of research results

Under Horizon Europe, beneficiaries must engage in dissemination and exploitation activities regarding their results.

Dissemination means the public disclosure of the results by appropriate means (other than resulting from protecting or exploiting the results), including by scientific publications in any medium.

Exploitation means the use of results in further research and innovation activities other than those covered by the action concerned, including inter alia, commercial exploitation such as developing, creating, manufacturing and marketing a product or process, creating and providing a service, or in standardisation activities.

Experience shows it is not always easy to meet these goals. As an applicant, it is useful to keep in mind the following:

- At the stage of forming the consortium, before submitting your proposal, attention should already be paid to eventual and expected results, ownership issues and the associated intellectual property rights (IPR) with a view to disseminating and exploiting the results efficiently.
  - The consortium agreement sets the framework for successful project implementation and results exploitation including intellectual property management, and is meant to settle where already possible all issues that might hamper the smooth and seamless cooperation of the different actors for the different parts of the project.
  - Having a consortium agreement with clear IPR management and ownership rights between the consortium members can maximise the exploitation potential of the project's results.
  - The consortium agreement should in principle be negotiated and concluded before signing the grant agreement, and should complement the grant agreement but must not contain any provision contrary to it.
  - The consortium agreement is a private agreement between the beneficiaries setting out the rights and obligations amongst themselves, and does not involve the Commission/Agency.

- The implementation of Horizon 2020 programme showed that beneficiaries often confused the concepts as dissemination, communication and exploitation. The guidelines below clarify the differences and can help the beneficiaries to apply the concepts in practice. In addition the EU offers a wide range of services to assist beneficiaries in dissemination and exploitation activities.

Guidelines for your dissemination, exploitation and communication activities

We suggest you take a step-by-step approach to dissemination, exploitation and communcation when developing your proposals for an application. These guidelines are not compulsory.

The dissemination and exploitation part

1. Prepare your planned summary for exploitation and dissemination activities carefully.

This must be a distinct part of your proposal (unless excluded by the call conditions). As it is too early to know what kind of results you will have, at this stage we only expect a planned summary for Dissemination and Exploitation (D&E) activities. Unless otherwise specified in the call conditions, you will be asked to submit a detailed D&E plan along with a plan for communication activities at the latest 6 months after the date of signature of your grant agreement.

In order to give you an idea of how these recommendations could be described in your proposal, we have devised an example of a project involved in water treatment:

1) Identify the problem/need to address

Example: in a context of pandemic, the current sand water treatment does not filter against viruses. It requires the use of iodine and chlorine which in large quantity may have an impact on health and the environment. Chlorine also has a taste that makes it unpleasant for the consumer who then resorts to bottled water.

2) Check what is the current offer (*e.g. competition*)

Example: The market usually offers:
- Reverse Osmosis (R.O.) Membranes   - Ultrafiltration (U.F.) Membranes
- Micro-Filtration (M.F.) Membrane   - Nano-Filtration (N.F.) Membrane

3) What is the added value of your research/technology/methodology

Example: using techniques issued from biomimetics, to filter the water and combat the viruses like live organisms do in nature

4) Identify the Key Exploitation Result(s) (KER)

Example: our KER will be an eco-friendly biomimetic membrane for filtering water thereby removing 99% of viruses in water treatment plants.

5) Explain what the outcome is (do not confuse it with the expected impact to be addressed in the canvas of the application)

Example of the outcome: We would like to create a filtering membrane to treat tap water. At the end of the project, the technology should be used by 10 water treatment plants.
The expected impact will be: For companies and water treatment plants, our technology is expected to reduce the costs in the long run (after the initial investment) and the use of chemical product to treat the water. We plan on testing the technology in X region(s) of the EU and this environmental friendly technology should encourage help reducing the use of plastic bottles by consumers who would then drink tap water.

6) Identify the target groups (early adopters)

Example:
Target group: water treatment equipment manufacturers (filter manufacturers)
End users: water treatment plants that have been approached by the consortium and agreed to test the technology

7) Describe some dissemination measures and channels to reach out to your target audience

Example of dissemination measures:
Organising visits for potential investors and/or B2B to the demo plant
Participation in events such as trade fair dissemination to increase awareness of our project amongst target user base, including international conferences on water management & environment

8) Describe some exploitation measures
  - Realize a Demo plant to show the UVP (Unique Value Proposition) of the novel solution
  - Establish contacts with industry (B2B) *e.g. scan main players in the water treatment and gather information about the dynamics of each of the target markets*
  - Reach out to end-users (regional water authorities, consumers) identified during the dissemination activities to redefine/improve features of the product
  - Organise testbeds with end users (public authorities, companies in water treatment, citizens)

9) How your results can feed back to policy making and how it contributes to EU priorities
  Example:
  Water treatment would contribute to higher quality of tap water at a lesser cost with a better taste and the guarantee of a safer product (free of viruses), thereby encouraging citizens to drink tap water instead of bottled water, and reducing the impact on the environment, thereby contributing to the green deal. We will reach out to the local authorities to raise their awareness and get their support. We will implement a mapping of stakeholders at the local governmental level. For that we can rely on indicators as level of interest in water management but also Go-to-market service from Horizon Results Booster. We will create a white paper to be distributed to regional water authorities from the region of A and B (where we intend to run the tests)

2. Involve potential end-users and stakeholders in your proposal.

If they're committed from early on, they may help guide your work towards specific qualities and applications of your results. End-users could come from the regional, national and international networks of the partners in your consortium, or from the value chains they operate in. They could be involved as partners in the project, or, throughout its duration, as members of an advisory board or user group tasked with co-creating and testing the results and providing feedback. In the case your project aims at providing policy recommendations, you may want to approach policy makers from local/regional/national authorities, or regulatory bodies in order to design your research project bearing in mind their needs from the start, and to actively involve them during the project to integrate their feedback and know their potentially evolving policy needs.

3. Say how you expect the results of your project to be exploited/further developed and give the main advantages of the new solution(s) you expect to emerge.

The results could be for example: a manual, test, model, new therapy, better product or process, or improved understanding of mechanisms **and advantages** for reduced material or energy usage, improved safety, or better-trained staff.

Explain how you expect results like these to be exploited. This could also depend on progress elsewhere in an innovation chain, in related projects or in adjacent fields - so outline these dependencies and any progress to be made in these areas.

4. Link your proposal to the policy context of the call for proposals.

Think of how your project's results will contribute to the outcomes specified in the calls and topics and how they are linked with the wider impact, in the longer term, specified in the respective destinations in the work programe. Consider the following questions:

- What are the objectives of your project?
- Why and how they can be important in view of work programme?
- What target audience (user communities? Parts of the society?) would benefit?
- Is it clear how the effects of your project can contribute to the outcomes or wider impact?

5. Implement open science practices

Think of use, ownership and access rights.

Open science practices are addressed and evaluated under 'excellence' as they are considered a part of the methodology. However, open access in particular also results in the broad dissemination of knowledge and is relevant in the context of dissemination.

Providing open access to peer-reviewed publications is mandatory in Horizon Europe, when peer-reviewed publications are produced. Open access to generated research data is required under the premise 'as open as possible as closed as necessary', meaning that there can be exceptions to this. Data management plans are mandatory for all projects generating or reusing data and should be aligned with the D&E plan. Additionally, we recommend that you provide open access to research outputs beyond publications and data (*e.g. software tools, models, apps, etc*) and share them as early and openly as possible providing guidance for potentially interested users. Costs for providing open access to publications and data are eligible and should be budgeted in the proposal.

Please consult the relevant sections under 'open science' for guidance on all of the above and the Annotated Grant Agreement for further guidance regarding the requirements.

6. Show you understand the barriers to any exploitation of your results. How will you tackle them? Possible obstacles may include:

- inadequate financing
- skills shortages
- other R&I work within and beyond Horizon Europe
- regulation that hinders innovation[16]
- intellectual property right issues
- traditional value chains that are less keen to innovate
- incompatibility between parts of systems (lack of standards)
- mismatch between market needs and the solution
- user behaviour

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16) See Innovation Principle, a tool to ensure that EU policies and legislation support innovation

Your proposal should show you understand these impediments and how you will tackle them. You may involve in your projct experts in economics, business, marketing and public administration that could help to overcome barriers.

7. Think ahead. Once your research and innovation is complete, will you need to take further steps to apply it in actual practice?

Examples of further steps: standards to be agreed on, financing the testing and prototyping, scaling up or production, promoting acceptance by consumers or other partners in a value chain. Policymakers may also establish follow-up steps to integrate the results into policies. You could also consider support schemes for follow-up steps, *e.g. national programmes, EIC, InnovFin and Invest EU schemes Regional Funds, Enterprise Europe Network (EEN), European IPR Helpdesk, European exploitation support schemes (more on ESIC in the Work Programme), Horizon Results Platform, or Horizon Results Booster services*.

The communication part:

Since EU grants are financed by public funds, beneficiaries are generally expected to actively engage in communication activities, to promote the projects.

Communicating and promoting the project

What does communication involve?

Communication activities must already be part of the proposal and be described in the draft Dissemination and exploitation plan including communication activities which is an admissibility criterion.

A good communication plan should define clear objectives (adapted to various relevant target audiences) and set out a description and timing for each activity.

With your communication activities you should draw the attention of general and specialised audiences to the EU policy area addressed by the call.

Good communication

- Starts at the outset of the action and continues throughout its entire lifetime.

- Is strategically planned and not just ad-hoc efforts.

- Identifies and sets clear communication objectives (*e.g. have final and intermediate communication aims been specified? What impact is intended? What reaction or change is expected from the target audience?*).

- Is targeted and adapted to audiences that go beyond the project's own community, including the media and the public.

- Chooses relevant messages (*e.g. how does the action's work relate to our everyday lives? Why does the target audience need to know about the action?*).

- Uses the right medium and means (*e.g. working at the right level — local, regional, national, EU-wide; using the right ways to communicate — one-way exchange (website, press release, brochure, etc) or two-way exchange (exhibition, school visit, internet debate, et.); where relevant, include measures for public/societal engagement on issues related to the action*).

- Is proportionate to the scale of the action.

Strategy for intellectual property management

Applicants must outline their strategy for the management of intellectual property (IP), including intended protection measures (if relevant) and how these would be used to support exploitation in the proposal (section on impact).

Particularly in the case of projects aimed at economic and societal exploitation, the strategy for IP management must be commensurate with the desired outcomes and impacts. Hence, a weakness or failure to submit such a strategy would also need to be reflected in the proposal evaluation (scoring) with view to the 'credibility' of the envisaged impact pathways.

Results ownership

What is the ownership of results?

The owner of results is the natural or legal entity that has generated the results.

Results are defined as any tangible or intangible effect of the action, such as data, know-how or information, whatever its form or nature, whether or not it can be protected, as well as any rights attached to it, including intellectual property rights.

When do you have to address the ownership of your results?

The ownership of potential results should be addressed very early by the consortium members when preparing the proposal.

Why does the results ownership matter?

Horizon Europe has the specific objective to strengthen the deployment and exploitation of innovative solutions. This objective calls for transparency and clarity in terms of results ownership.

The lack of clarity on the ownership of results can be one of the main obstacles for exploitation and commercialisation, especially for SMEs. Clarity of results ownership is a critical factor for attracting investors. Beneficiaries should also clarify their freedom to operate without infringing on intellectual property owned by third parties that might require specific action (*e.g. licencing*) to fully exploit the own intellectual property.

More practically speaking, it is important that potential future consortium members decide on the ownership of results when drafting the proposal to simplify their lives as beneficiaries. Indeed, beneficiaries must indicate the owner(s) of the results in the final periodic report of the Horizon Europe project in the so called Results Ownership List. If the ownership of results has not been carefully thought through at the proposal phase, beneficiaries may face difficulties in filling in the Results Ownership List at the reporting stage. Knowing that failure to fill in the Results Ownership List will block the submission of the final periodic report and hence the payment, dedicating sufficient time on the allocation of the ownership of results at the proposal phase will avoid hurdles at the end of the project.

Standardisation

What is standardisation?

A standard is a document that sets the technical requirements of a product, service or process and its use. Standards are adopted by recognised standardisation bodies (such as ISO, CEN, CENELEC, ETSI, and many more). In these organisations, representatives from industry, research, governments and civil society, discuss and agree on what should be a standard. Once a standard is published, its use is normally voluntary but in some cases certain specific standards can be made mandatory by law.

In other words, standards form a common language that allows researchers, people, public institutions and industry to communicate, produce and commercialise products and services in a harmonised manner. This is especially important in the European single market.

Why is it important to consider standardisation when drafting a proposal?

Standards play an important role in the valorisation of research & innovation results:

They help researchers bring their innovation to the market and spread technological advances by making their results transparent. In spreading the diffusion of new technologies, standards provide both economic opportunities, facilitate realisation of SDGs and give confidence to consumers that an innovative technology is safe.

They codify the technology requirements and inform both manufacturers and consumers on what to expect.

They allow technologies and materials to be interoperable: since a standard provides details on the use and content of a technology or a material, it is much easier to know when and how it can be used in combination with other technologies.

In other words, by codifying information on the state of the art of a particular technology, standards enable dissemination of knowledge (both within and outside the relevant industry community). Moreover, standards bridge the gap between research and products or services allowing the diffusion of the technology in the market and increasing the probabilities of

its take-up. Standardisation facilitates the deployment of new technologies, interoperability between new products and services. Innovations can more easily gain market acceptance and consumer trust if they comply with existing standards for safety, quality, performance and sustainability.

If the project is relevant for standardisation it is advised for applicants to involve standard development organisations in the consortium in order to facilitate the valorisation of project results through standardisation.

15. Do No Significant Harm principle

What is meant by the Do No Significant Harm principle in the context of Horizon Europe?

The Commission Communication on the European Green Deal[17] introduced green oath to 'do no harm'. The 'Do not Significant Harm' (DNSH) principle has been further specified in the EU Regulation on the establishment of a framework to facilitate sustainable investments[18], commonly defined as the 'EU Taxonomy Regulation'. Six environmental objectives are listed in Article 9[19] of the EU Taxonomy and Article 17 specifies what can constitute a 'significant harm' for these objectives:

1. An economic activity is considered to do significant harm to **climate change mitigation** if it leads to significant greenhouse gas (GHG) emissions;

2. An economic activity is considered to do significant harm to **climate change adaptation** if it leads to an increased adverse impact of the current climate and the expected future climate, on the activity itself or on people, nature or assets;

3. An economic activity is considered to do significant harm to the **sustainable use and protection of water and marine resources** if it is detrimental to the good status or the good ecological potential of bodies of water, including surface water and groundwater, or to the good environmental status of marine waters;

4. An economic activity is considered to do significant harm to the **circular economy**, including waste prevention and recycling, if it leads to significant inefficiencies in the use of materials or in the direct or indirect use of natural resources, or if it significantly increases the generation, incineration or disposal of waste, or if the long-term disposal of waste may cause significant and long-term environmental harm;

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17) COM (2019) 640, The European Green Deal.
18) The 'EU Taxonomy Regulation' refers to Regulation (EU) 2020/852 on the establishment of a framework to facilitate sustainable investment, by setting out a classification system (or 'taxonomy') for environmentally sustainable economic activities.
19) Climate change mitigation; climate change adaptation; sustainable and protection of water and marine resources; transition to a circular economy; pollution prevention and control; protection and restoration of biodiversity and ecosystems.

5. An economic activity is considered to do significant harm to **pollution prevention and control** if it leads to a significant increase in emissions of pollutants into air, water or land;

6. An economic activity is considered to do significant harm to the **protection and restoration of biodiversity and ecosystems** if it is significantly detrimental to the good condition and resilience of ecosystems, or detrimental to the conservation status of habitats and species, including those of Union interest.

References on the DNSH principle are included in the General Introduction of the Work Programme 2021-2022 of Horizon Europe Pillar II and in Cluster 4 (Digital, Industry and Space), Cluster 5 (Climate, Energy and Mobility), and Cluster 6 (Food, Bioeconomy, Natural Resources, Agriculture and Environment) because of their particular relevance for environmental outcomes and impacts.

At programming stage, the Horizon Europe work programme has been co-created to support research and innovation activities that respect climate and environmental priorities of the Union and cause no significant harm to them.

At project level, the reference to the DNSH principle in the Horizon Europe Work Programme is included in the application form (proposal part B template) to offer researchers the possibility to present the credential of their projects in relation to the DNSH principle. Applicants can refer to the DNSH principle when presenting their research methodology and the expected impacts of the project, to show that their project will not carry out activities that make a significant harm to any of the six environmental objectives of the EU Taxonomy Regulation listed above.

However, **evaluators will not score applications in relation to their compliance with the DNSH principle** unless explicitly stated in the work programme (currently, this is the case only for actions in the European Innovation Council Work Programme 2021).

16. Open science

Open science in Horizon Europe

Open science is an approach based on open cooperative work and systematic sharing of knowledge and tools as early and widely as possible in the process. It has the potential to increase the quality and efficiency of research and accelerate the advancement of knowledge and innovation by sharing results, making them more reusable and improving their reproducibility. It entails the involvement of all relevant knowledge actors.

Horizon Europe moves beyond open access to open science for which it features a comprehensive policy implemented from the proposal stage to project reporting. The Horizon Europe Regulation sets the legal basis for the open science obligations and incentives that apply to Horizon Europe beneficiaries. The Annotated Grant Agreement provides guidance on

how to comply with the open science obligations required in the Model Grant Agreement. **The present guide complements the information provided in the Annotated Grant Agreement, with a particular focus on the preparation of proposals**.

In Horizon Europe, open science practices are considered in the evaluation of proposals, under 'excellence' and under the 'quality and efficiency of implementation'.[20] There are mandatory open science practices, which are required for all projects through the Model Grant Agreement and/or through the work programme or call conditions, and recommended practices (all open science practices that are not mandatory). Recommended open science practices are incentivised through their the evaluation at the proposal stage. Proposers should be aware of both mandatory and recommended practices and integrate them into their proposals.

Open science practices include early and open sharing of research (for example through preregistration, registered reports, pre-prints, or crowd-sourcing); research output[21] management; measures to ensure reproducibility of research outputs; providing open access to research outputs (such as publications, data, software, models, algorithms, and workflows); participation in open peer-review; and involving all relevant knowledge actors including citizens, civil society and end users in the co-creation of R&I agendas and contents (such as citizen science).

These practices are explained and relevant resources provided in a separate section further below (open science practices and resources).

Mandatory open science practices

- Some open science practices are **mandatory for all beneficiaries per the grant agreement**. They concern:

  ◦ open access to scientific publications under the conditions required by the grant agreement;

  ◦ responsible management of research data in line with the FAIR principles of 'Findability', 'Accessibility', 'Interoperability' and 'Reusability', notably through the generalised use of data management plans, and open access to research data under the principle 'as open as possible, as closed as necessary', under the conditions required by the grant agreement;

  ◦ information about the research outputs/tools/instruments needed to validate the conclusions of scientific publications or to validate/re-use research data;

  ◦ digital or physical access to the results needed to validate the conclusions of scientific publications, unless exceptions apply;

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20) This does not apply to the ERC programme that does not include open science in the evaluation. It also does not include EIC transition calls for the WP 2021-2022 where open science practices are exceptionally evaluated under 'impact'.

21) These are results generated by the action to which online access can be given in the form of scientific publications, data or other engineered outcomes and processes such as software, algorithms, protocols and electronic notebooks.

○ in cases of public emergency, if requested by the granting authority, immediate open access to all research outputs under open licenses or, if exceptions apply, access under fair and reasonable conditions to legal entities that need the research outputs to address the public emergency[22].

These obligations are described in the Model Grant Agreement (Article 17) and detailed guidelines on complying with them are provided in the Annotated Grant Agreement (Article 17).

• Some open science practices are **mandatory per specific work programmes or call conditions**, which may provide for additional obligations to adhere to open science practices.

Recommended open science practices

These are open science practices beyond the mandatory ones, such as involving all relevant knowledge actors, including citizens, early and open sharing of research, output management beyond research data, open peer-review. This is a non-exhaustive list of practices that proposers are expected to adopt when possible and appropriate for their projects. Finally, certain work programme topics or call conditions may encourage specific additional open science practices.

Evaluation of open science practices

Open science practices are evaluated under the '**Excellence**' criterion (in particular under methodology) and under the '**Quality and efficiency of implementation**' award criterion. Proposers should address open science practices in the relevant section on open science under methodology[23].

Proposers will have to provide concrete information on **how** they plan to comply with the **mandatory open science** practices. Failure to sufficiently address this, will result in a lower evaluation score.

A clear explanation of how they will adopt **recommended practices**, as appropriate for their projects, will result in a higher evaluation score.

If proposers believe that none of the open science practices (mandatory or recommended) apply to their project, then they have to provide a **justification**.

Under the 'excellence' part of their proposals, in the section on methodology, proposers should describe how open science practices (mandatory and recommended, as appropriate) are implemented as an integral part of the methodology and show how their implementation

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22) The additional provision on access in cases of public emergency does not apply to the ERC.
23) The information in this section does not apply to the ERC programme, which does not include open science in the evaluation.

is adapted to the nature of their work, therefore increasing the chances of the project delivering on its objectives. Information relevant to the specific area of the proposal should be provided in no more than one page. If open science practices are not applicable to the proposal, justifications should be provided sp that, if evaluators agree, open science will not be taken into consideration in the evaluation. Additionally, proposers generating or reusing data should outline in a maximum of one (additional) page their plans for data management.

Under 'capacity of participants and consortium as a whole', proposers should describe how the consortium brings together the necessary disciplinary and inter-disciplinary knowledge. Proposers should show how this includes expertise and/or track record in open science practices, relevant to what is planned for the project. If justification has been provided that open science practices are not relevant for their projects, it is not necessary to demonstrate track record and expertise.

Finally, in **part A of their proposals**, proposers are asked to list up to five relevant publications, widely used datasets or other achievements of consortium members that they consider significant for the action proposed. Open access is expected for publications, in particular journal articles, while datasets are expected to be FAIR and 'as open as possible, as closed as necessary'. If publications are not open access, proposers are strongly encouraged to deposit them retroactively in repositories and provide open access to them when possible. The significance of publications will not be evaluated on the basis of the Journal Impact Factor of the venue they are published in, but on the basis of a qualitative assessment provided by the proposers for each publication.

How should you address open science practices in your proposal?

Make sure to read the Annotated Grant Agreement on the mandatory open science practices in combination with this guide[24].

Early and open sharing: Provide specific information on whether and how you will implement early and open sharing and for which part of your expected output. For example, you may mention what type of early and open sharing is appropriate for your discipline and project, such as preprints or preregistration/registration reports, and which platforms you plan to use.

Research data management (RDM): RDM is mandatory in Horizon Europe for projects generating or reusing data. If you expect to generate or reuse data and/or other research outputs (except for publications), you are required to outline in a maximum of one page how these will be managed. Further details on this are provided in the proposal template in the relevant section on open science. A full data management plan (DMP) is not required at submission stage. For those work programmes that require the use of the European Open Science Cloud (EOSC) federated repositories, proposers should explicitly discuss the use of such repositories in their proposals. By exception, in cases of a public

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24) The information in this section does not apply to the ERC programme, which does not include open science in the evaluation.

emergency and if the work programme requires so, you should submit a full DMP already with submission of proposals or at the latest by the signature of the grant agreement. A template for a DMP is provided under the reporting templates in the reference documents of the Funding and Tenders portal of the European Commission.

Reproducibility of research outputs: you should outline the measures planned in the project that tend to increase reproducibility. Such measures may already be interweaved in other parts of the methodology of a proposal (such as transparent research design, the robustness of statistical analyses, addressing negative results, etc) or in mandatory/non-mandatory open science practices (*e.g. the DMP, early sharing through preregistration and preprints, open access to software, workflows, tools, etc*) to be implemented. More detailed suggestions on good practices for enhancing reproducibility and resources in the relevant section below.

Horizon Europe requires information via the repository where publications and data have been deposited on any research output or any other tools and instruments - data, software, algorithms, protocols, models, workflows, electronic notebooks and others - needed for the re-use or validation of the conclusions of scientific publications and the validation and reuse of research data. Further, beneficiaries must provide digital or physical access to data or other results needed for the validation of the conclusions of scientific publications, to the extent that their legitimate interests or constraints are safeguarded[25]. More details on these requirements for reproducibility and guidance on how to meet them are provided in the AGA (article 17).

Open access: Offer specific information on how you will meet the open access requirements, that is deposition and immediate open access to publications and open access to data (the latter with some exceptions and within the deadlines set in the DMP) through a trusted repository, and under open licenses. You may elaborate on the (subscription-based or open access) publishing venues that you will use. You may also elaborate on the trusted repository/repositories through which open access to publications and research data will be provided (article 17). Open access to research data and other research outputs should be addressed in the section on research data management of your proposal. Research data should be open as a default, unless there are legitimate reasons for keeping them closed. On open access to data and the legitimate reasons for restricting access, consult the AGA (article 17).

As a general rule, open access to other research outputs such as software, models, algorithms, workflows, protocols, simulations, electronic notebooks and others is not required but strongly recommended. Access to 'physical' results like cell lines, biospecimens, compounds, materials, etc. is also strongly encouraged.

Open peer review: Anytime it is possible, you are invited to prefer open peer review for your publications over traditional ('blind' or 'closed') peer review. When the case, you should provide specific information regarding the publishing venues you envisage to make use of, and highlight the venues that would qualify as providing open peer review.

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25) This does not apply to ERC calls.

Citizen, civil society and end-user engagement: Provide clear and succinct information on how citizen, civil society and end-user engagement will be implemented in your project, where/if appropriate. The kinds of engagement activities will depend on the type of R&I activity envisaged and on the disciplines and sectors implicated.

This may include: *co-design activities* (such as workshops, focus groups or other means to develop R&I agendas, roadmaps and policies) often including deep discussion on the implications, the ethics, the benefits and the challenges related to R&I courses of action or technology development; co-creation activities (involving citizens and/or end-users directly in the development of new knowledge or innovation, for instance through citizen science and user-led innovation); and *co-assessment activities* (such as assisting in the monitoring, evaluation and feedback to governance of a project, projects, policies or programmes on an iterative or even continual basis).

The extent of engagement in the proposal could range from one-off activities alongside other methodological approaches to being the primary focus or methodological approach of the project itself. Engagement will require resources and expertise and is therefore often conducted by dedicated interlocutor organisations or staff with relevant expertise. More detailed information on these activities and useful resources developed over the course of Horizon 2020 can be found in the relevant section below.

Open science practices and relevant resources

Early and open sharing of research

'Early and open sharing' means making research work, methodologies, outputs, such as data and software, among others, and findings available as soon as possible in the research process. Examples of such early sharing include preregistration, registered reports and pre-prints. Early-sharing practices support reproducibility in the research and helps researchers secure precedence over their findings and/or conclusions.

Preregistration of the research plan in a public repository makes available the research hypothesis, study design and planned analysis before data is collected. Preregistration is assisted by dedicated platforms; it increases the transparency, credibility and reproducibility of the results and helps addressing publication bias toward positive findings.

Registered reports are research articles that are peer-reviewed and published in two stages. The study design and analysis plan including hypothesis and methodology undergo peer-review of the quality and suitability of the research question and protocol. If accepted, research protocols are preregistered (*see preregistration*) and the final research article is provisionally accepted for publication. After the research is conducted, an article containing the results and discussion as well as any changes is submitted and undergoes a second round of peer-reviewing. Registered reports reduce publishing bias for positive results as the acceptance for publication is based on the quality of the research, regardless of the outcome.

Preprints are scientific manuscripts that are publicly shared prior to peer-review and journal publication via preprint platforms. An increasing number of journals accepts sharing of

preprints prior to publication, but there are exceptions. Beneficiaries have to check the policy of their target journal to clear that a preprint will not pre-empt its publication.

Resources

ORION open science factsheets on preregistration, preprints and crowd science: https://www.orion-openscience.eu/public/2019-02/201810-VA-Orion-FactSheets-V5.pdf

The Centre for open science offers a wealth of resources on Registered Reports, including a list of journals that support them: https://www.cos.io/initiatives/registered-reports

Sherpa Romeo can be used to check the journal submission policy and if the posting of a preprint is considered as prior publication: https://v2.sherpa.ac.uk/romeo

Preregistration repositories (examples)

- OSF (domain-general preregistration repository service with multiple formats for preregistration)
- AsPredicted (domain-general registry service providing standardised preregistration template)
- Preclinicaltrials.eu (preclinical animal study protocols)
- PROSPERO (health and social care)
- Evidence in Governance and Politics (EGAP) (political sciences)
- Registry for International Development Impact Evaluations (RIDIE) (social sciences)

Preprint servers (examples)

- Zenodo – multidisciplinary;
- bioRxiv – Life sciences;
- PsyArxiv – Behavioural sciences;
- LawArXiv – Law;
- Preprints – multidisciplinary
- medRxiv – Medicine and health sciences;
- SocArXiv – Social sciences and humanities;
- ArXiv – o.a. physics, mathematics, computer science;

Research data management and management of other research outputs

Research data management (RDM) is the process within the research lifecycle that includes the data collection or acquisition, organisation, curation, storage, (long-term) preservation, security, quality assurance, allocation of persistent identifiers (PIDs), provision of metadata in line with disciplinary requirements, licencing, and rules and procedures for sharing of data. RDM is an essential element in any project that generates, collects or re-uses data. Planning ahead to data needs that proposers are likely to encounter during the project is a best practice. For example, provisions need to be in place to ensure that data is managed responsibly (*e.g. the right venue is chosen for deposition, adequate are issued, legal provisions such as General Data Protection Regulation (GDPR) are respected, etc*). Further,

data management should be in line with the FAIR principles[26], to ensure that researchers can find, access and re-use each other's data, maximising the effectiveness and reproducibility of the research undertaken.

RDM, in line with the FAIR principles is a requirement that should be carried out regardless of whether the data generated and re-used in the project is intended to be openly accessible, or if access restrictions are foreseen. FAIR data is not equivalent to open data (publicly available to everyone to access and reuse). Data can, and should be FAIR even when access is restricted.

RDM and the FAIR principles can be applied to research outputs other than data (*i.e. workflows, protocols, software, samples, etc*). Proposers are recommended to consider robust management practices for data and other research outputs as early as the proposal stage of their project.

Below are important elements and resources for RDM useful already at proposal stage.

Persistent identifiers (PIDs) are key in ensuring the findability of research outputs, including data. They are globally unique and long-lasting references to digital objects (*such as data, publications and other research outputs*) or non-digital objects such as researchers, research institutions, grants, etc. Frequently used persistent identifiers include digital object identifiers (DOIs), Handles, and others. For further reading on PID types, please refer to https://www.dpconline.org/handbook/technical-solutions-and-tools/persistent-identifiers.

To enhance the findability of research outputs, and their potential reuse, **standardised metadata frameworks** are essential, ensuring that data and other research outputs are accompanied by rich metadata that provides them with context.

To enhance the re-usability of research data, they must be licenced. For more information on the licences required for data under Horizon Europe, please refer to the AGA (article 17).

Trusted repositories assume a central role in the Horizon Europe for the deposition of and access to publications and research data. For a definition of trusted repositories in Horizon Europe please refer to the AGA (article 17). Proposers, with the help of data and research support staff (*e.g. data stewards, data librarians, etc*), should check whether the repositories that they plan to deposit their data have the features of trusted repositories, and justify this accordingly in their Data Management Plans.

Data management plans (DMPs) are a cornerstone for responsible management of research outputs, notably data and are mandatory in Horizon Europe for projects generating and/or reusing data (on requirements and the frequency of DMPs as deliverables consult the AGA article 17). A template for a DMP is provided under the reporting templates in the reference documents of the Funding and Tenders portal of the European Commission. Its use is

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26) FAIR data are data that are curated to satisfy the principles of findability, accessibility, interoperability, and reusability. For further reading: https://www.go-fair.org/fair-principles

recommended but not mandatory. DMPs are formal documents that outline from the start of the project all aspects of the research data lifecycle, which includes its organisation and curation, and adequate provisions for its access, preservation, sharing, and eventual deletion, both during and after a project. Writing a DMP is part of the methodology of the project, since good data management makes the work more efficient, saves time, contributes to safeguarding information and to increasing the value of the data among the beneficiaries themselves and others, during and after the research. DMPs are thus a key means of support when planning and conducting a research project, and, ideally, filling in a DMP should be started prior to the beginning of the project.

DMPs play a key role in helping researchers to adequately manage research outputs other than data and publications, also in line with the FAIR principles. Such research outputs may be physical or digital, and include original software created during the project, workflows, protocols, new materials such as samples, cell-lines, antibodies, among many others. DMPs should reflect an adequate management strategy for such outputs as well.

A DMP should be a living document, which is updated and enriched as the project evolves. Such updates might occur after attaining milestones related e.g. to the generation of new data or to reflect changes related to the original planning, changes in data/output access provisions or curation policies, changes in consortium practices (*e.g. new innovation potential, decision to file for a patent*), changes in consortium composition, etc.

A good practice regarding DMPs is to register them as a non-restricted public deliverables to make them openly accessible, unless legitimate reasons exist to keep them confidential. An additional good practice is to publish the DMP in specialised journals or publishing platforms such as RIO etc., or to deposit them in DMP-specific public repositories such as DMPOnline and others.

As practices with regard to data management, storage, and sharing differ widely across disciplines, the DMPs should reflect common disciplinary practices. In addition to domain specificities, DMPs across the board should address an overarching set of data-related requirements including those aspects related to making the data FAIR. Common aspects that need to be addressed in all DMPs include[27]:

- **Data set description:** a sufficiently detailed description of the data generated or re-used, including the scientific focus and technical approach to allow association of their data sets with specific research as well as information on data types and an estimate of the data set's size.

- **Standards and metadata:** the protocols and standards used to structure the data (i.e. fully reference the metadata) so that other scientists can make an assessment and reproduce the dataset. If available, a reference to the community data standards with

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27) These aspects are broadly in line with the requirements set forth in Science Europe's Practical Guide to the International Alignment of Research Data Management: https://www.scienceeurope.org/media/4brkxxe5/se_rdm_practical_guide_extended_final.pdf

which their data conform and that make them interoperable with other data sets of similar type.

- **Name and persistent identifier for the data-sets:** a unique and persistent identification (an identifier) of the data sets and a stable resolvable link to where the data sets can be directly accessed. Submission to a public repository normally provides this; many institutional repositories provide similar services.

- **Curation and preservation methodology:** information on the standards that will be used to ensure the integrity of the data sets and the period during which they will be maintained, as well as how they will be preserved and kept accessible in the longer term. A reference to the public data repository in which the data will be/is deposited with relevant consideration on whether the chosen repository meets the requirements of a trusted repository.

- **Data sharing methodology:** information on how the data sets can be accessed, including the terms-of-use or the license under which they can be accessed and re-used, and information on any restrictions that may apply or relevant security and privacy considerations. It is also important to specify and justify the timing of data sharing. On open access to research data see *below relevant section on open access*.

- **Output management, for research outputs other than data and publications:** The section on output management should show efforts to manage outputs in line with the FAIR principles, including a detailed description of the output, consider relevant metadata standards and the provision of PIDs when depositing the output, or its digital representation if it is physical. The plan should further detail the deposition, curation and preservation methodology foreseen, identifying the right home for the output, and it should set out an approach likely to maximise the re-use and adoption of the output by the wider research community. If the output is physical, the plan should indicate how it would be made available to potential users.

- **Costs and personnel related to RDM:** An estimation of costs related to RDM such as costs for data collection, data documentation, data storage, data access and security, data preservation, data availability and reuse as well as the person/team responsible for data management and quality assurance processes.

The European Open Science Cloud

The European Open Science Cloud (EOSC) aims to deploy and consolidate an open, trusted virtual environment to enable circa 2 million European researchers to store, share, process, analyse, and reuse research digital objects including data, publications and software across disciplines and borders. A European co-programmed Partnership approach for EOSC has been proposed for the period 2021-2030 (https://eosc.eu). It will bring together institutional, national and European initiatives and engage all relevant stakeholders to deploy a European Research Data Commons where data are Findable, Accessible, Interoperable, Reusable (FAIR). This European contribution to a Web of FAIR Data and Related Services for Science will support open science in a deepened European Research Area and provide the basis for the

research and innovation data space foreseen in the European Strategy for Data.

Certain work programmes may require the use of trusted repositories that are federated in EOSC for depositing research data. In that case, data must be deposited in repositories which are registered to the EOSC and support (implicitly or explicitly) the FAIR principles. An initial offering of EOSC resources and services can be found from the EOSC Portal. This offering is expected to continue growing in function of the EOSC rules of participation.

Resources
Metadata standards and Research Data Management guidelines

- The FAIRsharing portal with information and resources on data standards, databases, and policies in the life sciences and other scientific disciplines.

- DM guidelines and good practices for the Life Sciences, the Social Sciences and the Humanities provided by relevant research infrastructures, ELIXIR, CESSDA and DARIAH, respectively along with relevant data resources and repositories/databases.

- For more information on disciplinary metadata standards, visit Digital Curation Centre and Research Data Alliance Metadata Standards Directory.

DMP

- A template for the Horizon Europe DMP is provided A template for a DMP is provided under the reporting templates in the reference documents of the Funding and Tenders portal of the European Commission.

- The RDA FAIR Data Maturity Model Working Group delivers a detailed annotated list of indicators to address when increasing the FAIRness of data.

- For developing DMPs: The DMPONLINE tool (supports the development of project DMPs); ARGOS (online tool); the Data Stewardship Wizard, a joint ELIXIR CZ and ELIXIR NL tool, helps researchers understand what is needed for FAIR-oriented data stewardship, and build their own Data Management Plans.

- The Science Europe Practical Guide to the International Alignment of Research Data Management contains detailed guidance for drafting and evaluating DMPs.

Repositories

See resources under 'open access to research outputs' section below.

Measures to ensure reproducibility of results
Reproducibility is the possibility for the scientific community to obtain the same results as the originators of specific findings. Reproducibility of some or all results is important as it increases the performance of research & innovation (wider use of research results); it limits waste of resources (less duplication and fewer false baselines); it increases the quality and the reliability of research (stronger methods, controls and reporting); and, as a result, it may

increase the trust of citizens in science. Therefore, reproducibility is integral part of 'Excellence'; we expect the results of Horizon Europe to be reproducible, and planning should start at proposal stage to make results reusable and reproducible.

Below is a list of practices which tend to increase reproducibility. Some of them may already be required by the MGA (for example DMP, FAIR) or by specific calls and proposers may interweave such practices in various parts of the methodology section as appropriate:

- Specify with precision and no ambiguities the research design and the methodologies that you will be applying.

- Specify how you will deal with negative results, if any, so that others can lean from your project regarding of its outcomes.

- Make prior searches and checks on existing results and data to ensure you are not duplicating unnecessarily.

- Specify how you are making use of pre-prints, preregistration of protocols and registered reports (*see above, 'Early sharing of research results'*), to ensure that your method and research questions are accountable, if applicable.

- Detail the steps you will take to make your research process and tools (software, materials, protocols, flows, ...) transparent and available during and after the research.

- Mention the steps, if any, that you will take to ensure the validity and the quality of the project's process and results (*e.g. peer review, knowledge sharing, independent testing, supervision, quality control mechanisms*).

- Plan to use the DMP to the full extent possible to detail the assets and materials underlying your data collection and analysis (*see above, 'DMP'*).

- Ensure that your data are FAIR so that others can find them and re-use them to reproduce your results (*see above, 'FAIR'*).

- Specify how you will ensure robust statistical analysis, that can be repeated (power of sample, robust experimental techniques, open software, ...).

- Specify what 'common assets' for research & innovation your project will be building, if any, including knowledge bases, methodologies, evaluation frameworks, ontologies, open repositories, etc.

- Make provisions to validate, demonstrate, make interoperable, scale-up and overall make replicable the results of your R&I activities.

- Consider whether your project will produce digital copies of your results, *e.g. Digital Twins, virtual bodies, digital blueprints, that increase the likelihood of re-use and reproducibility*.

Resources

- An extensive list of resources is provided by the Centre for open science

- Information and resources provided by networks focusing on reproducibility, for example in the UK, Germany, Switzerland

- Guidelines and toolkits on reproducibility, especially specific to your field (*e.g. in biomedical research*).

Open access to research outputs

Open access is online access at no cost for the end user of research outputs such as scientific publications, data or other engineered outcomes and processes (*e.g. software, models, algorithms, protocols and electronic notebooks*). Open access often carries less restrictive copyright and licensing barriers than traditionally published works, for both the users and the authors.

Open access enables increased quality and efficiency of research and accelerates the advancement of knowledge and innovation by making results reusable and by improving their reproducibility. It also offers the means for more creativity, more trust in science and greater impacts by building on collective intelligence, facilitating cross-disciplinary research and involvement of all relevant knowledge actors, including citizens.

Horizon Europe requires deposition of scientific peer-reviewed publications and research data and open access (with exceptions for research data) following specific requirements. For guidance on this consult the AGA (article 17).

While it is not mandatory to publish (if a project intends to exploit its results, it may decide not to publish), if **scientific peer-reviewed publications** are produced then they must be open access immediately at publication time under open licenses (such as Creative Commons), providing specific minimum sets of rights of reuse (CC BY for articles and book chapters in edited books and CC BY, CC BY-NC, CC BY-ND, CC BY-NC-ND or equivalent for long-text formats. The following checklist shows what users can do with publications and other outputs licensed under the following Creative Commons licenses.

	YOU CAN			YOU MUST	YOU MAINTAIN
	Share (copy and redistribute the material in any medium or format)	Use for commercial purposes	Adapt (remix, transform and build upon the material)	Attribute Give appropriate credit, provide a link to the license, and indicate if changes were made.	Copyright, database rights
CC BY	Yes	Yes	Yes	Yes	Yes
CC BY NC	Yes	No	Yes	Yes	Yes

CC BY ND	Yes	Yes	No If you remix, transform, or buildupon the material, you may not distribute the modified material.	Yes	Yes
CC BY NC ND	Yes	No	No	Yes	Yes
CC0	Yes	Yes	Yes	No	No: Waived

It is important to be aware that Horizon Europe requires that enough intellectual property rights are maintained by beneficiaries or authors to ensure the required open access to scientific publications.

Proposers should be aware that beneficiaries are required to retain sufficient intellectual property rights (IPR) to comply with their open access obligations. Authors may need to interact with prospective publishers, in particular when they publish in venues that are not open access. To facilitate compliance with their open access obligations, beneficiaries/ researchers are encouraged to notify publishers of their grant agreement obligations (including the licensing requirements) already at manuscript submission. For example, by adding the following statement to their manuscript: *"This work was funded by the European Union under the Horizon Europe grant [grant number]. As set out in the Grant Agreement, beneficiaries must ensure that at the latest at the time of publication, open access is provided via a trusted repository to the published version or the final peer-reviewed manuscript accepted for publication under the latest available version of the Creative Commons Attribution International Public Licence (CC BY) or a licence with equivalent rights. CC BY-NC, CC BY-ND, CC BY-NC-ND or equivalent licenses could be applied to long-text formats."* If the publishing agreement is contrary to the grant agreement obligations, authors should negotiate its terms and, alternatively, look for a different publishing venue/options.

Data should be deposited in a trusted repository as soon as possible after data production and at the latest by the end of the project. Data underpinning a scientific publication should be deposited at the latest at the time of publication and in line with standard community practices. Beneficiaries of Horizon Europe have to ensure open access to research data generated in their projects under the principle 'as open as possible and as closed as necessary'. This means that data is in principle open, unless beneficiaries decide to restrict access to some or all their research data for legitimate reasons. On open access to data and the legitimate reasons for restricting access consult the AGA (article 17) and section above on research data management.

Open access to other research outputs, such as software, workflows and others, will ensure that these outputs that have been generated by Horizon Europe actions are also freely accessible to all. This will promote transparency, efficiency and reproducibility, as well as trust in science, and will facilitate access for citizens. Proposers/beneficiaries are also encouraged to license research outputs other than publications and data under appropriate

licenses. With regard to software, it should be noted that with the exception of CC0 (i.e. public domain dedication) CC licenses are not appropriate (although they can be used for software documentation). Instead, the use of appropriate software licenses, such as those listed as free by the Free Software Foundation and listed as open source by the Open Source Initiative, is strongly recommended.

Resources

Publishing

- Open Research Europe (ORE), the open access publishing platform of the European Commmission for all disciplines, for research stemming from Horizon Europe https:// open-research-europe.ec.europa.eu

- Locate trustworthy open access journals in your field of work in the Directory of Open Access Journals www.doaj.org

- Check whether a journal has an open access policy that is aligned to the Horizon Europe requirements with the Journal Checker Tool https://journalcheckertool.org (tool to become available toward the end of 2021).

- Locate trustworthy open access publishers and open access monographs in the Directory of Open Access Books https://www.doabooks.org

Repositories

Search for open repositories in www.opendoar.org

www.re3data.org offers a Repository Finder to facilitate the search for a suitable general or discipline-specific repository for various kinds of research outputs.

The general-purpose repositories for multidisciplinary research results including data, software and publications:

- www.zenodo.org - general-purpose repository for data, software and publications

- https://figshare.com – repository for any research outputs of all file formats

- open science Framework (OSF) - open source project management tool and repository

Repositories for Software:

- GitHub is development platform to host and review code, manage projects, and build software

- Savannah hosts free projects that run on free operating systems, with a focus on GNU software

- SourceForge is an Open Source software community and hosting platform

- Launchpad is a software collaboration and hosting platform

Repositories for experimental workflows and protocols:

- Protocol Exchange (open repository for sharing scientific research protocols) and
- Protocols (Platform for data management and protocol sharing)

Discipline-specific repositories:

- ELIXIR Deposition Databases and ELIXIR Core Data Resources (repositories recommended for the deposition of life sciences experimental data)

Publishing using open peer-review

Open peer review is an umbrella term for various alternative review methods that seek to make classical peer review more transparent and accountable. It has neither a standardised definition, nor an agreed schema of its features and implementations. Open peer review refers to a peer review process that contains one or more of these elements[28]:

- Authors and reviewers are aware of each other's identity during or after the review process.
- Review reports are published alongside the relevant article.
- The wider community is able to contribute to the review process (peer researcher or even general public).
- Manuscripts are made immediately available in advance of the formal peer review procedure.
- Review or commenting on the final 'version of record' is made possible.
- Direct, reciprocal discussion between authors and reviewers and/or between reviewers is allowed and encouraged.
- Review can be decoupled from publishing when facilitated by a different organisational entity than the venue of publication (*e.g. publishing platforms*).

Some journals and scholarly publishers apply open peer review. Some platforms, including preprint servers, may also facilitate open peer review of preprints. For example, Open Research Europe, the open access publishing platform of the European Commission uses the open peer review model, where both names of authors and reviewers are public, and the review report is open access.

Open peer review is an important aspect of open science. Opening up what has traditionally been a closed process increases opportunities to spot errors, validate findings and to increase the overall trust in published outputs. Open peer-review is considered by some among the measures that increase the quality of the peer review process (by making it more constructive), and the transparency of research (with 'openness' applying to all processes in

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28) Taxonomy of open peer review elements based on Ross-Hellauer T. What is open peer-review? A systematic review listed under 'Resources'.

the scientific workflow). Another argument to engage in open peer review is that it ensures reviewers to get credit for their efforts.

Resources

Ross-Hellauer T. What is open peer review? A systematic review. *F1000Research* 2017, 6:588 (https://doi.org/10.12688/f1000research.11369.2)

FOSTER proposes a module to learn basics on open peer review (https://www.fosteropenscience. eu/ learning/open-peer-review)

Open Research Europe (https://open-research-europe.ec.europa.eu) supports open peer review in all scientific fields for all Horizon Europe publications.

Some discipline-specific venues support open peer review and are suitable for the life sciences (*e.g. eLIFE, Bio Med Central, BMJ, GIGA science and BioRxiv, ASAPbio*), the social sciences (*e.g. SAGE open, Wiley and SocArXiv*) and the arts and humanities (SAGE open, Wiley and digitalculturebooks).

Citizen, civil society and end-user engagement

Citizen and civil society engagement is a programme principle and operational objective that refers to the opening up of R&I processes to society to develop better, more innovative and more relevant outcomes, and to increase societal trust in the processes and outcomes of R&I.

Opening up the R&I system towards society and supporting citizens, civil society and end-users to participate in R&I – as sources of ideas, knowledge and/or data, as data collectors and/or analysers, and/or as testers and/or end users – enlarges the collective intelligence, capabilities and scope of the R&I and is likely to lead to greater creativity and robustness of the outcomes and reduced time-to-market of the innovative products and services. It also increases the relevance and responsiveness of R&I, ensuring that its outcomes align with the needs, expectations and values of society. Moreover, it is a key element for improving the transparency, co-ownership and trust of society in the process and outcomes of R&I. Conducting R&I openly, responsibly, transparently, and in adherence to the highest standards of research integrity and ethics is also important for responding to increased science denial.

Engagement can range from the identification and conceptualisation of R&I priorities (*e.g. through deliberative or other participatory processes*), to the implementation, utilisation and assessment of R&I results (*e.g. through data collection, data analysis, discussion and publication or presenting scientific results, working in fab-labs to develop new innovations, testing innovations and solutions, and evidence-based advocacy*).

The following are activities that proposers may consider including in their proposal:

<u>*Co-design*</u> activities could involve workshops, focus groups or other means to develop R&I agendas, roadmaps or policies. These could be one-off activities in one or several different

localities or repeated consultations with the same or varying groups. They could involve citizens and/or one or many organisation types at the same time. Co-design activities often include deep discussion on the implications, the ethics, the benefits and the challenges related to R&I courses of action or technology development. Co-design could be the overall focus of a project (*e.g. to develop a roadmap for a certain technology*), a Work Package within a project that uses the outcomes of the co-design in subsequent Work Packages, or a supporting Work Package that provides continual feedback on project activities throughout the project cycle.

Co-creation activities, such as citizen science or user-led innovation, involve citizens or end-users directly in the development of new knowledge or innovations, through a range of different levels of participation. These could include identifying R&I questions to be tackled by the project, developing a methodology, observing, gathering and processing data, right up to the publication and presentation of results. The co-creation activities could be the focus of a proposal, or could be one of the methodological approaches taken alongside others.

Co-assessment activities, such as assisting in the monitoring and evaluation of the progress of the project, portfolio of projects, policies or programmes, help ensure an iterative or even continual process of interaction with citizens, civil society and end-users throughout the project cycle on the quality, utilisation and (potential) impact of project outputs.

In certain cases, citizens, civil society and end-users may be involved across different stages of the R&I and/or policy cycle, by deciding on the research to be conducted, conducting that research, analysing and interpreting the data, and engaging in related advocacy or policy activities.

An important aspect to consider in many cases is the inclusivity of the engagement and ensuring diversity of participation. The challenge of sustaining engagement should not be underestimated and different forms of compensation or rewards could be considered, as well as measures for two-way learning between scientists or innovators and the co-creators.

Engagement requires resources and expertise. Often, engagement is conducted by dedicated interlocutor organisations that already have the reach, trust, and expertise to successfully carry out the engagement exercises. The integration of the engagement activities, and their outcomes within the project design, should aim to ensure use of the outcomes (i.e. they are not 'window dressing' or unimportant side-activities), and that there is appropriate feedback and acknowledgement to the engaged. If the call conditions allow it, the launch of calls for small grants or prizes can be useful (or in some other cases even essential) for reaching and engaging local communities and small associations, civil society organisations, social enterprises, or small businesses.

Generally, the greater the interaction from across the quadruple helix (academia-industry-government-civil), the more the R&I results will be reliable, trusted and taken up by society. Different organisation types, and different societal perspectives, help ensure that the processes and the outcomes of the R&I align with the needs, values and expectations of society. In many cases, the body of knowledge and practice built up in Horizon 2020 on Responsible Research and Innovation will be relevant.

Co-design, co-creation, and co-assessment, as (sometimes) radical departures from more traditional forms of R&I, could imply changes to the institutional governance of the participating beneficiaries that last beyond the lifetime of project funding.

Terminology:

- 'Citizens' should be understood as individuals acting on their own initiative and not on behalf of their employer or sectoral interests. It does not refer to any legal citizenship(s) that people may or may not hold.
- 'Civil society' refers to the ensemble of citizens and civil society organisations that are active in the public sphere but distinct from government and business.
- 'Civil society organisations (CSOs)' include all non-state, not-for-profit structures, such as citizens' associations, patient groups, professional societies or groups, consumer groups, humanitarian organisations, non-governmental organisations (NGOs), foundations and charities.
- 'End-users' are public, private or civil (i.e. civil society, see above) organisations that constitute potential users of the R&I outputs.
- 'Engagement' means the involvement of citizens and civil society in co-designing R&I agendas, in co-creating R&I contents, and/or in co-assessing R&I outcomes.

Resources

The Responsible Research and Innovation (RRI) toolkit
Action catalogue of inclusive research methods
Methods to engage the public
The societal readiness Thinking Tool
Innovation Compass Self-check Tool for SMEs
Living innovation co-creation tool-kit for responsible innovation
Resources to open up research and innovation actors to society
Models and guidelines to increase patient engagement in health research
RRI Practice Handbook for research organisations
EU portal for citizen science projects, initiatives, networks, organisations, and training courses

17. Innovation Procurement

What is innovation procurement and how is it relevant for Horizon Europe?

Innovation procurement happens when public procurement is used to drive innovation from the demand side. This enables the public sector to speed up the development and adoption of innovative solutions that can improve the quality and efficiency of public services or address wider societal challenges while opening concrete business opportunities for companies in Europe to bring innovations to the market.

Innovation procurement is therefore a topic of **cross-cutting importance for all pillars of the Horizon Europe programme**:

- Under the *Excellence Science pillar*, innovation procurement can help increase the EU's global scientific competitiveness in the field of research infrastructures. In the field of supercomputing for example, innovation procurement actions financed under FP7 and Horizon 2020 have paved the way for stronger European cooperation and competitiveness through the joint undertaking for High Performance Computing (HPC).

- Under the *Global Challenges and European Industrial Competiveness pillar* innovation procurement can trigger new research and development (R&D) and deployment of innovative solutions to address societal challenges (*e.g. in health, security, energy, environment, transport···*) and reinforce technological and industrial capacities. For EU-missions, innovation procurement can also play a key role to bring to the market solutions that can tackle big problems. This online brochure[29] bundles examples of innovation procurement funded by the EU research and innovation programme that successfully tackled societal challenges in several sectors.

- Under the *Innovative Europe pillar*, innovation procurement links to SME support via the European Innovation Council.

Finally, innovation procurement is also central to the European Defence Fund and may also be used in the context of the Euratom Programme.

What is the strategic importance for Europe?

Benchmarking shows that in Europe investments on innovation procurement are 2 times lower compared to other leading global economies. Underinvestment is the biggest in R&D procurement (5 times lower) and in adoption of ICT based solutions (3 times lower). As innovation procurement is crucial for public sector modernisation and business growth, **mainstreaming innovation procurement is of strategic importance to strenghten Europe's global competitiveness**. By closing the gap between supply and demand in a way that reinforces EU strategic autonomy, innovation procurement can make a key contribution to economic recovery[30]. It can increase resilience in the supply chain by opening up opportunities for innovative companies, including also SMEs and Startups, to access the public procurement market, attract financial investment and scale up their business.

How does Horizon Europe support innovation procurement?

Horizon Europe provides EU funding to start innovation procurement. A key difference to other research and innovation actions is that funding for innovation procurement is not targeted at potential 'providers' but at potential 'buyers' of innovative solutions: public procurers, possibly in cooperation with private and NGO buyers.

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29) https://digital-strategy.ec.europa.eu/en/library/innovation-procurement-power-public-purse
30) Impacts of EU funded PCP show 20%-30% efficiency and quality improvements in public services, doubling of the amount of public procurement directly awarded to startups/SMEs, a factor 20 increase in the amount of cross-border contract award to startups/SMEs and a factor 4 additional financing secured by startups/SMEs. The use of place of performance and IPR/commercialisation conditions that fuel commercialisation in Europe, also contributes to EU strategic autonomy.

Two complementary types of innovation procurement are supported:

- **Public Procurement of Innovative solutions (PPI)** can be used by procurers when challenges of public interest can be addressed by innovative solutions that are nearly or already in small quantities on the market. PPI can thus be used when there is no need for procurement of new R&D to bring solutions to the market, but as a clear signal from a sizeable amount of early adopters/launch customers that they are willing to purchase/deploy the innovative solutions if those can be delivered with the desired quality and price by a specific moment in time. PPI may still involve conformance testing before deployment.

- **Pre-Commercial Procurement (PCP)** can be used by procurers when there are no near-to-the-market solutions that meet all the procurers' requirements and new R&D is needed to get new solutions developed and tested to address the procurement need. PCP can then compare the pros and cons of alternative approaches to address the challenge and eliminate risk from promising innovations step-by-step via solution design, prototyping, development and first product testing. PCP is a public procurement of R&D services that does not include the deployment of commercial volumes of end-products (*see PPI for the latter*).

In several areas, there is a need for European cross-border cooperation on innovation procurement to address challenges that require cross-border interoperability or interconnection, to pool resources for problems that cannot be financed from only national funding, to obtain higher quality and lower cost solutions and to reduce fragmentation of demand so that companies can sell their solutions to a wide European market.

Therefore, **Horizon Europe provides different types of support for buyers from different countries** that want to collaborate together on innovation procurement:

- **Coordination and Support actions (CSA)** support coordination and networking activities for groups of procurers to investigate the feasibility and/or prepare the ground for concrete future innovation procurement. CSA grants do not provide EU co-financing for a procurement action.

- **PCP or PPI actions** co-finance both the procurement cost for groups of procurers to buy the research, development, validation and possible first deployment (PCP) or wider scale deployment (PPI) of innovative solutions as well as additional related costs to prepare, manage and follow up such procurement. A minimum of two public procurers from two different EU Member States or associated countries are required in the buyers' group. One of them will act as lead procurer to coordinate and lead one joint PCP or PPI action or several separate but coordinated PPI actions for the buyers' group. In addition other procurers, e.g. private procurers or NGO procurers, can be part of the buyers' group. Both in PCP actions, PPI actions and CSAs that prepare PCP or PPI procurements, other entities (*e.g. experts, certification bodies*) can also participate in the additional activities of the action, except entities that are potential suppliers of solutions for the procurement action or have another potential conflict of interest with the procurement action. In total there must be minimum three participants from three different Member States or

countries associated to Horizon Europe in the action. Entities formed by several public procurers from different countries can also apply for this type of funding (*e.g. European Groupings of Territorial Cooperation- EGTCs, European Research Infrastructure Consortia – ERICs, Central Purchasing Bodies, etc*).

For more information about the CSA and PCP and PPI action instruments, refer to General Annex H of the Horizon Europe Work Programme.

The EU itself can also implement innovation procurement from the Horizon Europe budget, either alone or together with public buyers from Member States. An example funded by Horizon Europe is the EU blockchain PCP implemented by the European Commission.

It is also possible for one single buyer to implement PCP and PPI actions on its own, under the subcontracting activities of a regular research and innovation grant.

Examples of projects and achievable impacts?

Examples of ongoing PCP and PPI projects funded by previous FP7 and CIP programs can be found here. Showcase success stories are bundled here. More information about the impacts achieved by past projects is also available here.

How to find and apply for relevant calls?

If you are a public buyer and you are looking for an overview of all actions that support innovation procurement, you can search all calls on the Funding and Tenders portal via the keywords 'innovation/innovative procurement', 'PCP', 'PPI'.

Where to find support to prepare a proposal?

Looking for partners? Participate in info days and EU events on innovation procurement in preparation of calls for proposals. Get connected with other procurers and experts from around Europe that are interested and active on innovation procurement via the European Procurement Forum.

National Contact Points (NCPs) in every Member State offer information and guidance in your own language on how to apply for Horizon Europe funding and may help with partner search.

Check if there is an innovation procurement competence/support center in your country where you could find information and support. This European network of national innovation procurement competence centers can be a starting point.

Is my organisation a public procurer?

Public procurers are organisations that are contracting authorities or contracting entities according to the definition of those terms in the EU public procurement directives 2014/24/EU, 2004/25/EU, 2009/81/EC.

'**Contracting authority**' means the State, regional or local authorities, bodies governed by public law, associations formed by one or several of such authorities or one or several of such bodies governed by public law (for the full definition, *see Article 2(1)(1) of Directive 2014/24/EU*). Bodies governed by public law also include entities financed mostly by the State, regional or local authorities, or other bodies governed by public law and entities controlled by those bodies (for the full definition, *see Article 2(1)(4) of Directive 2014/24/EU*). This includes for example ministries, regions, cities, road management authorities, public hospitals, central purchasing bodies etc.

'**Contracting entities**' refers to entities operating in specific sectors (such as utilities for water, energy, transport, postal services covered by Directive 2014/25/EU and contracting entities in the field of security covered by Directive 2009/81/EC). They may be contracting authorities, public undertakings or entities operating on the basis of special or exclusive rights (for the full definition, *see Article 4 of Directive 2014/25/EU*).

Under Horizon Europe, public procurers also include entities that are contracting authorities/ entities according to the above definition but to which the EU public procurement Directives itself do not apply (*e.g. international organisations such as ERICs - European Research Infrastructure Consortia*).

Related links

- Overview and links to EU policy initiatives on PCP and PPI[31]

- Subscribe to the innovation procurement newsletter[32] to stay up-to-date with latest EU policy initiatives, workshops, call news and more.

- Topics supporting Innovation Procurement[33]

- In order to help procurers implement PCP and PPI, the EU also developed specific guidance in the Annotated Model Grant Agreement and example template tender documents for Horizon funded PCP actions[34] and for PPI actions[35].

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31) https://ec.europa.eu/digital-single-market/news/eu-policy-initiatives-pcp-and-ppi

32) https://sorry.ec.europa.eu

33) https://ec.europa.eu/info/funding-tenders/opportunities/portal/screen/opportunities/topic-search-cs;freeTextSearchKeyword=;matchWholeText=true;typeCodes=1,2;statusCodes=31094501,31094502,31094503;programmePeriod=2014%20-%202020;programCcm2Id=31045243;programDivisionCode=null;focusAreaCode=null;geographicalZonesCode=null;programmeDivisionProspect=null;startDateLte=null;startDateGte=null;crossCuttingPriorityCode=InnovationProcurement;callCode=null;cpvCode=null;performanceOfDelivery=null;sortQuery=sortStatus;orderBy=asc;onlyTenders=false;topicListKey=topicSearchTablePageState

34) http://ec.europa.eu/research/participants/data/ref/h2020/other/gm/h2020-guide-pcp-procurement-docs_en.docx

35) http://ec.europa.eu/research/participants/data/ref/h2020/other/gm/h2020-guide-ppi-procurement-docs_en.docx

18. Key Digital Technologies

Due diligence is required regarding the trustworthiness of all artificial intelligence-based systems or techniques used or developed in projects funded under the Horizon Europe Framework Programme. Wherever appropriate, AI-based systems or techniques must be developed in a safe, secure and responsible manner, with a clear identification of and preventative approach to risks.

To a degree matching the type of research being proposed (from basic to precompetitive) and as appropriate, AI-based systems or techniques should be, or be developed to become (implicitly or explicitly contributing to one or several of the following objectives):

- technically robust, accurate and reproducible, and able to deal with and inform about possible failures, inaccuracies and errors, proportionate to the assessed risk posed by the AI-based system or technique

- socially robust, in that they duly consider the context and environment in which they operate

- reliable and to function as intended, minimising unintentional and unexpected harm, preventing unacceptable harm and safeguarding the physical and mental integrity of humans

- able to provide a suitable explanation of its decision-making process, whenever an AI-based system can have a significant impact on people's lives.

3

EURAXESS:
EU Research
Support Service

Delegation of the
European Union to
the Republic of Korea

1. What is EURAXESS

"EURAXESS – Researchers in Motion" is a European Commission initiative that aims to support development of the European Research Area (ERA) by addressing barriers to the mobility of researchers and to enhance scientific collaboration between Europe and the world. EURAXESS is supported by 40 participating countries across Europe (EU member states and countries within the Horizon 2020 Associated Countries list). Designed as a comprehensive tool-set, it provides researchers access to a complete range of information and support services that are structured around five areas: *Jobs and Funding, Career Development, Information and Assistance, Partnering and Worldwide*. Through its portal (euraxess.ec.europa.eu) it provides a single access point for career development resources and jobs, funding and hosting opportunities in Europe, as well as information on the conditions of living and working in European countries as a researcher. EURAXESS also provides personalised assistance to incoming and outgoing researchers through its network of more than 500 Service Centres in Europe. The international arm of the EURAXESS initiative links Europe to the rest of the world through its 7 hubs outside of Europe (ASEAN, China, India, Japan, Latin American and Caribbean States, North America and Korea).

2. EURAXESS network's services to researchers and institutions

All EURAXESS tools provide services to researchers and Research Performing Institutions (RPOs) independently of their origin, country of affiliation, research domain – including humanities and social sciences, institution area (private R&D, public research institutes, universities and higher education institutions, etc), or career level – from PhD candidate level to senior profiles. In particular:

• The **Jobs and Funding** section provides, via a fully open online platform (jobs.euraxess.org), access to the largest European job portal for research related jobs that also includes PhD positions. Korean or Korea-based individual researchers can not only look for jobs in Europe, but also create their profiles and CVs online with the aim to be spotted by potential employers. Korean research institutions may register to the portal so as to be given the authorisation to post job offers. Publication of offers is free. This section also provides access to a funding database maintained by research and innovation funding agencies all around Europe that researchers can use to look for funding programmes that meet their needs for funding for international cooperation or mobility projects. The funding database also

includes travel grants and fellowships. In addition, researchers can find hosting offers on EURAXESS - Expressions of Interest from research institutions in supporting applications to the Marie Skłodowska-Curie Actions Individual Fellowships calls, as well as offers from institutions which dispose of research infrastructures.

- The **Information and Assistance** section provides, via a central portal (services.euraxess.org) and via 40 national portals (euraxess.ec.europa.eu/choose-your-country) a full range of useful information to researchers intending to relocate to Europe, comprising 17 topics (in alphabetical order): access to the culture of the host country & language courses; accommodation; banking; career development; day care, schooling & family related issues; departure conditions & formalities; entry conditions & visas; funding opportunities; health insurance; intellectual property rights; medical care; pension for researchers; recognition of diplomas; taxation & salaries; unemployment; and work permit. In addition to the online information services, more than 550 centres and contact points in the 40 countries participating in EURAXESS respond to researchers' requests by phone or personal visits and more than 1,500 staff yearly answer to 350,000 of these requests.

- The **Partnering** section provides an online networking tool (euraxess.ec.europa.eu/partnering) to researchers and RPOs who have created a profile on the EURAXESS portal, with which they can connect to other individuals or institutions for their research collaboration or mobility projects.

- The **Career Development** section (euraxess.ec.europa.eu/career-development) on the portal includes resources for both researchers and research supporting organisations.

- The **Worldwide** section (worldwide.euraxess.org) provides information and networking services both online and offline to researchers from specific regions or countries outside of Europe.

3. What is EURAXESS Korea

EURAXESS Worldwide, the international branch of EURAXESS, launched in May 2018 its services in a seventh location, Korea. It aims at increasing and improving researcher mobility and research cooperation between Korea and Europe. Its objectives are:

- To promote ERA from the angle of mobility and research funding opportunities and programmes available;

- To provide tailored and relevant information to Korea-based researchers: from PhD candidate level to professor level, all disciplines, in academia and industry;

- To create opportunities for networking for researchers; and

- To grow a community of international-minded researchers.

All EURAXESS Korea services are free, and of easy access via its website: korea.euraxess.org.

4. EURAXESS Korea's services to Korea-based researchers and institutions

EURAXESS Korea mainly provides three services:

- Information services, through its website korea.euraxess.org and social media (@EURAXESS_Korea) where funding, job opportunities, policy developments, events and networking opportunities of interest to Korean researchers and Korean RPOs are provided in the form of a curated newsfeed, both in English and in Korean.

- Events and seminars, where detailed explanation of EURAXESS services, and also European funding programmes such as Horizon 2020, Horizon Europe, European Research Council grants or Marie Skłodowska-Curie Actions grants is provided directly to students, researchers and research administrators. Among events, the European Alumni Research Nights are regularly held in Seoul to permit emulation and exchange of knowledge and know-how about researcher mobility to Europe. Among seminars, the EURAXESS Korea Tour serves as a platform for Korean institutions to stimulate and train their researchers to participate in mobility or research cooperation programmes with Europe.

- Community building aims at better information exchange between Korea-based researchers so as to increase Korea-Europe research exchanges.

EURAXESS Korea is operated by Dr. Tomasz Wierzbowski – they can be reached at korea@euraxess.net.

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4

Science, Technology and Innovation of the EU Member States

Delegation of the European Union to the Republic of Korea

**Science, Technology
and Innovation
of the European Countries**
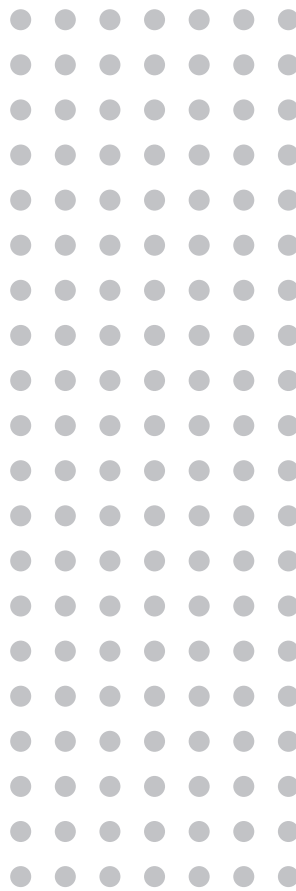
1 AUSTRIA

1. Policies and Strategies in Science, Technology and Innovation

2. National STI Programmes and Initiatives

3. Joint Activities with Korea

4. Science, Technology and Innovation Cooperation Partners

AUSTRIA

Country Outline

- GDP: 447,217 million euros (Eurostat 2022)
- GDP per Capita: 38,080 euros (Eurostat 2022)
- Areas of marked S&T specialisations: Life Sciences, Physics, Energy & Environment

Contact Information

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With research and development accounting for 3,22 % (2022) of the country's economic output (GDP), Austria is performing well above the EU and OECD average. Over the last decade, Austria has built a mature and modern innovation system. One of its pillars is its educational system: there are currently 22 state universities in Austria (including six universities of the Arts and three technical universities), 21 universities of applied sciences and 17 private universities – with a total of around 391,644 students (2022), of which more than 112,500 come from abroad. Austrian researchers and scientists are among the world's elite in numerous areas, such as quantum physics, mathematics and medicine, as well as the humanities and social sciences. One recent example is the quantum physicist Anton Zeilinger who won the Nobel Prize in physics in 2022. In addition to higher education institutions, Austria's educational system is also aligned with the needs of companies by having a longstanding tradition of dual vocational training for young adults, which operates in parallel in apprenticeships and vocational schools. Furthermore, for all technical disciplines, Higher Technical Colleges (HTC) offer highly qualified training courses that are often equivalent to international Bachelor levels. The Austrian business landscape is characterized by innovative small and medium sized enterprises, which form the backbone of Austria's innovation economy. In terms of R&D expenditure, which currently stands at EUR 15,5 billion, it is the business enterprise sector that accounts for the biggest share of R&D expenditure in terms of total expenditure at approx. 50% (or EUR 7.8 billion), with a - by international comparison - high share of foreign investment at 17% (or EUR 2.6 billion). Also, innovative companies in Austria can make use of a research financing support system that is recognized as a global model. The funding quota for company research projects ranks at the top end of the international scale. From basic to applied research, the entire innovation process is supported generously in Austria by public financing, with three agencies being mainly responsible for administering those funds: the Science Fund "FWF" makes available almost EUR 273 million per year for basic research projects; the Austrian Research Promotion Agency "FFG" supports industry-oriented research with an extensive program of grants (incl. with Korea) and services. Over EUR 572 million are invested annually for application-oriented projects. Thirdly, the Austrian Federal Promotional Bank "AWS" supports companies as a financing partner in all stages, from pre-seed to company creation and international growth projects.

1. Policies and Strategies in Science, Technology and Innovation

The Austrian Government adopted a new Science, Technology and Innovation Strategy in December 2020. The Document fixes the main targets for Austria's Research and Innovation policy until 2030. The Austrian STI Strategy 2030 is built around 3 main goals to which measures are associated:

1) Strengthen the Austrian STI landscape and take a leading position at international level

More specifically, this aim targets an intensification of Austria's STI activities in the private sector with at least a 20% increase in the number of innovative companies and 5 to 10 new world-leading research-intensive companies in Austria, as well as an increase in Austria's STI output. Better rankings in the main international indexes especially the European Innovation Scoreboard (top 5 is targeted), the global innovation index (top 10 is targeted) and Digital Economy and Society Index (Top 5 targeted) are part of this goal. Major actions to achieve this goal are the following ones:

Ⅰ) Enhance research infrastructures and their accessibility: This implies to participate in major European infrastructure projects, make research infrastructure accessible to academic and industrial sector, as well as funding strategic infrastructure projects especially for data infrastructures.

Ⅱ) Participation at European missions, partnerships, and Important Projects of Common European Interest (IPCEI): This implies to participate to the funding of these initiatives and to support Austrian actors for their participation in the European projects. Austrian strength will be identified, and participation monitored.

Ⅲ) Finance strategic internationalization: This will be based on the launch of strategic collaborations with complementary countries and a better promotion and visibility of Austrian's main research and innovation activities.

2) Target Excellence and Results

This implies a strong and efficient participation in European projects of the 9th research and innovation research framework of the European Union (Horizon Europe) including the European research council. The new target for R&D expenditures is fixed at 4% of the GDP. An extension of the Venture capital pool and an increase of venture capital expenses is also part of the targets to achieve the goal.

Ⅰ) Fund Excellent research: An excellence initiative will be launched with more funding available on competitive basis and the creation of 3 excellence clusters. Universities, the Institute of Science and Technology and the Austrian Science Academy will be strengthened in their leading position for high quality basic research.

Ⅱ) Develop applied research for the benefit of society: A technology offensive aiming at developing applied research in the field of Production methods, tech for green, life science and digital technology will be deployed. This will be supported by measures targeting

more efficient technology transfer between the academic and the industrial sector and measures increasing the innovation ability of SMEs.

III) Support research for attaining climate targets: Technology neutral research activities as well as key enabling technologies aiming at tackling climate change will be supported. This will be complemented by participation in European programs and incentives for the private sector to invest in new technologies.

3) Focus on Skills, Talents and Knowledge

This implies to increase available competences especially in the fields of science, technology, engineering, and mathematics (STEM). In 2030 at least 20% more students should graduate in these disciplines with an increase of 100% of them participating in an international exchange program (top 3 is target at the IMD World Talent Ranking). This will be complemented by an improved and more visible higher education system (at least 2 Universities in the top 100 of the Times Higher Education ranking, 45% of staff members with international experience).

I) Develop Human Resources: Foster curiosity, creativity and environmental awareness at all learning levels will be a priority. Primary education and continuing education will be modernized with a special emphasis on the acquisition of STEM skills. A better adequation between higher education and research activities as well as an enhancement of career opportunities for women in science will also be focused on.

II) Enhance international opportunities for researchers and students: Austria will take part in European and International mobility programs (Erasmus+, Horizon Europe's Marie Skłodowska-Curie Actions program, Fulbright, European Universities and Joint study programs). In addition, mobility will be encouraged and the visibility of Austria's research and higher education strength will be enhanced. The strategy will be implemented with appropriate funding levels for research and innovation programs as well as for the main research and innovation institutions.

Open Innovation Strategy: Austria also implements its open Innovation Strategy. The strategy was adopted in July 2016 by the Austrian Government. In addition to accompanying studies concerning specific aspects of open innovation, particular attention was given to intensive and long-term participation by members of the public and relevant stakeholder groups. The most important tool in this participation process was the online portal openinnovation. gv.at. From the middle until the end of 2015 stakeholders, interested members of the public and experts all had the opportunity to discuss their ideas for the Open Innovation Strategy and to publish existing Best Practice examples. Parallel to the digital options a stakeholder workshop was organized in January 2016 and also provided an opportunity to participate in the process of drawing up the strategy and contributing specific content. The fact that 470 people from science, business and government took part in this process demonstrates the high level of stakeholder interest in open innovation. This was followed in spring 2016 by an online consultation in which the general public was invited to submit comments on the key elements of the Open Innovation Strategy, Vision 2025 and the proposed measures, and to suggest changes. This formed the basis for the drafting of the final text of the strategy.

2. National STI Programmes and Initiatives

International Cooperation Programmes/Initiatives

Programme Title	Contents
Horizon Europe https://www.horizon-europe-community.at	The Austrian Research Promotion Agency (FFG) is the national contact point for Horizon Europe (2021-2027), the 9th research and innovation framework program of the European Union. The Program opens several topics to international collaboration with partners outside Europe. To that extent, intensive research and innovation based Korean institutions can work with Austrian partners by joining their project consortiums. In Horizon 2020 (2014-2020), the 8th Research and Innovation framework program, Austrian and Korean institutions collaborated in 18 highly innovative projects.
Eureka-Network Eureka	FFG www. ffg.at/en/funding	Eureka is an international research and innovation network associating over 45 countries. The Program promotes international collaboration by providing access to public funding for international collaborative R&D projects. The program's focus lies on R&D Projects close to the market aiming at the development of new products, processes, or services. Most of Eureka Calls follow a bottom-up principle and are hence open to a wide range of Research and innovation activities. Within the framework of Eureka, many collaborative R&D projects between Austria and South Korea have been launched successfully in the Eurostars, Eureka Network, Eureka Clusters, and Globalstars programs. Additional calls for projects further strengthen this collaboration opportunity: - Two annual Cut off Dates will continue to enable the submission of Eurostars projects in the future. - Projects can be submitted all year round to the open call for Eureka network projects. Further thematic calls like the "2020 Multilateral Call with South Korea on Advanced Materials" are organized periodically. In addition to the different annual calls issued by Eureka Clusters, projects can be submitted to the Cluster calls. Calls for 2023 and beyond are already outlined in a multi-annual plan. Matchmaking is supported by Enterprise Europe Network and during the "Korea Eureka Days" which is an annually held event. Funding conditions in Eureka are similar for Austria and South Korea with grants in the range of max. 60-67% respectively for SMEs. Large Companies and research organizations can be supported as well. The Austrian Research Promotion Agency (FFG) is the national contact point for the Eureka programs.

National program Beyond Europe	FFG www. ffg.at/en/funding	The Austrian Research Promotion Agency (FFG) program "Beyond Europe" supports Austrian companies, research and university institutes and other organizations in creating and extending collaborations with partners outside Europe (including Korea). The program is open to collaborative projects in all thematic fields. Funding is available for projects in all technical disciplines. Project proposals may be submitted for exploratory projects and cooperative R&D projects of the category "Experimental Development". In addition, funding by several thematic funding programs is also accessible to Korean researchers in transnational R&D projects. Furthermore, FFG provides a wide range of funding options and support for participation in international programs and initiatives.
The Global Incubator Network Austria (GIN) Global Incubator Network Austria – GIN Austria gin-austria.com	GIN is the connecting link between Austrian and international startups, investors, incubators and accelerators with a special focus on selected hotspots in Asia (Hong Kong, Israel, Japan, Mainland China, Singapore and South Korea). GIN connects the Austrian startup ecosystem with international partners interested in the Austrian and European markets respectively. GIN is managed by the main Austrian public funding agencies FFG and aws.

3. Joint Activities with Korea

Activities with the RoK in 2023-2024

Programme Title	Contents
Bilateral Agreements	▪ Bilateral agreement on scientific cooperation between the Austrian Academy of Sciences and the Korean Academy of Science and Technology (KAST) since 2011. Joint research projects and visits to both organizations are initiated on regular basis. ▪ Bilateral agreement between the Austrian Science Fund and the National Research Foundation of Korea (NRF). Several joint research projects have been supported. ▪ Cooperation agreement between Austrian Research Promotion Agency and Korea Institute for the Advancement of Technology (KIAT) and KOTRA
University Cooperation	A total of 27 cooperation agreements exist between 10 Austrian and their Korean counterparts. In addition to that, a total of 43 cooperation agreements exist between 11 Austrian Universities of Applied Sciences and Korean institutions.

4. Science, Technology and Innovation Cooperation Partners

| Organisation Name	Detailed Information
Austrian Institute of Technology (AIT) https://www.ait.ac.at	The Austrian Institute of Technology (AIT) is Austria's largest Research and Technology Organization (RTO) and plays a key role in Austria and in Europe as a research and technology institute for key infrastructure issues of the future. With its five departments of Energy, Mobility, Health & Environment, Safety & Security as well as Foresight & Policy at locations such as TechGate Vienna or the Austrian Research Centers Seibersdorf, AIT closely cooperates with the business community on developing new infrastructure solutions. Several Korean researchers and PhD students are doing research at AIT.
Institute of Science and technology (IST Austria) https://ist.ac.at/de/home	The Institute of Science and Technology Austria (IST Austria) national research organization dedicated to cutting edge research the physical, mathematical, computer, and life sciences. IST Austria performs world class basic research, trains the next generation of European scientific leaders and supports science education and technology transfer.
Ludwig Boltzmann Gesellschaft (LBG) https://www.lbg.ac.at	Ludwig Boltzmann Gesellschaft (LBG) is major national research organization with a focus on medical science, life science and social science and humanities. LBG manages 20 Ludwig Boltzmann Institutes in collaboration with academic and industrial partners. LBG is also highly committed to science communication activities for the general public.
Austrian Cooperative Research (ACR) https://www.acr.ac.at	Austrian Cooperative Research is a network of private research institutes offering applied R&D for companies. The ACR network comprising very different research institutions providing applied research, development & innovation (RDI) services, technology transfer, advice on available subsidies, training courses, and high-quality testing and measuring. The ACR network performs more than two-thirds of its services for SMEs.
AVL List GmbH https://www.avl.com	AVL is the world's largest independent company for development, simulation and testing technology of powertrains (hybrid, combustion engines, transmission, electric drive, batteries and software) for passenger cars, trucks and large engines. The headquarter is located in Graz, Austria. AVL also implanted research facilities in Korea.

Austrian Universities and Universities of Applied Sciences bmbwf.gv.at	Many excellent Universities and Universities of Applied Sciences with a very broad range of scientific departments with different specializations are located in Austria. A list of the major Universities is available on the website of the Federal Ministry of Education, Science and Research.

Science, Technology
and Innovation
of the European Countries
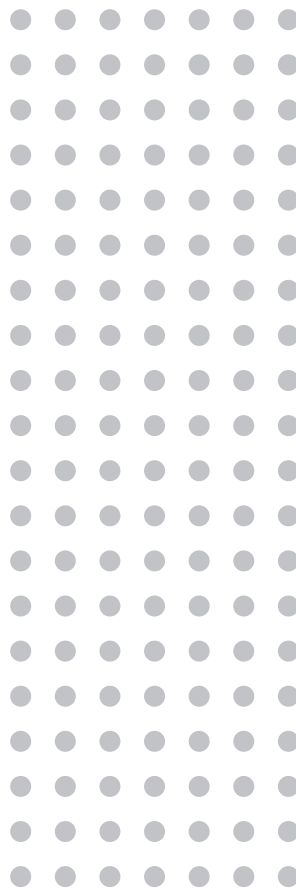
2 BELGIUM

1. Policies and Strategies in Science, Technology and Innovation

2. National STI Programmes and Initiatives

3. Joint Activities with Korea

4. Science, Technology and Innovation Cooperation Partners

BELGIUM

Country Outline

- GDP: 554,044 million euros (Eurostat 2022)
- GDP per Capita: 37,040 euros (Eurostat 2022)
- Areas of marked S&T specialisations: Chemistry, Pharmaceuticals, Space, Electrical Equipment, ICT services

Contact Information

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Belgium is a federal state, composed of communities and regions. It is mainly the communities and regions that are responsible for scientific research and innovation. Some STI responsibilities remain at the federal level: space research; nuclear research, defence related research; polar research; some international programmes and institutes; fiscal support measures (taxes); scientific research institutes that focus on federal competences; and foreign access to the labour market, social security, scientific visa, regulatory framework, etc.

The Federal Science Policy office (BELSPO) coordinates science policy at the federal level and runs the bodies where the different Belgian authorities meet in order to agree on international science policy issues of common interest. The regions and communities coordinate their own specific policies through the regional governments and agencies.

Science has traditionally been linked to education and the public sector. But for some time now, industry has also been heavily involved in scientific research, focusing on space travel, biochemistry, medicine, pharmaceuticals and IT.

1. Policies and Strategies in Science, Technology and Innovation

In 2021, Belgium spent 3.22% of its GDP on research and development (R&D). Belgium thus moves up to 2nd place in the EU rankings, after Sweden. As in previous years, the private sector accounts for the lion's share of research spending (2.42% of GDP in 2021 compared with 1.38% in 2010). The share of the public sector (education and the public sector) in Belgium increased from 0.65% of GDP in 2010 to 0.77% in 2021. The various entities are pursuing proactive R&D investment policies with a view to maintain the 3% objective (spending 3% of the GDP on research and development).

Research and innovation policy in Belgium is designed and implemented in a multi-level governance framework involving the federal government and autonomous regional and (linguistic) community governments.

Belgium is a strong innovator and is known for its attractive research system, its very generous support system for research, high firm investments in research and last but not least the linkages between the private and public research actors. The country has a strong, internationally competitive research infrastructure (most importantly its universities and a handful of major research facilities) driven by a globally connected and highly productive workforce. IMEC is a good example and is well connected to major Korean firms in the ICT sector.

The business sector in Belgium is more active than the EU28 average in terms of both the financing and performance of research and development (R&D). According to the OECD the direct and indirect support of companies is among the highest of the world (7th position). The R&D-intensity of the Belgian private sector is among the highest in Europe.

A small number of foreign-owned companies play a key role in underpinning this strong performance, with the R&D investments of a few large companies in a limited number of sectors and mostly managed overseas, making a significant impact on the R&D performance. The country is characterized by a relatively large share of SMEs. Belgian SMEs are highly innovative and have the highest absorptive capacity in the EU in terms of employment of a highly skilled labour force.

The Belgian authorities are strongly committed to and participate in European initiatives, especially the EU Framework Program for R&D. In a number of cases, this commitment matches national priorities, such as the implementation of the European Partnership for Researchers in both Communities, which should contribute to attracting and retaining qualified human resources. With regard to cross-border cooperation, Belgium is actively engaged in a range of initiatives, which include bilateral agreements, joint R&D projects, and shared research infrastructures.

In Belgium, each region/community has its own multi-annual plan that covers research and innovation.

The key R&I relevant aspects of Belgium's National Reform Programme 2020 sets out the structural measures taken by the Belgian governments over the last twelve months, as well as those in the pipeline for the coming months. Needless to say that the policies regarding the pandemic receive the greatest attention and they are also adjusted on a daily basis. At the time of writing those lines below, new measures are being taken or existing ones adjusted.

(1) While fiscal consolidation was a priority for the previous government, the actual governments are now focusing in the first place on combatting the negative effects of the energy crisis.

(2) All levels are working to improve the efficiency and effectiveness of public spending, including through spending reviews. The resources freed up will be used for strategic investments and long-term care. The National Pact for Strategic Investments Pact (NPSI) is implemented at the inter-federal level. This plan focuses on mobility, energy, innovation and digitisation.

(3) All the country's governments are committed to achieving the objectives of the National Energy Climate Plan 2021-2030. Support for innovation at the federal level was reflected in particular by the continuation of the "Digital Belgium" programme and by major investments, jointly with the Regions, in the framework of the European Battery Alliance (275 million euros in total), the Euro-HPC project, etc. The regions are also involved in the deployment of the European Digital Innovation Hubs (eDIH).

(4) On average, Government Budget Allocations for R&D (GBARD) represents about 50 % of public expenditure and investment in research and innovation related policies; the rest comes from support for other forms of innovation aid.

(5) In 2021, 14 projects were selected in the field of research under the Energy Transition Fund. Moreover, Belgium considers it a priority to keep its nuclear knowledge and expertise up to date with the support of its leading institutions such as SCK CEN and IBR.

(6) On 2 November 2021, the federal government approved the strategy on hydrogen to make Belgium a hub for the import and transit of green hydrogen. In order to increase the production of solar energy, the federal government decided on 18 March 2022 to reduce VAT on solar panels, heat pumps and boilers to 6 % (2022–2023).

Basic indicators for R&D investments

	Performance relative to EU in 2022	Performance change 2015-2022	Performance change 2021-2022
SUMMARY INNOVATION INDEX	**128.8**	**16.8**	**4.3**
Human resources	**129.6**	**4.8**	**0.0**
Doctorate graduates	129.7	11.4	0.0
Population with tertiary education	159.3	0.0	0.0
Lifelong learning	93.3	0.0	0.0
Attractive research systems	**157.9**	**-0.8**	**19.0**
International scientific co-publications	180.4	76.3	23.0
Most cited publications	126.2	-18.4	-2.5
Foreign doctorate students	189.7	-34.1	62.3
Digitalisation	**123.2**	**0.0**	**0.0**
Broadband penetration	141.0	0.0	0.0
People with above basic overall digital skills	100.0	0.0	0.0

Finance and support	**129.0**	**44.5**	**24.3**
R&D expenditures in the public sector	121.2	33.9	17.7
Venture capital expenditures	106.6	48.5	23.9
Government support for business R&D	169.5	54.7	33.7
Firm investments	**137.8**	**47.4**	**5.0**
R&D expenditure in the business sector	167.6	70.5	15.5
Non-R&D innovation expenditures	102.2	21.2	0.0
Innovation expenditures per employee	140.5	51.4	0.0
Use of information technologies	**166.3**	**0.0**	**-9.8**
Enterprises providing ICT training	181.3	0.0	-18.8
Employed ICT specialists	150.0	0.0	0.0
Innovators	**146.5**	**32.7**	**17.8**
Product innovators (SMEs)	134.5	22.0	34.5
Business process innovators (SMEs)	157.0	44.0	0.0
Linkages	**174.0**	**1.9**	**-9.8**
Innovative SMEs collaborating with others	223.6	-40.3	-25.5
Public-private co-publications	271.5	117.4	39.4
Job-to-job mobility of HRST	93.8	-11.8	-17.6
Intellectual assets	**87.1**	**-3.5**	**0.3**
PCT patent applications	95.4	-7.8	-0.2
Trademark applications	95.6	11.8	1.5
Design applications	66.8	-10.0	0.0
Employment impacts	**151.4**	**15.5**	**9.4**
Employment in knowledge-intensive activities	139.0	0.0	0.0
Employment in innovative enterprises	161.4	29.7	18.0
Sales impacts	**101.2**	**28.1**	**-0.5**
Medium and high-tech goods exports	93.2	14.0	-1.2
Knowledge-intensive services exports	97.8	11.8	4.3
Sales of innovative products	115.5	65.5	-5.1
Environmental sustainability	**100.8**	**10.9**	**-4.5**
Resource productivity	128.1	29.2	-2.6
Air emissions by fine particulate matter	103.0	7.6	1.1
Environment-related technologies	70.8	2.2	-12.5

(*Source: European innovation scoreboard 2022: publication of the European Commission*)

2. National STI Programmes and Initiatives

Programme Title	Contents
Grants Programme ASEM DUO – Belgium/Wallonia-Brussels https://www.ares-ac.be/en/relations-internationales/asem-duo-grant	- Cooperation Type: mobility - Funding Organisation: Wallonia-Brussels-International (WBI) - Call Opening/Closing Date: closed (next call in 2024) - Participation Qualification: lecturers/professors from a higher education institution recognised by the Wallonia-Brussels Federation whose institution already has a cooperation agreement with an education institution in several countries including South Korea. - Project Duration: 1 to 3 months - Funding Scale and Scheme: 5,000€ per month for the two professors - Research Fields: all
The Research Foundation – Flanders (FWO) www.fwo.be	- Programme names: - PhD and postdoctoral fellowships in Flanders - FWO incoming and outgoing mobility grants - FWO Junior/Senior Research Project - FWO Odysseus programme – Attracting top talent to Flanders - FWO Strategic Basic Research Program (SBO) - FWO Applied Biomedical Research with a Primary Societal finality (TBM) - Funding Organisation: FWO - Call Opening/Closing Date: depends on the type of programme - Participation Qualification: please check website. - Project Duration: please check website. - Funding Scale and Scheme: fellowship funding - Research Fields: in general, all domains
Scholarships for Excellence program – InWBI http://www.wbi.be	- Cooperation Type: mobility - Funding Organisation: Wallonia-Brussels-International (WBI) - Call Opening/Closing Date: please check website. - Participation Qualification: Researchers with a PhD - Project Duration: Long-term and short-term scholarships at postdoctoral level - Funding Scale and Scheme: please check website. - Research Fields: Transport and logistics; Mechanical engineering; Life sciences; Agriculture-industry; Aero-space; and Environmental technologies

Several PhD and postdoctoral fellowships and other grants from the F.R.S.-FNRS https://www.frs-fnrs.be/en	▪ Cooperation Type: mobility/credit & projects call. ▪ Funding Organisation: Fonds de la Recherche Scientifique – FNRS (F.R.S.-FNRS) ▪ Call Opening/Closing Date: several dates ▪ Participation Qualification: please check website. ▪ Project Duration: various durations possible ▪ Funding Scale and Scheme: please check website. ▪ Research Fields: all ▪ calls for PhD students (Aspirant, FRIA and FRESH, https://www.frs-fnrs.be/en/financements/chercheur-doctorant); Postdocs (Chargé de recherche https://www.frs-fnrs.be/en/financements/chercheur-postdoc); Tenure track positions (Chercheur qualifié, https://www.frs-fnrs.be/en/financements/chercheur-postdoc#confirme); ULYSSE (Incentive Grant for Mobility in Scientific Research – MISU, https://www.frs-fnrs.be/en/financements/chercheur-postdoc#misu), ▪ Mobility instruments: https://www.frs-fnrs.be/fr/financements/mobilite-monde ▪ Credits & Projects Call: https://www.frs-fnrs.be/fr/financements/credits-et-projets
Innovation mandates (IM) https://www.vlaio.be/en/subsidies/innovation-mandates	▪ Cooperation Type: joint research ▪ Funding Organisation: Agency for Innovation by Science and Technology (IWT) ▪ Call Opening/Closing Date: 2 deadlines per year ▪ Participation Qualification: open to anyone with PhD ▪ Project Duration: around 2 years ▪ Funding Scale and Scheme: there are various types of mandates: spinoff mandates that are 100% funded by IWT for up to 2 years; Innovation mandates involving cooperation with existing companies. ▪ Research Fields: all ▪ Others: The ultimate goal is to bridge the gap between academia and industry and to help researchers to make the transition into the business world.

EOS (Excellence of Science), a shared programme of the FWO and the F.R.S.-FNRS https://www.eosprogramme.be/index.php/about-eos	▪ Programme name: Excellence of Science (EOS) ▪ Cooperation Type: Research Project ▪ Funding Organisation: The Research Foundation – Flanders (FWO, www.fwo.be) and the Fonds de la Recherche Scientifique (F.R.S.-FNRS, www.fnrs.be/en) ▪ Call Opening/Closing Date: check website ▪ Participation Qualification: Non-Belgian research institutions can be included. ▪ Project Duration: 4 years ▪ Funding Scale and Scheme: Overall budget for non-Belgian research institutions may not exceed 10% of total budget. Project budget up to € 1,000,000 per year ▪ Research Fields: Fundamental research in all domains ▪ Matching fund from Korean government: No ▪ Other: The EOS programme wants to promote joint fundamental research between researchers in the Flemish and French-speaking communities of Belgium.
STEREO IV STEREO IV Programme | Belgian Earth Observation website (belspo.be)	▪ Cooperation Type: R&I programme open to international partner(s) ▪ Funding Organisation: BELSPO ▪ Call Opening/Closing Date: 1 call/year ▪ Participation Qualification: open to universities, public scientific institutions, and non-profit research institutions ▪ Project Duration: small projects (1-3 years), big projects (4-5 years) ▪ Funding Scale and Scheme: a maximum of 20% of the STEREO budget may be earmarked for foreign teams per project. ▪ Research Fields: Earth observation ▪ Matching fund from Korean government: the foreign partners co-finance the project by matching the STEREO IV under a parallel funding arrangement.
Federal Research Programme Drugs http://www.belspo.be/belspo/drugs/index_en.stm	▪ Cooperation Type: joint research ▪ Funding Organisation: BELSPO ▪ Call Opening/Closing Date: every year ▪ Participation Qualification: Foreign research fundable up to 20% of total budget of proposal/project ▪ Project Duration: 2 years average ▪ Funding Scale and Scheme: € 250,000 per project ▪ Research Fields: social sciences and humanities and life sciences. Each year specific topics are selected. Matching fund from Korean government: No

Eureka / Eurostars / Eureka Clusters https://recherche.wallonie.be/eureka	■ Programme name: EUREKA ■ Cooperation Type: International collaborative research projects. ■ Funding Organisation: SPW Research (www.recherche.wallonie.be) within the framework of Eureka (www.eurekanetwork.org) ■ Matching fund from Korean government: KIAT (www.kiat.or.kr)
BEWARE Fellowship https://recherche.wallonie.be/beware	■ Programme name: BEWARE Fellowship ■ Cooperation Type: International Researchers Mobility ■ Funding Organisation: SPW Research (www.recherche.wallonie.be) within the framework of MSCActions (European Commission) (https://marie-sklodowska-curie-actions.ec.europa.eu) ■ The program is running until September 2027. Next calls will be open in January and April 2024.
MERANET 3 https://recherche.wallonie.be/meranet	■ Programme name: MERANET ■ Cooperation Type: International collaborative research projects. ■ Funding Organisation: SPW Research (www.recherche.wallonie.be) (https://marie-sklodowska-curie-actions.ec.europa.eu) ■ Matching fund from Korean government : KIAT (www.kiat.or.kr)
Brains for Brussels https://innoviris.brussels/brains-brussels	■ Programme name: Brains for Brussels ■ Cooperation Type: International Mobility - Research Project ■ Funding Organization: INNOVIRIS ■ Participation Qualification: high-level researchers active abroad or in the RDI sector. ■ Project Duration: 3 years + potential 2 years ■ Funding Scale and Scheme: organizations that receive researchers and that have at least one establishment in Brussels Region. ■ Matching fund from Korean government: No

3. Joint Activities with Korea

Programme Title	Contents
Call for joint FWO-NRF mobility projects Research Foundation - Flanders - Cooperation with South Korea (fwo.be) http://www.nrf.re.kr/eng/main	■ Cooperation Type: Joint Mobility Project ■ Funding Organization: FWO and NRF ■ Call Opening/Closing Date: June 29th, 2023 ■ Participation Qualification: see program website. ■ Project Duration: 2 years ■ Funding Scale and Scheme: costs for exchange of researchers (travel expenses and DSA) ■ Research Fields: Fundamental research ■ Matching fund from Korean government: Yes, by NRF ■ Others: Promotion of international collaboration between Flanders and South Korea

4. Science, Technology and Innovation Cooperation Partners

Organisation Name	Detailed Information
Belgian Nuclear Research Centre (SCK-CEN) http://www.sckcen.be	■ Organisation type: research organisation ■ Major Research Areas/Products: nuclear science and technology and ionizing radiation ■ Contact information: Services, consultancy and R&D – business@sckcen.be
Von Karman Institute for Fluid Dynamics (VKI) www.vki.ac.be	■ Organisation type: research and education organisation ■ Major Research Area/Product: theoretical and experimental fluid dynamics including numerical methods. ■ Contact Information: secretariat@vki.ac.be
Cenaero www.cenaero.be	■ Organisation type: research organisation ■ Major Research Area/Product: aeronautics ■ Contact Information: info@cenaero.be
Flanders Institute for Biotechnology (VIB) www.vib.be	■ Organisation type: research organisation ■ Major Research Area/Product: life sciences ■ Contact Information: info@vib.be
Interuniversity Micro-Electronics Centre (IMEC) www.imec.be	■ Organisation type: research organisation ■ Major Research Area/Product: semiconductor technology, nanoelectronics, nanotechnology, design methods and technologies for ICT systems ■ Contact Information: info@imec.be
VITO https://vito.be	■ Organisation type: research organisation ■ Major Research Area/Product: energy, materials, chemistry, health, and land use (including earth observation) ■ Contact Information: vito@vito.be
Institute of Tropical Medicine (ITM) www.itg.be	■ Organisation type: research organisation ■ Major Research Area/Product: tropical medicine and health care ■ Contact Information: itmedu@itg.be
Competitiveness Clusters in Wallonia www.clusters.wallonie.be	■ Organisation type: competitiveness clusters in various fields ■ Major Research Area/Product: transport and logistics, aerospace, green chemistry and durable materials, biotechnology and health, food industry, mechanical engineering ■ Contact Information: info@logisticsinwallonia.be, contact@greenwin.be, contact@biowin.org, info@wagralim.be, info@polemecatech.be
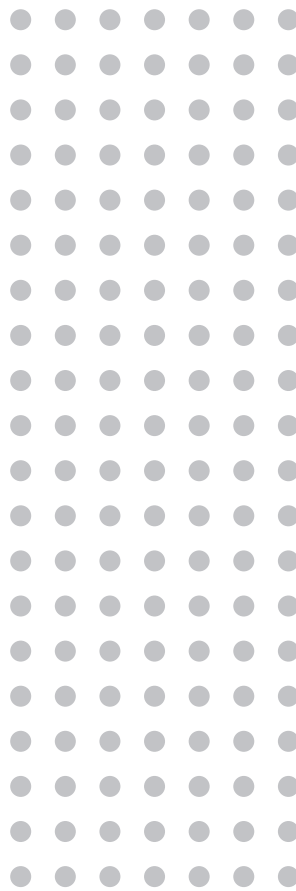
3 BULGARIA

BULGARIA

Country Outline

- GDP: 85,800 million euros (Eurostat 2022)
- GDP per Capita: 7,680 euros (Eurostat 2022)

Contact Information

- Organisation: "Science" Directorate Ministry of Education and Science
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1. Policies and Strategies in Science, Technology and Innovation

The National Development Programme BULGARIA 2030 is a strategic framework document of the highest order in the hierarchy of national programming documents, determining the vision and general goals of the development policies in all sectors of general government, including their territorial dimensions. The document sets out three strategic goals for the implementation of which it groups the government intentions into five areas (axes) of development and sets 13 national priorities.

National strategy for development of scientific research in the republic of Bulgaria 2017-2030 (Better science for better Bulgaria). The National Strategy defines the goals and corresponding measures and actions by the state for the development of scientific research in the period 2017-2030. It is one of the necessary conditions for achieving the goals laid down in the Partnership Agreement of the Republic of Bulgaria with the EC during the program period 2014-2020 and is bound to the Innovation Strategy for Smart Specialization 2014-2020. The strategy is also in line with a number of national and European documents.
The operational plan for the implementation of the first stage of the National Strategy for the Development of Scientific Research in the Republic of Bulgaria 2017-2030 was adopted by Decision No. 640 of the Council of Ministers of September 5, 2018.

The National Roadmap for Research Infrastructure 2020-2027 includes the main research complexes in the country and their respective prioritization at European and national level, according to the areas of impact of the ESFRI (energy, environment, health and food, natural and engineering sciences, social and cultural innovations and e-infrastructure) and ISSS (information and communication technologies and informatics; healthy lifestyle and biotechnology industries; mechatronics and clean technologies, and new technologies in the creative and recreational industries), the infrastructures being grouped as follows:

- International research infrastructure
- Unique research facilities
- Bulgaria in Pan-European Research Infrastructures (ESFRI)
- Infrastructure Consortia (ERICs)
- National research and innovation complexes
- Information and Communication Technologies
- E-infrastructures. Digital, computational and computer research (E-research)

The strategic document published by the Ministry of Education and Science of the Republic of Bulgaria includes a total of **51 infrastructures**, including **15 Centers of Competence and Centers of Excellence**, developed under the Operational Program "Science and Education for Smart Growth". The consistent scientific policy and investments in scientific infrastructure affirm Bulgaria's commitment to 8 existing European research consortia (ERICs, i.e., CLARIN, Euro Argo, ESS, EuroBioImaging, BBMRI, SHARE, EATRIS, DARIAH) and the participation in 5 partnerships to establish new ones (ACTRIS, CTA, ELI, EPOS, AnaEE).

Innovation Strategy for Smart Specialization 2021-2027

The Executive Agency "Programme Education" acts as a Managing Authority of the Operational Programme "Science and Education for Smart Growth" 2014-2020 and Programme "Education" 2021-2027. In this capacity, the agency is responsible for the overall programming, management and implementation of the programmes in accordance with the principle of sound financial management and all obligations under national and European Union law arising therefrom.

Additional information/brief overview: https://s3platform.jrc.ec.europa.eu/region-page-test/-/regions/BG

2. National STI Programs and Initiatives

Program **"Research, Innovation and Digitization for Smart Transformation"** meets the strategic needs and priorities of Bulgaria for accelerated economic development through investments in the development of scientific research, scientific infrastructure, innovation and smart industry and the rapid uptake of digital technologies in economy and society. The ambition is to raise the country significantly
its innovation performance and by 2030 to move from a "beginner" to a "moderate" innovator.

The activities of the Program will overcome structural deficiencies in the field of science research, innovation and digitization identified in the reports of the European Commission for Bulgaria from 2019 and 2020 and in particular the very low level of expenditure on R&D from both the public and private sectors, fragmentation of the scientific system research and higher education, poorly developed links between academia and business and low levels of penetration of digital technologies in the economy and society.

NB: Currently, there are no active specific/dedicated Programmes and Initiatives facilitating international or bilateral cooperation (including with Korea). The EU Framework Programme for research and innovation is Horizon Europe.
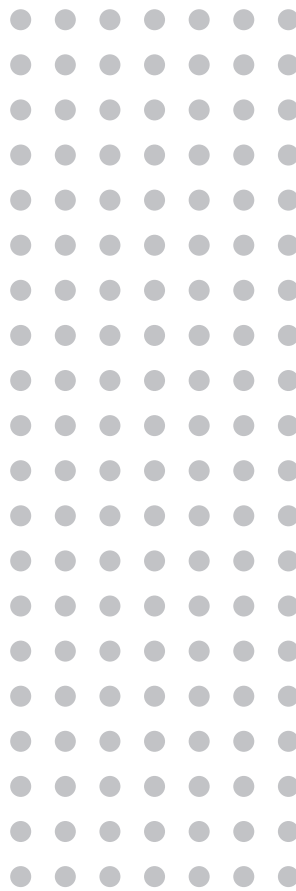
3. Joint activities with Korea

Not applicable.

4. Science, Technology and Innovation Cooperation Partners

Please refer to the National Roadmap for Research Infrastructure 2020-2027. Upon request, relevant additional (or specific) information can be provided.
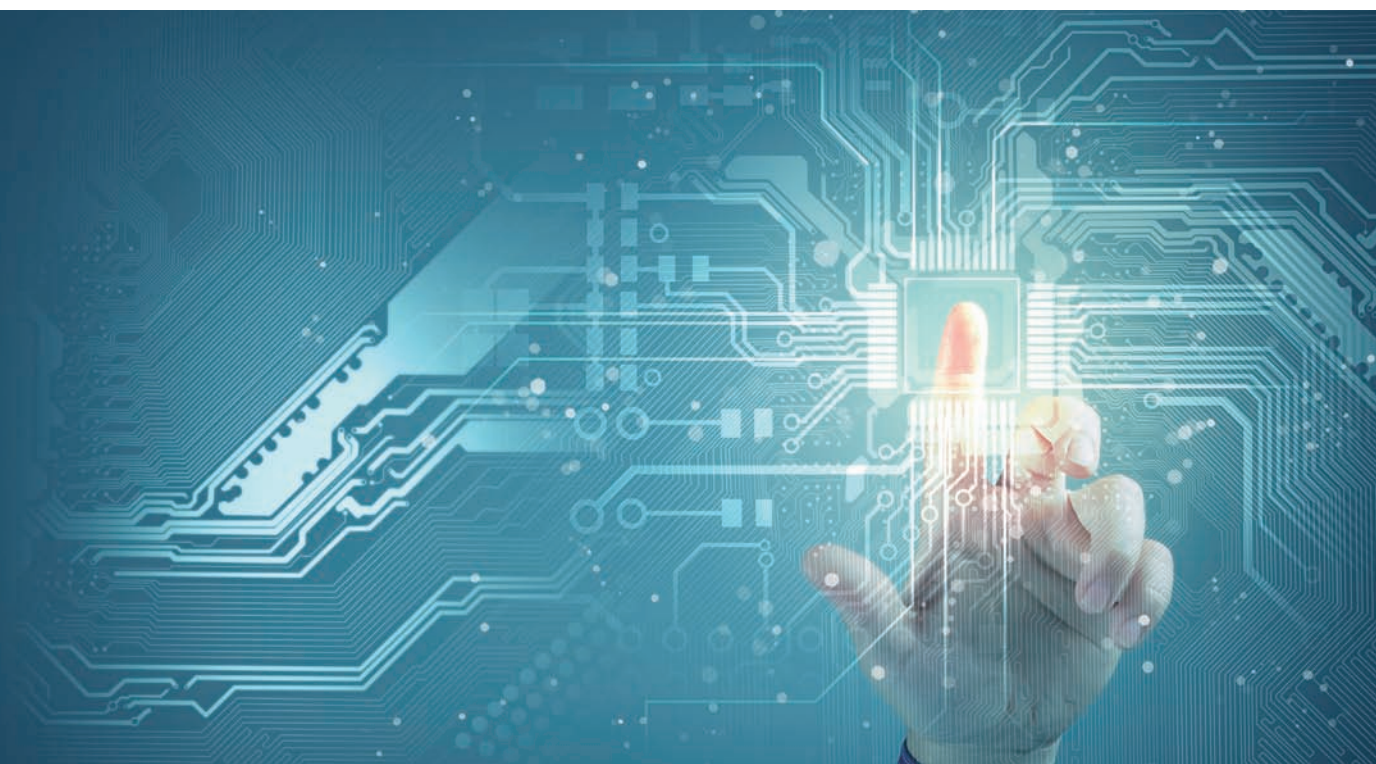
4 CROATIA

1. Policies and Strategies in Science, Technology and Innovation

2. National STI Programmes and Initiatives

3. Joint Activities with Korea

4. Science, Technology and Innovation Cooperation Partners

CROATIA

Country Outline

- GDP: 67,989 million euros (Eurostat 2022)
- GDP per Capita: 14,660 euros (Eurostat 2022)
- Areas of marked S&T specialisations: Personalized Health, Smart and Clean Energy, Smart and Green Transport, Security: Awareness, Prevention, Response, and Remediation, Sustainable and Circular Food, Customized and Integrated Wood Products, Digital Products and Platforms

Contact Information

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- Name / Position: Prof. Radovan Fuchs, Ph. D. / Minister of Science and Education
- Phone no. / e-mail: (+38) 5 1 4569 000

Croatia recognizes science as developmental priorities that can enable its long-term social stability, economic prosperity and secure cultural identity.

The quality of science and technology in Croatia is monitored by the Ministry of Science and Education, the National Council for Science, Higher Education and Technological Development and the National Innovation Council.

There are five types of institutions which carry out the scientific and research activities in Croatia:

1. public institutes
2. institutions of higher education
3. other research legal entities
4. independent commercial institutes
5. corporate industrial institutes

1. Policies and Strategies in Science, Technology and Innovation

The Croatian research sector, which consists of universities, public and private scientific institutes and other research subjects, operates in an old system unfavourable for innovation. Management and institutional structure limit research and development activities at universities and demotivate cooperation within the research sector and between the research and private sectors. Fragmentation and poor governance in the research sector also prevent transformative action. Croatia's achievements in terms of STI do not sufficiently contribute to the increase in productivity, which is a consequence of unsatisfactory research results and insufficient private investments in R&D, which leads to weaker progress of Croatia towards the Europe 2020 goals.

As a basis for STI policies Croatia developed Smart specialization strategy of the Republic of Croatia for the period from 2016 to 2020 (hereinafter: S3 16-20). S3 16-20 is a strategic document that defines priority areas for encouraging investment in research, development and innovation (RDI) with public funds. Croatian S3 16-20 identified 5 thematic priority areas of investment (TPAs) with further sub-priority areas. Thematic priority areas were identified by introducing triple helix approach, which implies the involvement of the public sector, academia and business sector in identifying their innovation potential in business and research sector as well as their market opportunities. This bottom-up process is known as an entrepreneurial discovery process (a form of formal consultation of stakeholders or experts).

Upon lessons learned during implementation and mid-term evaluation of S3 16-20, the new S3 2029 was developed and is expected to be adopted by Croatian Government in Q3 2023. The program interventions envisaged by the new S3 2029 aim to improve overall Croatian innovation efficiency and capacities for strengthening competitiveness and promoting industrial digital and green transformation. This is planned to be realized through three specific objectives of S3:

- Improved performance in conducting excellent research,
- Bridging the gap between the research and business sector,
- Improved innovation performance.

Specific objectives aim at research sector to generate the most up-to-date and influential knowledge that can create knowledge spill over effects on the economy. Research and business sectors to interact more intensively with the aim of encouraging technology transfer and developing innovations based on research and development. The business sector to increase its capacity and efficiency for R&D-based and non-R&D-based innovation in order to strengthen competitiveness.

Five thematic priority areas defined in S3 16-20 are broaden to 7 TPAs, where investments from ESI Funds, Recovery and Resilience Facility and national budget will be directed. Seven TPAs are: Personalized Health, Smart and Clean Energy, Smart and Green Transport, Security: Awareness, Prevention, Response, and Remediation, Sustainable and Circular Food, Customized and Integrated Wood Products, Digital Products and Platforms. S3 2029 is conceived as a flexible and "living" strategy that will be adjusted according to future trends and needs of the national innovation system stakeholders. Entrepreneurial discovery process, will play an important role in that respect, as it had in the creation of the Strategy. The strategy foresees turning EDP into a continuous process and to strengthen the governing role of National Innovation Council.

In order to address the above-mentioned goals, Croatia decided to carry out a comprehensive reform of the Croatian scientific and research system. In addition to S3 analysis of Croatian research system, findings and recommendations of the European Commission in the Reports for Croatia and the Recommendations of the Council were taken into account. Interventions that will support implementation of S3 2029 rely, in addition to national budget funding, on the funds provided from the Multiannual Financial Framework 2021-2027.

The first step towards improvement, higher productivity and growth of investment in the research system in Croatia is being implemented within the framework of the National Plan for Recovery and Resilience 2021-2026 (hereinafter: NRRP). Ministry of Science and Education (hereinafter: MSE) plans to improve the STI system through reform 3.2. Boosting research and innovation capacity with total estimated value of the investment of 318.534.740 EUR. Reform 3.2. consists of three mutually connected structural reforms that target: insufficient result-driven research in research organizations, fragmentation of the research sector, outdated career advancement framework, insufficient targeting of market failures and beneficiaries' needs in programming framework.

So far, the implementation of the NRRP has resulted in the adoption of three new laws that correspond with three reforms; Act on Higher Education and Scientific Activity, Act on the Croatian Science Foundation and the Act on Quality Assurance in Higher Education and Science, which represent the backbone of the reform of the Croatian scientific and research system.

The new Act on Higher Education and Scientific Activity enables organisational and functional reform of public universities and scientific institutes and funding aimed at achieving institutional development objectives. It provides a legal and financial framework for the organisational and functional integration of universities and scientific institutes, as well as a dialogue on institutional objectives and a new results-based funding framework. The reform of the research system is of key importance because by funding the science system through the new model of programme agreements, results-based funding will be fully and consistently put into practice.

The new Act on Quality Assurance in Higher Education and Science regulates the internal quality assurance and improvement of higher education institutions and scientific institutes, the external evaluation of the quality of higher education institutions and scientific institutes, and the organization and tasks of the Agency for Science and Higher Education. The second reform will improve the system of employment, advancement and career development of researchers in the science system, and together with the research system reform will have a lasting positive effect on the quality of research results, motivation and productivity of researchers and on the efficiency of scientific institutions in the Republic of Croatia.

In addition, through the third reform, the program framework will be improved and programs will be developed that will respond to market shortcomings and the needs of target users in a targeted and more direct way than before. The new Act on the Croatian Science Foundation more clearly defines the tasks of the Croatian Science Foundation in the field of implementation, coordination, design, monitoring and evaluation of programmes and for evaluating research and development project financing policies, thus creating a strong and independent system for the implementation of the selection, funding and monitoring of research and development projects.

In addition to NRRP, science and innovation programs will be financed through Program Competiveness and Cohesion 2021-2027 (hereinafter: PCC 21-27). Investments of the MSE listed under priority objective 1. "Strengthening the economy by investing in research and

innovation, supporting business competitiveness, digitalization and developing skills for smart specialization" are planned following independent analysis of investments made in previous period (OPCC 2014-2020). Investments planned in the PCC 21-27 build upon lessons learned through implementation of investments in the NRRP and create a natural continuation of funding Croatian scientific and research system. Investments listed under special objectives 1.i and 1.iv. focus on funding RTI infrastructure which will give more opportunities to research organizations for market-driven research and will be open to the needs of business sector that lacks necessary technology to perform R&D. In addition, funding will be given to encourage in particular applied research and market-oriented R&D activities in research organizations and collaborative R&D activities of two sectors as well. This will be accompanied by further development of technology transfer practices, as the goal is to ensure their widespread use in the RDI sector. Furthermore, investments will be focused on development of skills and strengthening the competencies of researchers for smart specialization (including entrepreneurial skills). Given that smaller and younger companies show higher productivity growth and that the level of investment in the early product development is certainly insufficient, support will be given to the emergence of new knowledge-based companies and to their R&D activities. Support will also be given to innovations in the early stages of development in both sectors.

2. National STI Programmes and Initiatives

Not Applicable

3. Joint Activities with Korea

Not Applicable

4. Science, Technology and Innovation Cooperation Partners

Organisation Name	Detailed Information
Croatian science foundation http://www.hrzz.hr	▪ Organisation type: Research foundation ▪ Major research areas/products⋯: All areas ▪ Current cooperation status with Korea: None ▪ Contact point: Professor Ozren Polašek, PhD. MD, Director of the Foundation
The Croatian Agency for SMEs, Innovation and Investments https://hamagbicro.hr	▪ Organisation type: Agency for SMEs, Innovation and Investments ▪ Major research areas/products⋯: All areas ▪ Current cooperation status with Korea: None ▪ Contact point: Vjeran Vrbanec, Chairman of the Board of Directors
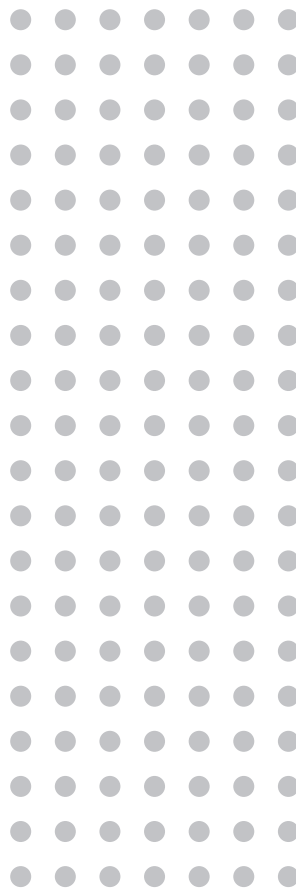
5 CYPRUS

1. Policies and Strategies in Science, Technology and Innovation

2. National STI Programmes and Initiatives

3. Joint Activities with Korea

4. Science, Technology and Innovation Cooperation Partners

CYPRUS

Country Outline

- GDP: 27,777 million euros (Eurostat 2022)
- GDP Per capita: 27,490 euros (Eurostat 2022)
- Areas of marked S&T specialisations: Energy, Food, Built Environment, Transport, Health, ICT, Environment

Contact Information

- Organisation: Directorate General Growth, Ministry of Finance
- Name / Position: Mr Savvas Zannetos / Planning Officer
- Phone no. / e-mail: (+357) 22602874 / szannetos@dgepcd.gov.cy

The RTDI system in Cyprus is relatively new and is evolving with the aim to increase efficiency and modernize the government, research and productive sector cooperation.

Recently a systematic effort was initiated in order (a) to evaluate the current research and innovation system and procedures in Cyprus and to give recommendations for its adjustment and upgrading it to become more effective and efficient and (b) to adopt explicit multiannual RTDI priorities. The National Committee for Research, Innovation and Technological Development (NCRITD), established by the Council of Ministers, in September 2013, was entrusted with the task to evaluate the current research and innovation system and procedures in Cyprus and to give recommendations for its adjustment and upgrading to become more effective and efficient. The study was submitted to the President of the Republic in March 2014.

R&D expenditure GERD/GDP is among the lowest in the EU with 0.47% or €83.3 million in 2012 (latest available data) and is slightly decreasing compared to 2011. In the National Reform Programme 2013 Cyprus set an R&D intensity target of 0.5% for 2020. This target was set taking seriously into consideration the particularities of Cyprus in terms of both the size of the research community as well as the orientation of the economy in low value added products and services (lack of big manufacturing firms) and the very small size and low involvement of Cypriot enterprises and firms in research and innovation activities in terms of participation and expenditure on R&D and innovation.

1. Policies and Strategies in Science, Technology and Innovation

The Smart Specialisation Strategy for Cyprus, an ex-ante conditionality for the absorption of European Structural and Investment Funds for R&I, was initiated in mid-2013 by DG EPCD

and was adopted by the Council of Ministers in March 2015. An extensive analysis of the national R&I priorities has been conducted with the aim of maximizing the knowledge based development potential of the Cyprus economy through targeted support to research and innovation in the sectors where Cyprus has a competitive advantage. The sectors identified through this process are Tourism, Energy, Agriculture/Food Industry, Construction, Shipping, Health, and ICT and Environment as horizontal priorities.

2. National STI Programmes and Initiatives

As mentioned above a new Strategy was adopted by the Council of Ministers in March 2015. The strategy includes a pillar called "Extraversion" that specifically aims at boosting international cooperation that foreign research entities can participate in projects as partners of Cypriot Contractors.

3. Joint Activities with Korea

Not Applicable

4. Science, Technology and Innovation Cooperation Partners

Most of the research in Cyprus takes place in the research centres within the universities. Moreover, there are also several specialized research centres and knowledge institutes outside of universities. However none of the Key Research Organisations has active STI cooperation programmes with RoK.

Organisation Name	Detailed Information
Research Promotion Foundation http://www.research.org.cy	■ Organisation type: Research Foundation ■ RPF promotes the development of scientific and technological research in Cyprus, and provides funding ■ Major activities with Korea: None ■ Contact Information: Tel: +357 22 205000 / Fax: +357 22 205001 　　　　　　　　　　　　　Email: ipe@research.org.cy
Cyprus Institution http://www.cyi.ac.cy	■ Organisation type: research Institute ■ Major Research Area/Product: Energy, Environment and Water, Archaeology Computation-based Science and Technology ■ Major activities with Korea: None ■ Contact Information: info@cyi.ac.cy

Cyprus International Institute www.hsph.harvard.edu/cyprus	▪ Organisation type: University ▪ Major Research Area/Product: Environment and Public Health ▪ Major activities with Korea: None ▪ Contact Information : lenia.josephides@cut.ac.cy
Agricultural Research Centre www.ari.gov.cy	▪ Organisation type: Research Institute ▪ Major Research Area/Product: Agriculture ▪ Major Activities with Korea: None ▪ Contact Information : info@ari.gov.cy
Cyprus Institute of Neurology and Genetics www.cing.ac.cy	▪ Organisation type: Research Institute ▪ Major Research Area/Product: Health and Genetics ▪ Major activities with Korea: None ▪ Contact Information : enquiries@cing.ac.cy
University of Cyprus www.ucy.ac.cy	▪ Organisation type: University ▪ Contact Information : +357 22894288
Cyprus University of Technology www.cut.ac.cy	▪ Organisation type: University ▪ Contact Information : +357 25002500
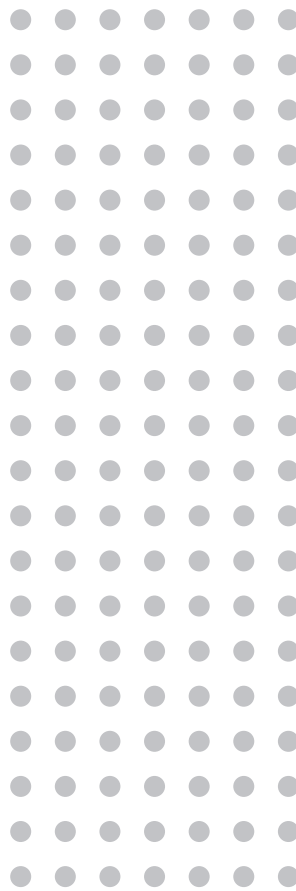
6 CZECH REPUBLIC

CZECH REPUBLIC

Country Outline

- GDP: 276,265 million euros (Eurostat 2022)
- GDP Per capita: 18,460 euros (Eurostat 2022)
- Areas of marked S&T specialisations: There are 6 defined priority areas and 24 subareas with a total of 170 specific objectives. The priority areas include Competitive knowledge-based economy, Sustainability of energetics and material resources, Environment for quality life, Social and cultural challenges, Healthy population, Safe society.

Contact Information

- Organisation: Embassy of the Czech Republic in the Republic of Korea
- Name / Position: Mr Jakub Kopecký / Head of Economic Section
- Phone no. / e-mail: +82 2 725 6763 / commerce_seoul@mzv.cz

Czechia, a mid-sized country with outstanding industrial tradition and cultural heritage, is well known for its high quality science and innovative spirit. Its universities, research and innovative centres are open to bilateral and multilateral cooperation. The Czech Government recognizes that new knowledge and technologies are key to future prosperity and growth and for coping with global challenges. We stand ready to work together with experts and officials from other governmental and RDI institutions as well as with representatives of the academia and help forge partnerships between Czech scholars, researchers and innovators and their possible international counterparts. We are keen to identify new opportunities for collaboration, assist in networking across borders and continents, and to support joint projects matching mutual interest of those willing to work together bilaterally and multilaterally.

1. Policies and Strategies in Science, Technology and Innovation

Research in Czechia

Czech research can build on advanced capacities and knowledge in a number of areas, including mathematics and physics, digital technologies and AI, cyber security, organic chemistry, biochemistry, and new materials. Hundreds of millions of people around the globe have benefited from Czech discoveries and technologies: antiretroviral drugs used in the treatment of diseases such as HIV/AIDS, hepatitis B (prof. Antonín Holý), soft lenses (prof. Otto Wichterle), polarography (Jaroslav Heyrovský) or antivirus software (Avast).

Basic and applied research is in Czechia performed at universities and at the institutes of the Czech Academy of Sciences (CAS). There are altogether 54 institutes of CAS with some 11,000 employees, more than half of them researchers with university degrees.

Large research infrastructures on Czechia's territory

Large research infrastructures (RIs) funded by the Czech Government (Ministry of Education, Health and Sports) provide unique, state-of-the-art facilities and equipment, and enable advanced research (both basic and applied), technology development and innovation. Their operating costs are covered from the state budget (EUR 85 mil. In 2023); up-grade and investments are supported from the EU Cohesion Policy Funds (EUR 163 mil. In 2023-2026). RIs have been built in recent years with the aim to interlink Czech universities, institutes of CAS and other research centres.

RIs provide unique research facilities and bring together advanced knowledge and expertise. They are open to collaboration with international partners from RDI organisations and innovative firms. Many of them are international with English as working language, therefore RIs could serve as hubs for international cooperation in RDI with involvement of the best Czech teams.

RIs are clustered into following basic categories:
- energy
- health and food
- physical sciences, engineering
- environment
- biological and medical sciences
- social sciences, humanities

Smart Specialization in applied research and innovation in Czechia

Czechia builds on a long-term tradition of high-quality manufacturing, innovation and research. To advance those qualities, modernize the Czech industry and boost growth of Czech innovative entrepreneurship, the Government adopted National Research and Innovation Strategy for Smart Specialization (RIS3). It should serve as an instrument to support research and innovation in a "smart" manner and fully explore a high potential of Czech knowledge and resources in identified areas at both national and regional levels.

Smart specialization should ensure long-term competitive edge of Czech private sector and serve as a driver for technological transformation. Concrete areas and projects with a high potential for applications have been identified. There are altogether nine "domains of specialization" ready for promotion.

Smart specialization is also implemented at regional level. Each Czech region is building its own innovation ecosystem. To support that, regional innovation centres have been set up. They are open to international collaboration.

Strategic documents regarding the National RDI Policy 2021+ can be found at: https://www.vyzkum.cz/FrontClanek.aspx?idsekce=932081

Strategic documents regarding the National Research and Innovation Strategy for Smart Specialization (RIS3) can be found at: https://www.mpo.cz/en/business/ris3-strategy/ris3-strategy--265275

Strategic documents regarding the National priorities of Oriented Research can be found at: https://www.vyzkum.cz/FrontClanek.aspx?idsekce=782681

2. National STI Programmes and Initiatives

International Cooperation Programmes/Initiatives

Programme Title	Contents
Research Cooperation (https://gacr.cz/en/overview/bilateral-cooperation)	■ Programme name: Research Cooperation ■ Cooperation Type: Basic research ■ Funding Organisation: Czech Science Foundation / National Research Foundation of Korea (NRF) ■ Call Opening/Closing Date: The call for proposals is announced once a year usually in February/March. ■ Participation Qualification: Proposals are to be submitted in English to both grant agencies simultaneously and the main evaluation criteria of project proposals are quality and originality, complementary approaches and methods, the applicants' previous research and publication record, eligibility of costs and declared research outputs of participating partners. ■ Project Duration: 2 years ■ Research Fields: All research areas
SIGMA Programme (successor of the DELTA 2 Programme) (https://www.tacr.cz/en/sigma-programme)	■ Programme name: SIGMA Programme (successor of the DELTA 2 Programme) ■ Cooperation Type: Applied research ■ Funding Organisation: Technology Agency of the Czech Republic / Korea Institute for Advancement of Technology (KIAT) ■ Call Opening/Closing Date: Currently not open (TBD, might open in May 2024) ■ Participation Qualification: Proposals are to be submitted in English to both grant agencies by the respective applicants. ■ Project Duration: 3 years ■ Funding Scale and Funding Scheme: Expected amount allocated to the call: CZK 160 million ■ Research Fields: TBD

SIGMA Programme (successor of the DELTA 2 Programme) (https://www.tacr.cz/en/sigma-programme)	▪ Programme name: SIGMA Programme (successor of the DELTA 2 Programme) ▪ Cooperation Type: Applied research ▪ Funding Organisation: Technology Agency of the Czech Republic / Korea Institute of Energy Technology Evaluation and Planning (KETEP) ▪ Call Opening/Closing Date: Currently not open (TBD, might open in May 2024) ▪ Participation Qualification: Proposals are to be submitted in English to both grant agencies by the respective applicants. ▪ Project Duration: 3 years ▪ Funding Scale and Funding Scheme: Expected amount allocated to the call: CZK 160 million ▪ Research Fields: TBD

3. Joint Activities with Korea

Activities with the RoK in 2023-2024

Programme Title	Contents
Renewable energy technologies	High-level bilateral talks on ST cooperation in priority areas, namely in renewable energy technologies (hydrogen) - TBC

4. Science, Technology and Innovation Cooperation Partners

Organisation Name	Detailed Information
Office of the Minister of Science, Research and Innovation (https://www.vyzkum.cz/Default.aspx?lang=en)	▪ Organisation type: organizational unit of the state ▪ Major research areas/products : support of research, experimental development and innovation from public resources ▪ Contact point: - Ms Jana Havlíková - Deputy Minister for Science, Research and Innovation - e-mail: havlikova.jana@vlada.cz

Ministry of Education, Youth and Sports (https://www.msmt.cz/research-and-development-1)	▪ Organisation type: organizational unit of the state
	▪ Major research areas/products : preparation of the National Research and Development Policy of the Czech Republic
	▪ Contact point:
	  - Mr Lukáš Levák
	  - Director of Department
	  - e-mail: Lukas.Levak@msmt.cz

Ministry of Foreign Affairs (https://www.mzv.cz/jnp/en/foreign_relations/science_and_technology/index.html)	▪ Organisation type: organizational unit of the state
	▪ Major research areas/products : support and realisation of science diplomacy
	▪ Contact point:
	  - Ms Kateřina Joselová
	  - Head of Science Diplomacy Unit
	  - e-mail: science@mzv.cz

Ministry of Industry and Trade / CzechInvest (https://www.czechinvest.org/en?force)	▪ Organisation type: organizational unit of the state
	▪ Major research areas/products: attracting investments in the field of STIs to the Czech Republic, supporting innovation in start-ups, SMEs, etc.
	▪ Contact point:
	  - Mr René Samek
	  - e-mail: Rene.Samek@czechinvest.org

Technology Agency of the Czech Republic (https://www.tacr.cz/en)	▪ Organisation type: organizational unit of the state
	▪ Major research areas/products : applied research, development and innovation, and collaboration with similar agencies abroad
	▪ Current cooperation status with Korea: Active
	▪ Contact point:
	  - Ms Kateřina Feiglová
	  - Bilateral cooperation (DELTA 2 / SIGMA Programme)
	  - e-mail: katerina.feiglova@tacr.cz

The Czech Science Foundation (https://gacr.cz/en)	▪ Organisation type: independent public organisation
	▪ Major research areas/products : public funding exclusively for basic research projects
	▪ Contact point:
	  - Ms Kamila Pětrašová
	  - Head of the International Relations Department
	  - e-mail: kamila.petrasova@gacr.cz
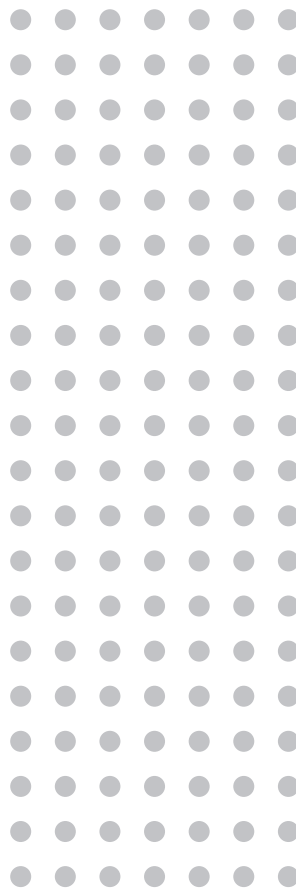
7 DENMARK

DENMARK

Country Outline

- GDP: 380,617 million euros (Eurostat 2022)
- GDP Per capita: 51,660 euros (Eurostat 2022)
- Areas of marked S&T specialisations: Energy and environment, Health and Life Science, Quantum Science, ICT/Robotics

Contact Information

- Organisation: Embassy of Denmark, Innovation Centre Denmark Seoul
- Name / Position: Ms Inie Madsen / Science & Innovation Counsellor,
  Ms Go Wun Kim / ST&I officer
- Phone no. / e-mail: (+82) 02-6363-4832 / inimad@um.dk, gowkim@um.dk

In Denmark, research is the key motor for growth and societal development. Denmark is ambitiously investing in research and is among the strongest research nations, measured in gross domestic expenditure on R&D. With the national strategy for investments in green research, technology, and innovation, the government has set a long-term direction to use research and technology as the pillars to accelerate the development of green solutions to realise the climate targets of 2030 and 2050). Ambitions are founded in creating continued growth and development in the public as well as the private sector, while also contributing to some of the pressing challenges of the future.

In 2023, the European Innovation Scoreboard ranked Denmark as the most innovative EU member state, highlighting public-private co-publications, international scientific co-publications, lifelong learning, foreign doctorate students and environment-related technologies.

According to Universitas 21, Denmark has the third best higher education system in the world in 2020. The ranking reflects the aims of higher education, highlighting the contribution to innovation through research and the facilitation of interconnections between tertiary institutions and stakeholders, both domestic and international.

1. Policies and Strategies in Science, Technology and Innovation

With the national strategy for investments in green research, technology and innovation, the Danish government has substantially lifted the level of funding with the aim to boost activities as well as set a long-term direction to use research and technology as the pillars to accelerate the development of green solutions to realise the climate targets of 2030 and 2050. Denmark will focus its efforts on those challenges (missions), where answers are most important in order to meet Denmark's ambitious climate objectives and to strengthen nature and the environment. In connection with the 2023 Finance Bill, the government has allocated public

research funds earmarked for green research of an amount equal to EUR 325 million.

Since 2021, the Danish government has invested public funds equal to approx. EUR 140 million to four green InnoMissions focused on challenges with a special need for cutting-edge solutions to meet the 2030 targets and to set the direction towards carbon neutrality by 2050, create new jobs and exports of green solutions contributing to a reduction in greenhouse gas emissions globally:

1. Carbon capture and storage or utilisation
2. Green fuels for transportation and industry (Power-to-x etc.)
3. Climate and environment-friendly agriculture and food production
4. Circular economy with a special attention to plastics

While green research will be prioritized in the years to come, other classical Danish positions of strengths such as life science, health and welfare technology, and technology and innovation that can keep production and jobs in Denmark will receive funding.

In June 2023, the Danish government launched the first part of a new strategy on quantum science. The strategy comprises an investment of one billion DKK to support ongoing research endeavours in Denmark within the domain of quantum science. This commitment underscores the prospective significance of quantum technology in crucial areas like healthcare, the green transition, and cyber security. It solidifies Denmark's aspiration to establish itself as a preeminent quantum research hub.

2. National STI Programmes and Initiatives

Denmark has one of the most effective research and innovation systems in the world, as can be seen in various OECD statistics, bibliometric analyses and the Innovation Union Scoreboard. The latter has ranked Denmark an Innovation Leader for eight consecutive years, where it in 2023 was ranked second-to-none. Denmark has a particular solid performance in creating good framework conditions for innovation, human resources and attractive research systems.

All universities in Denmark are public, and due to a merger of most sector specific research institutions in 2007, the majority of public research is conducted at Danish universities.

Furthermore, the Danish research infrastructure includes seven independent 'Approved Technological Institutions' that foster the link between research and business communities by spreading the most recent knowledge and state-of-the-art technology to the business community.

Research and innovation in Denmark is funded partly through universities' basic funding, and partly through external and competitive funds from various research and innovation financing bodies. In addition to public funds, a number of private foundations provide research funding. In 2021, approx. EUR 700 million of Danish research funding came from private Danish foundations and organisations. The major public and private research funding organisations are as follows:

Public foundations
- Innovation Fund Denmark
- The Danish Council for Independent Research
- The Danish National Research Foundation
- GUDP, The Environmental Technology Development and Demonstration Program (MUDP) & Energy Technology Development and Demonstration Programme (EUDP)

Private foundations
- Novo Nordisk Foundation
- Lundbeck Foundation
- Villum Foundation
- Realdania
- Augustinus Fonden
- Nordea Foundation
- A.P. Møller Fonden
- Carlsberg Foundation
- Velux Foundation
- Tryg Foundation
- LEGO Foundation

International Cooperation Programmes/Initiatives

Programme Title	Contents
Global Innovation Network Program	▪ Programme name: Global Innovation Network Program ▪ Cooperation Type: R&D network grants ▪ Funding Organisation: Danish Agency for Higher Education & Science ▪ Closing Date: August 15 2023 ▪ Participation Qualification: University, public research institution, RTO, research hospital, national cluster ▪ Project Duration: 1-2 years ▪ Funding Scale and Funding Scheme: Max EUR. 100,000 ▪ Research Fields: open to all, but priority to green transition, life science and digital & emerging technologies.

3. Joint Activities with Korea

On the bilateral level, the Korean Ministry of Science and ICT and the Danish Ministry of Higher education and Science has confirmed their collaboration for 2023-2025 to be within Biotech, quantum and hydrogen. Within these fields, joint workshops, conferences and network activities for research institutions and innovative companies will be organised.

Innovation Centre Denmark in Seoul facilitates exchanges and networking activities within research and innovation, connecting Danish and Korean universities and research institutions. It also supports Danish corporates, SMEs and start-ups with advisory services on navigating Korea as an innovative hub and supports Danish companies' innovation collaboration with Korean partners.
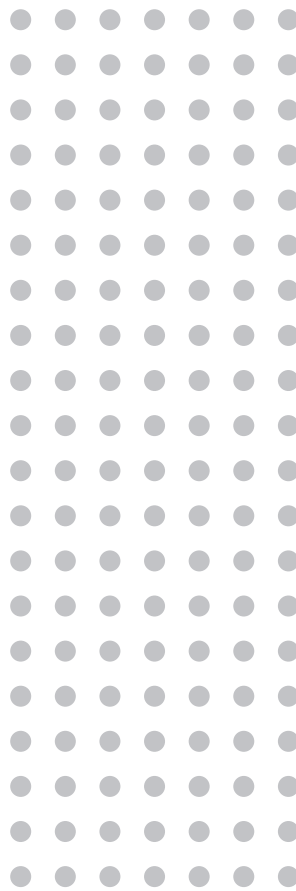
4. Science, Technology and Innovation Cooperation Partners

Organisation Name	Detailed Information
Innovation Centre Denmark Seoul	■ Organisation type: Government sector ■ Major research & innovation fields: Green transition, tech & life science ■ Innovation Centre Denmark facilitates research and innovation collaboration between Danish and Korean universities, research institutions and innovative companies. ■ Contact point: https://icdk.dk/our-locations/seoul
Danish Agency For Science and Higher Education	■ Organisation type: Government sector ■ Government Agency under Ministry of Higher Education & Science in Denmark ■ Collaboration with Korea: MSIT & MOF ■ Contact point: www.ufm.dk
Innovation Fund Denmark	■ Organisation type: Government sector ■ Funding agency under Ministry of Higher Education & Science in Denmark ■ Collaboration with Korea: KIAT ■ Contact point: www.innovationsfonden.dk
Universities in Denmark	■ Organisation type: Higher Education and research ■ University of Copenhagen: www.ku.dk ■ Aarhus University: www.au.dk ■ University of Southern Denmark: www.sdu.dk ■ Roskilde University: www.ruc.dk ■ Aalborg university: www.aau.dk ■ Technical University of Denmark (DTU): www.dtu.dk ■ Copenhagen Business School: www.cbs.dk ■ IT University of Copenhagen : www.itu.dk
Research & Technology Organisations	■ Alexandra Institute: www.Alexandra.dk ■ Bioneer: www.bioneer.dk ■ DFM: www.dfm.dk ■ DBI: www.brandogsikring.dk ■ DHI: www.dhigroup.com ■ Force Technology: www.forcetechnology.com ■ The Danish Technological Institute: www.teknologisk.dk
National Cluster organisations	■ Please find a list of all national clusters through this link: https://clusterexcellencedenmark.dk/the-danish-clusters/denmarks-13-national-clusters/?lang=en

Science, Technology
and Innovation
of the European Countries

8 ESTONIA

ESTONIA

Country Outline

- GDP: 36,011 million euros (Eurostat 2022)
- GDP Per capita: 16,250 euros (Eurostat 2022)
- Areas of marked S&T specialisations: Digital solutions across all areas of life, Health technologies and services, Valorisation of local resources, Smart and sustainable energy solutions

Contact Information

- Organisation: Ministry of Education and Research
- Name / Position: Ms Katrin Pihor / Head of the Research and Development Policy Department
- Phone no. / e-mail: (+372) 735-0170 / katrin.pihor@hm.ee

Estonia boasts a long tradition of providing quality education. Its vibrant and international education and research environment, endowed with the latest developments in information technology, makes Estonia an attractive place for people looking to work and study abroad. A top quality that unites Estonians is a reverence for science and technology.

1. Policies and Strategies in Science, Technology and Innovation

Estonian Research and Development, Innovation and Entrepreneurship Strategy 2021-2035 addresses research, development, innovation, and entrepreneurship within a common strategic framework to create more synergies and coherence between these areas.

The general objective of the strategy is for Estonian research, development, innovation, and entrepreneurship to work together to increase the well-being of Estonian society and the productivity of the Estonian economy, providing competitive and sustainable solutions for the development needs of Estonia and the world.

Taking into account the development needs of the Estonian RDI system and entrepreneurship, the strategy sets the following sub-objectives:
1. Estonia's development relies on knowledge-based and innovative solutions.
2. Research in Estonia is high-level, effective, and diverse.
3. Estonia's business environment is conducive to the entrepreneurial spirit and to the emergence and growth of knowledge-intensive enterprises, the creation and export of higher value-added products and services, and investments in all regions of Estonia.

KNOWLEDGE TRANSFER

Leveraging the societal benefits of RDI

- Activities in the RDIE focus areas
- Supporting knowledge transfer capacities
- Co-operation and co-ordination between actors in the RDIE system

RDIE 2035

RESEARCH SYSTEM

Basic capabilitiesof the research system

- Development of research institutions and the research community, competitive working conditions and next generation of researchers
- Research infrastructure
- International cooperation
- A coherent research and higher education system

BUSINESS ENVIRONMENT

A business environment conducive to science- and technology-intensive entrepreneurship

- International competitiveness of enterprises
- Creating higher added value and export capacity
- Technology- and development- intensive (foreign) investments

The strategy in English: https://www.hm.ee/media/1614/download

2. National STI Programmes and Initiatives

International Cooperation Programmes/Initiatives

Programme Title	Contents
Incoming postdoctoral grant https://etag.ee/en/funding/mobility-funding/postdoctoral-researcher-grant	▪ Programme name: Support for the Internationalization of Research and Development and Participation in the International Knowledge Market ▪ Cooperation Type: Researchers' mobility ▪ Funding Organisation: Estonian Research Council ▪ Call Opening/Closing Date: Usually in spring. One time a year after MSCA results are revealed. See more from the grant website. ▪ Participation Qualification: The support can be applied for by a postdoctoral researcher who has received a positive result (at least 70 points) in the MSCA postdoctoral individual grant application round within the two years preceding the application but has not received funding. The application must include the unfunded MSCA application and its outcome. ▪ Project Duration: 12-24 months ▪ Funding Scale and Funding Scheme: The amount of support for the 2023 application round is 72,000 euros per year, of which the grant is 86%, i.e., 61,920 euros, and the co-financing is 14%, i.e., 10,080 euros (direct costs of the project 57,600 euros, indirect costs 14,400 euros). Dependant on the national funding rates. ▪ Research Fields: The smart specialization fields (see above)
R&D funding and mobility opportunities for researchers in Estonia https://etag.ee/en/funding/research-funding/personal-research-funding	▪ If you are going to work as a researcher at an Estonian R&D institution, you can apply for personal research grants (starting, team and postdoctoral research grants). See more from https://etag.ee/en/funding/research-funding/personal-research-funding ▪ In case you are looking for a practical information on professional and daily life, as well as information on job and funding opportunities visit www.euraxess.ee EURAXESS Network gives information and assistance to researchers (PhD students, postdoctoral scholars, researchers, and other academic staff) wishing to come to Estonia or for those looking for jobs in research abroad.

Study opportunities and scholarships for international students in Estonia https://www.studyinestonia.ee	▪ In 2023 more than 100 degree programmes offered by Estonian higher education institutions are fully taught in English. ▪ STUDY IN ESTONIA is a cooperation platform of institutions of higher education in Estonia to increase visibility of Estonia as an attractive study destination and promote the possibilities for studying for international students. ▪ Please find detail information about scholarships for international students and about study programmes in English from www.studyinestonia.ee ▪ Most of scholarships provided by Estonian universities and government are for Master and PhD students, however there are some support schemes available for Bachelor students as well.

3. Joint Activities with Korea

Not Applicable

4. Science, Technology and Innovation Cooperation Partners

Organisation Name	Detailed Information
Estonian Research Council https://etag.ee	▪ Organisation type: Governmental foundation ▪ The goal of the Estonian Research Council is to effectively implement national research and development activities policy, increase the social and economic impact of research and development, and support ministries and state institutions in effective and knowledge-based research and development activities in policy making. For this purpose, the research agency organizes research and development activities funding, supports international cooperation, popularizes research activities and promotes research communication, evaluates the quality of research and development activities, analyses the research and development system, and advises policymakers. ▪ Contact point. Phone (+372) 730-0324, E-mail: etag@etag.ee

Estonian Business and Innovation Agency https://eas.ee/en	• Organisation type: Governmental foundation • The objectives of the Estonian Business and Innovation Agency are to increase Estonia's international competitiveness and to develop entrepreneurship and the living environment. To do this, innovation and research-intensive solutions are promoted. The organisation offers grants, loans, venture capital, credit insurance, and guarantees. • To grow R&D activities and investments of private entrepreneurs, Enterprise Estonia created the Applied Research Program that advises entrepreneurs on their novel product development and business plans and also co-finances projects proposing such. During three years, advice for more than 550 unique projects has been given and for the past two years approx. 100 projects have been co-funded in the amount of 112 million euros. The program is included on the strategic measures list of the European Commission, being also sought after among entrepreneurs. • In cooperation with Metrosert (government standards and measures holder), a Center for Applied Research has been created, with focus topics on biorefining, hydrogen technologies, health data valorization, drone technologies and self-driving vehicles. • Contact point. Phone: +372 6 279 700, E-mail: eas@eas.ee
Education and Youth Board https://harno.ee/en	• Organisation type: Governmental foundation • Education and Youth Board coordinates activities on promoting the possibilities for studying in Estonia for international students through Study in Estonia platform. They carry out surveys and organise professional trainings, publish information material, organise and participate in several different direct marketing activities. The main cooperation partners of Study in Estonia are universities providing degree programmes fully taught in English and internationally recognised. • Contact point: Phone (+372) 735 0500 info@harno.ee / info@studyinestonia.ee

University of Tartu
https://ut.ee/en
	■ Organisation Type: Public University
	■ Major Research Area: Multidisciplinary
	■ Major Activities with Korea:
	  1) Entrepreneurship agreements Licence agreement "Lactobacillus fermentum ME-3" with Namyang Dairy Products Co., Hyang Rim Corporation (2011–13).
	  2) Studies and teaching
	    - **Student exchange** under bilateral cooperation agreements with Pusan National University and Chung-Ang University, bilateral agreements also with University of Jeonju, Soongsil University.
	    - **Scholarship scheme** for incoming mobility for students and scholars under Erasmus+ mobility scheme.
	    - **Faculty and research visits, guest lecturers and teaching staff** from Korea.
	    - **Korean language tuition. Courses on Korean culture, history and society** have been actively taught at the University of Tartu Institute of Foreign Languages and Cultures since 2014. The visiting lectureship programme was initially supported by the Academy of Korean Studies and since 2016 by the Korea Foundation.
	  3) The University of Tartu Asia Centre. Established in 2016 as a consortium, which combines and coordinates the University's expertise research in Asian societies and economies. The aim of the Centre is to inform and shape contemporary thinking and understanding of developments in Asia and the Middle East. Through its activities, the Centre supports the promotion of research and teaching of Asia and the Middle East Studies as well as influences Estonia's economic and cultural life and social development by introducing competencies related to Asia. As one of its main efforts, in the academic year 2018/19 the Centre launched a Master's Programme on Contemporary Asian and Middle Eastern Studies.
	■ **Future Plans**: The University of Tartu is interested in reinforcing the cooperation with the Republic of Korea in the fields of research, technology, innovation and entrepreneurship.
	■ Contact Information:
	  Mr. Taivo Raud
	  Head of Rector's Strategy Office
	  Ülikooli 18a-103, 50090 TARTU / Phone: (+372) 737 5609
	  Ms. Kristi Kerge
	  Head of International Cooperation
	  Ülikooli 18, 50090 TARTU / Phone: (+372) 737 6123
	  Ms. Elo Süld
	  Head of the University of Tartu Asia Centre
	  Ülikooli 18, 50090 TARTU /Phone: (+372) 737 5300

Taltech
https://taltech.ee/en
	▪ Organisation Type: Public University
	▪ Major Research Area/Product:
	  - Civil Engineering
	  - Power Engineering
	  - Electrical Engineering
	  - Information and Communication Technology
	  - Chemistry and biotechnology
	  - Environmental technologies
	  - Mathematics and Physics
	  - Materials Science and Technology
	  - Social Sciences (incl. Economics)
	  - Healthcare technologies
	  - Production technologies, Mechanical and Instrumental Engineering
	▪ Major Activities with Korea:
	  - Student/researcher exchange, research co-operation
	  - 7 bilateral agreements with Korea universities
	▪ Future Plans: Student/Researcher exchange, R&D cooperation projects and co-publication (research, industry relations)
	▪ Contact Information: **Mr. Reijo Karu**, Head of International Cooperation, reijo.karu@taltech.ee, +372 620 3503

Tallinn University
https://www.tlu.ee/en
	▪ Organisation Type: Public University
	▪ Major Research Area/Product: Educational Innovation, Digital and Media Culture, Cultural Competences, Healthy and Sustainable Lifestyle, Society and Open Governance
	▪ Major Activities with Korea:
	  - Joint research, exchange students, university teachers and researchers (Erasmus+ 2023-2026 ICM exchanges with Hankuk University of Foreign Studies)
	  - Bilateral and exchange agreements with the following universities: Kyungpook National University, Chungbuk National University, Kyung Hee University and Dongguk University.
	  - "Tallinn King Sejong Institute" that provides Korean language and cultural classes to university students and to a wider base of learners.
	▪ Future Plans:
	  - Develop a Korean studies curriculum to be part of the Asian studies program
	  - Expand the exchanges and research cooperation with South-Korean universities
	▪ Contact Information: **Ms. Anete Elken**, Senior Specialist for International Cooperation, anete.elken@tlu.ee, +372 6199503

Estonian University of Life Sciences www.emu.ee	■ Organisation Type: Public University ■ Major Research Area/Product: - Agriculture - Veterinary Medicine and Animal Science - Forestry - Food Science - Environmental Science - Civil Engineering and Water Management - Plant Science - Engineering - Landscape Architecture - Rural economics and development ■ Future Plans: Student/Researcher exchange; development of bioeconomy research; managing climate change issues in Forestry and Agricultural fields. ■ Contact Information: **Ms Katri Hellat**, Estonian University of Life Sciences, Kreutzwaldi 1, 51014 Tartu, Estonia, katri.hellat@emu.ee
Estonian Academy of Arts www.artun.ee	■ Organisation type: Public University ■ Major Research Area/Product: Research at the Estonian Academy of Arts is oriented towards keywords such as practice, technology, theory, society, and culture. Alongside high-level research projects in art history, visual culture and Soviet culture, our priority is to develop artistic research on an international level. Artistic research is conducted in a variety of fields and encompasses different ways and tools of knowledge production: - artistic research in contemporary art, - design research, - practice based research in architecture and urban design, - conservation combining both practical elements and theo-ry-based research, - cultural heritage research ■ Contact Information: **Ms Sandra Mell,** Head of International Office sandra.mell@artun.ee, +372 626 7369

Estonian Academy of Music and Theatre https://eamt.ee/en	▪ Organisation type: Public University ▪ Major research areas: musicology, theatre studies, music education and cultural management ▪ Current cooperation status with Korea: reciprocal faculty visits, teaching staff from Korea ▪ Future plans: interested in reinforcing cooperation with Seoul National University. ▪ Student recruitment, artistic and educational exchange, joint cooperation projects ▪ Contact information: **Prof. Henry David Varema**, Vice Rector for Artistic Affairs and International Relations henry-david.varema@eamt.ee, +372 6675703 **Ms. Hanneleen Pihlak**, International Relations Coordinator hanneleen.pihlak@eamt.ee, +372 6675779

Science, Technology
and Innovation
of the European Countries
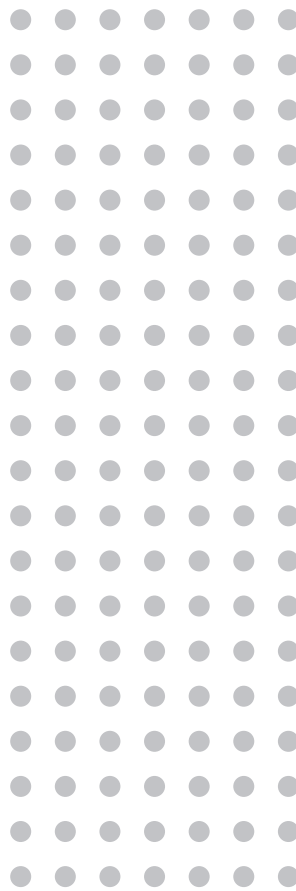
9 FINLAND

FINLAND

Country Outline

- GDP: 268,411 million euros (Eurostat 2022)
- GDP Per capita: 37,670 euros (Eurostat 2022)
- Areas of marked S&T specialisations: 5G/6G, quantum, space, nuclear, AI, photonics

Contact Information

- Organisation: Embassy of Finland in Seoul
- Name / Position: Mr. Antti Niemelä /
                   Minister Counsellor for Economy, Science, Technology, and Trade
- Phone no. / e-mail: (+82) 02-37010300 / antti.niemela@gov.fi

Finland is known for its high scientific and technological knowhow; for example 6G-Enabled Wireless Ecosystems, Artificial Intelligence and Atmosphere and Climate Competences. In Finland, one of the most competitive and ecological supercomputers in the world, is located in Kajaani, North-East Finland. LUMI started operating in 2022.

1. Policies and Strategies in Science, Technology and Innovation

In December 2021, the Parliamentary RDI working group reached consensus on aiming at 4% R&D national investment level by 2030 and proposed various measures to reach the target. Subsequently, Act on government R&D funding and Act on tax deductions for R&D activities for companies followed, and further solidified the target in legislation. The Government R&D funding Act stipulates that the public R&D funding should reach 1,2 % of GDP by 2030. Two thirds of the increase is expected to come from private investments. Furthermore, the Act instructs that the government have to prepare a multiannual plan for the use of government R&D funding for the following eight years once every electoral term.

The current plan published in March 2023 seeks, inter alia, to strengthen the role of the Prime Minister's Research and Innovation Council (RIC) in the management and coordination of research and innovation policy; to raise the population's level of competences, skills and education; to enhance RDI cooperation between different RDI actors; to direct R&D funding to identified priority areas; and to tackle and identify societal challenges and advance the twin transition.

Summary Parliamentary RDI Working Group Report

The Ministry of Education and Culture is responsible for the planning and implementation of higher education and science policy and preparing statutes, national budget proposals

and government decisions that apply to these. 14 Universities, including National Defence University, focus on scientific research and education supporting it. Universities of applied sciences (24 in total, including sectoral and regional UAS), on the other hand, offer pragmatic education that aims to respond directly to working life needs. The main emphasis of research, development and innovation at universities of applied science is on applied research and development. The science agencies and research institutes support the preconditions for research activities. (More information on policies on science and higher education https://minedu.fi/en/higher-education-and-research)

To ensure the freedom and independence of science and higher education, universities are autonomous actors and independent legal entities that have the right to make their own decisions related to their internal administration.

The Ministry of Economic Affairs and Employment is responsible together with other ministries for formulating and implementing the government's policies related to STI in various policy areas. The Ministry works to promote Finland's economic growth and competitiveness by supporting R&D activities, innovation, and entrepreneurship. The key competences of the Ministry in STI policy include national innovation policy, technology and industry policy, R&D, skills, IPR, and international STI cooperation. Examples of initiatives produced by the Ministry in this domain are The New Intellectual Property Strategy, Artificial intelligence Program and Sectoral low carbon roadmaps. The Ministry through Business Finland funnels most of the public RDI funding for businesses. Additionally, EU's regional and structural policy funds are also being channeled through the Centers for Economic Development, Transport and the Environment (ELY Centers) to support the RDI activities of companies and corporations.

The Academy of Finland (Research Council) is a public organization under the Ministry of Education and Culture. It is a key source of funding for scientific research through open competition in Finland and an active stakeholder in Finnish and international science and innovation policy. The Strategic Research Council (SRC) operates in connection with the Academy of Finland. The majority of the Academy's funds are channelled to the research carried out at universities, and it finances research projects, Flagship Progamme, Academy Programmes, Centres of Excellence, researcher activities, research infrastructures as well as international cooperation. The Academy's research councils decide on funding allocation to research carried out in their respective fields. The Academy also carries national responsibility for EU research programs and international research organizations together with relevant ministries and Business Finland.

Business Finland is a public organization under the Finnish Ministry of Economic Affairs and Employment. It is an agency for trade and investment promotion, innovation funding, travel promotion and talent attraction. Business Finland provides innovation funding in the form of grants and loans for universities, research institutes, enterprises and public organizations.

Universities and Universities of Applied Sciences
Please find the links to all 14 Finnish universities here: https://minedu.fi/en/universities and links to all 24 UAS here: https://minedu.fi/en/universities-of-applied-sciences

2. National STI Programmes and Initiatives

The Academy of Finland's Flagship Programme supports high-quality research and increases the economic and societal impact emerging from the research. The Finnish Flagships represent an effective mix of close cooperation with business and society, adaptability and a strong commitment from host organisations. International collaboration is an integral part of the Flagships' activities.

The Academy of Finland's Centre of Excellence (CoE) Programmes contribute to the renewal of science by supporting new research topics, new methods and approaches, and new research teams. The Academy of Finland selects CoEs based on international reviews and science policy objectives. CoEs are at the very cutting edge of science in their fields, carving out new avenues for research, developing creative research environments and innovations, and training new talented researchers for the Finnish research and business sectors.

Finland is a member of several international research infrastructures. The Academy of Finland covers membership fees and additionally provides funding for the acquisition, establishment or upgrading and expansion of nationally significant research infrastructures that promote scientific research.

Academy Programmes are science-driven, thematic and target-oriented bodies of research projects that are aimed at supporting scientific regeneration and increasing scientific and societal impact. Academy Programmes support multi- and interdisciplinary research of the highest quality, promote networking between researchers and provide platforms for international research cooperation.

The national Strategic Research Council (SRC) funds high-quality research with great societal relevance and impact. SRC-funded research seeks concrete solutions to grand challenges that require multidisciplinary approaches. SRC operates in connection with the Academy of Finland.

International Cooperation Programmes/Initiatives

Programme Title	Contents
6G Bridge https://www. businessfinland.fi/en/ for-finnish-customers/ services/programs/ 6g-bridge	The 6G Bridge program aims to make Finland the global leader in providing new value with 5G Advanced and 6G technologies for sustainable industries and societies e.g. in smart cities, smart energy, smart ports and smart factories with different ecosystem players.

6G Flagship https://www.6gflagship.com	Several projects are already ongoing between 6GFlagship Finland and Electronics and Telecommunications Research Institute (ETRI) and through the years 2023 and 2026 we aim to fund several joint projects in both 6G and Quantum Computing research fields with NRF.
Quantum Computing https://www.businessfinland.fi/en/for-finnish-customers/services/programs/quantum-computing	The Quantum Computing campaign is developing a globally attractive ecosystem in Finland to solve significant business problems for both Finnish and foreign customers with quantum computing.

3. Joint Activities with Korea

Finland cooperates with Korea through joint projects, facilitating ecosystem-to-ecosystem linkages, and events. In Korea Finland has focused especially on facilitating emerging technology ecosystem-level collaboration in key technologies such as 5G/6G, quantum, AI, space, and nuclear. Furthermore, emphasis is placed on connecting the innovative startup ecosystems more thoroughly.

Business Finland is providing innovation funding for joint research projects between Finnish and South Korean research institutes and universities through its programs and campaigns in close cooperation with the South Korean Ministry of Science and ICT (MSIT) and National Research Foundation (NRF).

Academy of Finland has an on-going discussion with the National Research Foundation (NRF) regarding funding for joint research projects between Finnish and Korean researchers.

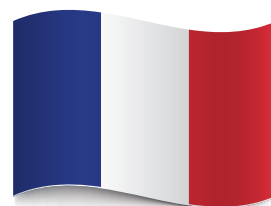## 4. Science, Technology and Innovation Cooperation Partners

Not applicable
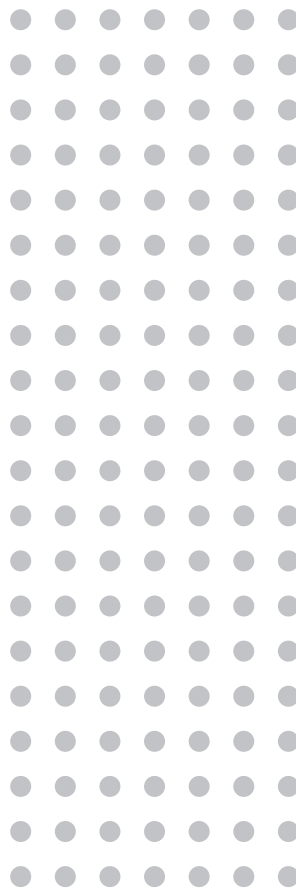
10 FRANCE

1. Policies and Strategies in Science, Technology and Innovation

2. National STI Programmes and Initiatives

3. Joint Activities with Korea

4. Science, Technology and Innovation Cooperation Partners

FRANCE

Country Outline

- GDP: 2,639,092 million euros (Eurostat 2022)
- GDP Per capita: 33,180 euros (Eurostat 2022)

Contact Information

- Organisation: Embassy of France
- Name / Position: Mr. Sébastien Codina / Scientific and Academic Cooperation Attaché
- Phone no. / e-mail: (+82) 2 317 8530 / sebastien.codina@kr.ambafrance-culture.org

France is a major R&D country, well connected in Europe and internationally, equipped with large world-class research infrastructures. In 2018, its gross domestic spending on R&D (GERD) would amount to 2.20% of the country's PNB. With estimated EUR 51.8 billion of global R&D expenses in 2018 France is the second major player in the EU, just behind Germany. The research effort came from the private sector, which carried out 65.3% of all R&D conducted in France in 2017 (EUR 33.0 billion), and the public sector (34.7%, EUR 17.6 billion). 441,500 people in 2017 (full time equivalent) were involved in R&D activities, 61% of which in the private sector.

In 2017, SMEs (including micro-firms) contributed to 18% of GERD and focused more than 50% of their funding on services. Large enterprises, which accounted for 58% of GERD, focused 40% of their funding on high technologies (17% aeronautics and space, 12% optical, electronic and computer devices, 10% pharmaceutical industry) and 33% on medium-high technologies (including19% automobile industry). EUR 24.9 billion (75.5%) were dedicated to industry, while the remaining EUR 8.1 billion (24.5%) were dedicated to services. In terms of scientific publications, France was ranked 6th worldwide in 2018 (2.8%). In terms of patent filing, according to the European system, France ranked 4th in 2018 (6.2% of patent issued) with a significant role in transportation, fine organic chemistry, mechanical components, special-purpose machines, chemical engineering.

1. Policies and Strategies in Science, Technology and Innovation

In recent years, France has substantially reformed its research and innovation system to improve its competitiveness. Its R&D expenditure has increased yearly by 1.6% for the last 15 years. As of 2017, 1.5% of the population in France was involved in R&D activities.

Enshrined by the law on Higher Education and Research enacted on July 22, 2013, the French National Strategy for Research (FNSR) was released in March 2015 The FNSR, developed in line with European policies for science and innovation and Horizon 2020, is based on a consultation with scientific, academic, economic and social partners.

The FNSR aims for several objectives:
- Meet the scientific, technological, environmental and societal challenges which France will face in the coming decades by defining a limited number of scientific and technological priorities;
- Promote basic science as the essential foundation for the development of a high-level science;
- Enhance the results of research by promoting innovation, technology transfer, and capacity of expertise and support to public policies, the development of scientific, technical and industrial culture;
- Strengthen the place of Humanities which can play a major and transversal role in all those societal challenges.

The FNSR identified 10 societal challenges and outlined 5 action programmes, which are the priority for the French research bodies and will define the strategic plan of public funding agencies such as French National Research Agency. Those 10 societal challenges are:

• Management of resources and adaptation to climate change: including the intelligent monitoring of planet Earth, the sustainable management of natural resources, the evaluation and control of climate and environmental risks, the development of eco- and biotechnologies and the study of the coastline. France ranks 5th in number of publications on earth science and 4th for atmospheric science, which means it is an area in which France already has some expertise.

• Clean, safe and efficient energy: comprising the dynamic management and multi-scale governance of energy system, energy efficiency, the reduction of the dependence on strategic materials and the search of fossil carbon substitutes.

• Industrial renewal: including the digital economy, green industry, human-centred manufacturing procedures, and design of new materials, sensors and instrumentation.

• Health and well-being: focusing on the multi-scale analysis of diversity and life evolution, the processing and collection of biological data and the establishment of a national network of centres of excellence for research and healthcare. France ranks 5th in basic biological research and can rely on a renowned academic system to meet this challenge.

• Food security and demographic challenge: aiming at the achievement of healthy and sustainable food supply, an integrated approach for productive systems and the production and diversified use of biomass. France plans to rely on its National Institute of Agricultural Research (INRA) and on public-private partnerships in this area.

• Sustainable cities and transports: creating observatories for cities, new mobility concepts, new tools and technologies to ensure sustainability in urban environments and integrating infrastructures and urban networks for resilience. This is an area of research

that is relatively new in France but can rely on well-established economical actors, particularly when it comes to the mobility and water management technologies.

- Information and communication society: focusing on the development of 5G network infrastructure, IoT, Big Data and man-machine collaboration. In this area, researchers can rely on a dense and reliable digital infrastructure as well as on an industry base of high technicality.

- Innovative, integrative and adaptive societies: aiming at the study of cultures and integration factors, and their abilities to innovate as well as the exploitation of data to understand the societies and the development of social, cultural and educational innovations.

- Space: building on the French expertise on spatial science, development of new services for earth observation and universe exploration, of the telecommunication and navigation sectors. France is the first space power in Europe and the second in the world in terms of public effort by inhabitants.

- Freedom and security of European territory, citizens and residents: aiming at the prevention and anticipation of risks and threats, the integrated approach to crisis management and the resilience of security systems.

Five action programmes are implementing in the following areas:

- Big data: focusing on the research of generalised solutions for the analysis of nonstructured data adapted to the use of a wide range of interested parties, the programme will also comprise the establishment of interdisciplinary communities targeting specific challenges, the development of infrastructures for the storage and big data processing and the training of data and knowledge scientists.

- Earth system (Observation, forecast and adaptation): this programme will focus on the conception and development of disruptive technologies for the observation infrastructure and processing of associated data, favouring the development of climate and environmental services and a sustainable food production system with optimal use of biomass through experimentation within living labs.

- Synthetic biology: this programme aims at the establishment of a scientific community and multidisciplinary centres on this subject with a view of favouring the training of researchers and the collection of "omic" (e.g. genomic, proteomic, etc.) data for modelling life mechanisms.

- From bench to bedside: this programme will support research projects with a strong potential of fast technology transfer to society and/or industry, thus stimulating health innovation.

- Human culture: this programme will support the development of multidisciplinary platforms, large data infrastructures on the study of human culture and behaviour, research on the influence of human factor on risk management and the transfer of humanities and social science research into the socioeconomic world.

In addition to the FNSR, France aims to promote the development of Artificial Intelligence (AI) technologies, as stated in the Villani Report that was released in March 2018. The objective is to allow for better circulation of data in order for the public authorities, public research actors and smaller economic actors to benefit from them. France aims to create "data commons" and a single-window for AI technologies. The Villani report highlights four priority areas: health, transport, environment and defence. Presented in November 2018, the French AI research strategy has two objectives: establish France as a global expert in AI and make the country a European leader in AI research. Four AI research institutes have been launched in Grenoble, Nice, Paris and Toulouse.

In March 2019, France presented the Nano Plan 2022, which is a programme of work and investment in R&D and pre-industrialisation aimed at controlling the production of new generations of electronic components to meet the need of the automotive, 5G communications, embedded AI, connected objects, aerospace and security sectors.

However, the French research policy can't be based solely on those strategic papers. The government has embarked on a Big Investment Plan worth EUR 57 billion, which will respond to four major challenges facing France: carbon neutrality, access to employment, competitiveness through innovation and the Digital State.

The French National Strategy for Research has been reviewed in December 2020 under the Research Programming Law (LPR). This new initiative, that represents an unprecedented investment in research, will allow France to remain among the world's leaders in research and to address global issues. That is why, LPR will put an emphasis on three main axes:
- Enhance attractiveness of scientific careers
- Reinforce linkages between research and society
- Strengthen funding mechanisms and structuring of research

Under this plan, France aims to allocate 3% of its PNB to R&D before 2023, which amounts to a budget increase of 1 billion euros every year.

Lastly, France also intends to fully embrace the quantum technological revolution with a national strategy. The five-year €1.8 billion plan, announced by French President Emmanuel Macron on January 21st, 2021, aims to finance research in quantum computing, communications and sensing. The French government will invest €1 billion. The remaining €800 million will come from commitments made by industrial players (€500 million), European funding (€200 million), and investors revolving around the French startup ecosystem (€100 million).

France's quantum strategy aims to deploy cutting-edge quantum computing infrastructure for research and industry. It is based on two main axes. The first is global and integrated technological development, from fundamental research to industrialization. The second is the strengthening of the French innovation ecosystem in its European environment, in particular by developing human capital and by recruiting, training and attracting the best both in public research and in industry.

2. National STI Programmes and Initiatives

International Cooperation Programmes/Initiatives

Programme Title	Contents
PHC STAR www.campusfrance.org/fr/star	■ Cooperation Type: Mobility ■ Funding Organisation: Ministry of Foreign Affairs (MEAE) ■ Call Opening / Closing Date: until 24/02/2021 ■ Participation Qualification: Research institute / university ■ Project Duration: 2 years ■ Funding Scale and Funding Scheme: 8 000 € / year ■ Matching fund from Korean government: NRF (Provides funds for the Korean researcher) ■ Research Fields: new materials and nanotechnologies, life and health sciences, biotechnologies, basic sciences, information and communication technologies ICT, aeronautics and space, environment sciences, societal challenges
French-Korean Joint Call on Artificial Intelligence	■ Cooperation Type: Research cooperation ■ Funding Organisation: Ministry of Foreign Affairs (MEAE) ■ Call Opening / Closing Date: 08/04/2019 – 10/05/2019 ■ Participation Qualification: Research institute / university ■ Project Duration: 1 year (to start when the sanitary conditions will permit) ■ Funding Scale and Funding Scheme: up to 50,000 € / project ■ Matching fund from Korean government: NRF (Provides funds for the Korean researcher) ■ Research Fields: Artificial intelligence

3. Joint Activities with Korea

Activities with the RoK

Programme Title	Contents
Fourth France-Korea Space Forum	■ Date: to be held when the sanitary conditions will permit ■ Venue: France ■ Major topic: Bilateral cooperation and development strategy in the space sector ■ Target Participants: CEOs and professionals of the space industry, researchers

France-Korea meeting on higher education, research and innovation	■ Date: to be held when the sanitary conditions will permit ■ Venue: Paris ■ Major Topic: Higher Education and research ■ Target Participants: representatives of higher education establishments
9th joint international workshop of FKPPL and FJPPL/TYL	■ Major topic: On-going collaborative research projects and future ones (high energy physics experiments, new particles and new fundamental properties of the universe, R&D developments for the next-generation of particle detectors and interdisciplinary science) ■ Date and Venue: to be held when the sanitary conditions will permit ■ Target Participants: Researchers from France-Korea Particle Physics Laboratory (FKPPL) and France-Japan Particle Physics Laboratory / Toshiko Yuasa Laboratory (FJPPL/TYL)

4. Science, Technology and Innovation Cooperation Partners

| Organisation Name	Detailed Information
CNRS (www.cnrs.fr)	■ Organization type: Public organization under the responsibility of the French Ministry of Education and Research ■ Major Research Area: All fields of science, technology and society ■ Major Activities with Korea: Physics and chemistry
Institut Pasteur (www.pasteur.fr)	■ Organization type: Private international research institute ■ Major Research Area/Product: Science, medicine and public health ■ Major Activities with Korea: Institute Pasteur Korea
CNES (https://cnes.fr)	■ Organization type: French National Space Agency ■ Major Research Area/Product: Space technology and its applications ■ Major Activities with Korea: Korean Aerospace Research Institute (KARI)
CEA (www.cea.fr)	■ Organization type: Government-funded technological research organization ■ Major Research Area/Product: Alternative Energies and Atomic Energy ■ Major Activities with Korea: Korea Atomic Research Institute (KAERI), Korea Institute of Energy Research (KIER) and Korea Institute of Science and Technology (KISTI) agreements
Ifremer (www.ifremer.fr)	■ Organization type: Government-funded technological research organization ■ Major Research Area/Product: Oceans, Environment and Fisheries ■ Major Activities with Korea: Korea Institute of Ocean Science and Technology (KIOST)

IRSTEA (www.irstea.fr)	▪ Public research organization ▪ Research in environment and agriculture: water, ecotechnologies, land management
INSERM (www.inserm.fr)	▪ Public research organization under the joint authority of the French Ministry of Health and French Ministry of higher Education, Research and Innovation ▪ Human health
INRIA (www.inria.fr)	▪ Public research organization ▪ Respond to multidisciplinary and practical challenges of the digital transition (applied mathematics, computing, simulation, algorithms, software, networks, cognition and interaction, digital planet
INRA (www.inra.fr)	▪ public research organization ▪ Food, agriculture, environment
IFPEN (www.ifpenergiesnouvelles.fr)	▪ Public research and training organization ▪ Earth science, fuel cell engineering; chemistry, catalysis, applied mechanics, mechatronics, economy

French-Korean laboratories:

- One International Joint Research Unit:
  - UMI 2B-FUEL (Building Blocks for FUture Electronics Laboratory) devoted to the development of functionalized two-dimensional (2D) materials-based multilayer heterostructures and molecularly-thin devices for future printed, organic, and large-area flexible electronics towards autonomous and integrated smart systems.
- One international associated laboratory: France-Korea Particle Physics Laboratory (FKPPL)
- Three international research networks:
  - Nano and Micro Systems (NAMIS)
  - Reaction-Diffusion Network in Mathematics and Biomedicine (ReaDiNet)
  - Gravitational behavior of antimatter at rest
- Institut Pasteur Korea (www.ip-korea.org)
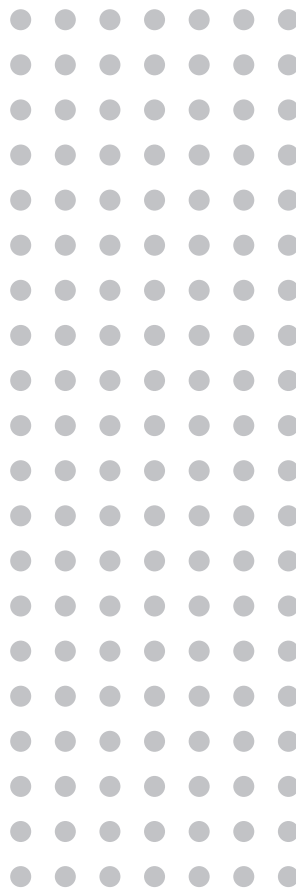
11 GERMANY

1. Policies and Strategies in Science, Technology and Innovation

2. National STI Programmes and Initiatives

3. Joint Activities with Korea

GERMANY

Country Outline

- GDP: 3,876,810 million euros (Eurostat 2022)
- GDP Per capita: 36,010 euros (Eurostat 2022)
- Areas of marked S&T specialisations: Automotive & Traffic Technologies, Aviation Technologies, Biotechnology, Energy Technologies, Environmental Technology, Health Research, Humanities, Information & Communication Technologies, Maritime Technologies, Materials Technology, Medical Technologies, Natural Sciences, Nanotechnology, Optical Technologies, Photonics, Plants, Production Technologies, Security Research, Services, Social Sciences, Space Technology

Contact Information

- Organisation: German Embassy Seoul / Division Scientific Affairs
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Introduction: Germany is a land of science and research. The development of innovative technologies and products is an important foundation of the German economy. Germany invests roughly 112 billion euros a year in R&D, two thirds of which are coming from the private sector. In 2021 Germany invested approximately 3,1% of GDP in R&D. Alongside R&D resources the number of people working in R&D is the most important indicator of R&D resources. More than half a million people work in this area in Germany – in business, in research institutions and at universities. Basic research plays as important a role as applications-oriented research. Germany offers various research locations: universities, non-university research institutes, companies and institutions run by public authorities. All in all there are over 1000 public or publicly funded institutions of science, research and development. Additionally more than a quarter of all industrial enterprises in Germany are active in research including many SMEs. The automotive industry, the electrical industry, the chemicals and pharmaceuticals sector and engineering companies all have a high demand for R&D personnel. Close cooperation between companies and research institutes is a traditional strength of the German research system.   * For detailed information have a look at: www.research-in-germany.org.

1. Policies and Strategies in Science, Technology and Innovation

Future Research and Innovation Strategy

Research and innovation form a basis for Germany's present and future prosperity und progress. They substantially contribute to respond to the grand challenges of our time. In 2023, the German government has launched its "Future Research and Innovation Strategy" in order to better unlock and seize the potentials of research and innovation.

As a comprehensive and forward-looking innovation strategy, it addresses three overarching aims: to defend, foster and regain technological leadership, to strengthen the knowledge and technology transfer from research to application; and to improve the openness to all types of new technology.

The Future Research and Innovation Strategy defines the key priorities and milestones of Germany's research and innovation policy in the years to come. Thus, it lays the foundation for an innovation ecosystem, which contributes to protect and preserve our climate, environment and natural resources, to secure and reinforce Germany's economic power and competitiveness; and to strengthen the resilience of society.

Internationalisation Strategy

Internationalisation is now firmly rooted in politics, science and business. The challenges Germany is facing are global challenges, which are also concerned by other countries in Europe and countries across the world. That is why the German Federal Government adopted an updated strategy for the internationalisation of science and research in December 2016 as a response to the challenges of globalization like climate change, questions of nutrition and food production, securing our future energy supply, combating poverty and infectious diseases.

The internationalisation of the German science and innovation system has developed considerable momentum over the last few years. Both the state and the private sector have made many resources available to secure and extend the scope of Germany's international competitiveness. German stakeholders from the worlds of science, business and politics are heavily engaged in the international arena and numerous initiatives have been launched.

In our globalized world scientific and technological progress are no longer achievable by individual countries but depend on cooperation and the exchange of ideas with leading international experts. The five main objectives of the internationalisation strategy are: (1) Strengthening excellence through global cooperation, (2) Developing Germany's strength in innovation on the international stage, (3) Internationalising vocational training and qualification, (4) Working with emerging and developing countries to shape the global knowledge-based society and (5) Overcoming global challenges together.

2. National STI Programmes and Initiatives

The German research landscape is diverse and multifaceted. Germany is the home of about 400 higher education institutions, more than half of which are universities of applied sciences. Universities and other higher education institutions offer a broad spectrum of research activities including basic research, applied research and development.

Two examples of academies of sciences and humanities are the National Academy of Sciences Leopoldina (www.leopoldina.org/en) and acatech – National Academy of Science and Engineering (www.acatech.de/uk). Founded in 1652 Leopoldina is one of the oldest

academies of science in the world. In 2008 it was appointed as National Academy of Sciences and it provides academic advice to both policymakers and society as a whole. Acatech – the National Academy of Science and Engineering – represents the interests of German science and technology communities at home and abroad. It provides scientific opinion and recommendation to policymakers and society.

Besides the academic field non-university research institutes play an important role in Germany. The following table gives an overview of the German Research Organisations as well as the Research Funding Organisations including information about activities in international cooperation and funding programmes.

International Cooperation Programmes/Initiatives

Programme Title	Contents

Max Planck Society (MPG)
www.mpg.de/en
	▪ Currently, the MPG operates 85 institutes.
	▪ The Max Planck Institutes (MPI) carry out basic research in life sciences, natural sciences and social science and humanities. Research must meet the Max Planck Society's excellence criteria.
	▪ 29 Nobel laureates have emerged from the ranks of MPG scientists.
	▪ Instruments of international cooperation:
	- Max Planck Centers: 16 Max Planck Centers worldwide.
	- MPG Partner Groups. More than 90 MPG Partner Groups worldwide, four in South Korea:
	  1) MPI for Human Cognitive and Brain Sciences, Leipzig I Prof. Dr. Angela Friederici
	  Daegu Gyeongbuk Institute of Science and Technology(DGIST), Seoul I Dr. Heyon-ae JEON
	  Field of Research: Cognitive Neurosciences
	  2) MPI for Polymer Research, Mainz I Prof. Dr. Hans-Jürgen Butt
	  Chung-Ang University, Seoul I Prof. Dr. Sanghyuk Wooh
	  Field of Research: Surface Templated Supraparticle Synthesis
	  3) MPI for Solid State Research, Stuttgart I Prof. Dr. Bernhard Keimer
	  Daegu Gyeongbuk Institute of Science and Technology (DGIST) I Dr. Kim Youngwook
	  Field of Research: Interfacial interactions in Van der Waals heterostructures
	  4) MPI for Evolutionary Biology, Plön Prof. Arne Traulsen
	  Inha University, Prof. Hye-Jin Park
	▪ German Max Planck Institutes cooperate in at least 55 projects with Korean Partners.
	▪ Funding Programmes: International Visiting Researchers at Max Planck Institutes, Max Planck Research Group Leader at a Max Planck Institute, Individual Doctoral Projects at Max Planck Institutes, International Max Planck Research Schools, Max Planck grants for Advanced Postdoctoral Training.

	- Max Planck POSTECH/Korea Research Initiative operates Korea-Germany Science and Technology Junior Fellowship program. This program offers outstanding Korean B.A. students a six months internship at host institutions in Germany.
Fraunhofer Society (FhG) www.fraunhofer.de/en.html www.fraunhofer.kr	- Fraunhofer is Europe's largest application-oriented research organisation with 76 research institutes. - Research focus: health, security, communication, energy and the environment. - Fraunhofer Institutes are cooperating with partners worldwide. - Many Fraunhofer Institutes have cooperation projects with Korean partners with a focus on ICT and Micro-electronics, display technologies, energy and life sciences. For example Fraunhofer Institutes ISE, IZI, IKTS etc. operate research projects with Korean counterparts, such as city of Seoul, Chonnam National University or ETRI. - The Fraunhofer Institute for Chemical Technology (Fraunhofer ICT) and the Korean technical university of Ulsan UNIST operate the Fraunhofer Project Center for Composites Research FPC@UNIST. - Fraunhofer Representative Office in Seoul - Funding Programmes: Fraunhofer Attract, Fraunhofer Bessel Research Award, Individual Doctoral Projects at Fraunhofer Institutes.
Helmholtz Association of German Research Centres www.helmholtz.de/en	- Helmholtz is Germany's largest research organization. - The 18 Helmholtz Centres have numerous unique research infrastructures at their disposal. - Interdisciplinary research which contributes to solving the great challenges facing society, science and industry. - Almost all Helmholtz centers are cooperating with Korean partners, for example UNIST-Jülich Cooperation in Energy Research. - Research fields: Energy; Earth and Environment; Health; Matter; Aeronautics, Space and Transport, Information, Information & Data Science, Quantum technologies, Climate Initiative, Open Science - 4 International Offices: Brussels, Israel, Moscow, Beijing. - Funding Programmes: Helmholtz Postdoc Programme, Helmholtz Young Investigators Group, Individual PhD Thesis at Helmholtz Centres, International Helmholtz Research Schools and Graduate Schools

Leibniz Association www.leibniz-gemeinschaft.de/en	■ 97 non-university research institutes are part of the Leibniz Association, twelve of them are currently cooperating with Korean partner institutes. ■ Cooperation extends to all five sections of Leibniz-Association: humanities and educational research; economics, social sciences, spatial research; life sciences; mathematics, natural sciences and engineering; environmental sciences. ■ Leibniz institutions have international cooperations in more than 140 different countries. ■ Funding Programmes: International Visiting Scholars at Leibniz Institutes, Leibniz DAAD Research Fellowships, Leibniz Graduate School and Leibniz ScienceCampi, Individual Doctoral Projects at Leibniz Institutes
Alexander von Humboldt Foundation (AvH) www.humboldt-foundation.de/en	■ The Humboldt Foundation promotes academic cooperation between excellent scientists and scholars from Germany and abroad. ■ It grants more than 700 fellowships and awards per year with the aim of bringing excellent scientists and scholars from all over the world to Germany to collaborate and work together. ■ The alumni network of the Humboldt FoundationAvH is outstanding. Over 200 Korean Alumni are members of the Humboldt Club Korea and the Humboldt Society in Korea. Ambassador Scientist in Korea: Prof. Tsche Kwang-Jun, Kyung Hee University in Seoul. ■ Every year the Humboldt Foundation organises two major colloquia abroad. One of those colloquia was held in Seoul in November 2015. ■ Funding Programmes: Alexander von Humboldt Professorship, Anneliese Maier Research Award, Fraunhofer-Bessel Research Award, Friedrich Wilhelm Bessel Research Award, Georg Forster Research Award, Georg Forster Research Fellowship for Experienced Researchers, Georg Forster Research Fellowship for Postdoctoral Researchers, Sofija Kovalevskaja Award, Capes-Humboldt Research Fellowships, Humboldt Research Award.

German Academic Exchange Service (DAAD) www.daad.de/en www.daad.or.kr	■ The DAAD is the organisation of German higher education institutions and their student bodies. It is devoted to internationalising the academic and scientific research system. ■ The DAAD provides scholarships for students and researchers. ■ 61 branch offices and Information Centres worldwide. ■ There is one DAAD Information Centre in Seoul, Korea. ■ Funding Programmes: Bilateral Exchange of Academics, Leibniz DAAD Research Fellowships, Re-invitation Programme for Former Scholarship Holders, Research Fellowships in Space, Aeronautics, Energy and Transportation Research, Research Grants for Doctoral Candidates and Young Academics and Scientists, Research Stays for University Academics and Scientists, Bi-nationally Supervised Doctoral Degrees.
German Research Foundation (DFG) www.dfg.de/en	■ The DFG is a self-governing research funding organisation, which is largely funded by the state. ■ It funds research projects at universities and other research institutions in all branches. ■ Korean Partner: NRF ■ Funding Programmes: Clusters of Excellence, Collaborative Research Centres, Emmy Noether Programme, Graduate Schools, Grants to Support the Initiation of International Collaboration, Heisenberg Programme: Fellowship/Professorship, Mercator Fellowship, Research Grants, and Research Training Groups. Support for early career researchers within Collaborative Research Centers.

3. Joint Activities with Korea

Many German Universities as well as many institutes of the Fraunhofer Society, the Helmholtz Association, the Leibniz Association and the Max Planck Society and other research organisations are cooperating on individual project basis with Korean partners.

On the government level there is a tradition of supporting international bilateral research cooperation between Germany and Korea through the instrument of bilateral calls. Examples are listed in the table below.

Activities with the RoK in 2023-2024

Programme Title	Contents
Bilateral 2+2-Project Call Lightweight and Robotics	▪ Korean-German bilateral call on 2+2-Projects ▪ Pilot call: September 2020 ▪ Topic : Robotics – Nursing robot, elderly care robot, robot therapist, social robot with artificial emotion and intelligence, collaborative robot including disaster robots Lightweight – Joining technologies for multimaterial lightweight construction for mobile applications, Life Cycle Assessment, focusing on the fields of automotive parts and auxiliary equipment for rehabilitation ▪ R&D-Projects with at least one German and Korean partner from a research institution + one German SME + one Korean industrial partner ▪ Funding: 600.000 EUR per project for 36 months from German side. ▪ 3 Projects funded ▪ Projects start September/October 2021 ▪ German Federal Ministry for Education and Research (BMBF) ▪ Korean Ministry of Trade, Industry and Energy (MOTIE) ▪ Supporting agencies: DLR-PT (German side), Korea Institute for the Advancement of Technology (KIAT) (Korean side) www.internationales-buero.de, www.kiat.or.kr
Bilateral 2+2-Project Call Energy transition	▪ Korean-German bilateral call on 2+2-Projects ▪ Pilot call: Juni 2020 ▪ Topic: Energy transition - Materials and technologies for electrical and electrochemical energy storage, especially innovative batteries -Energy efficient cities: sector integration in cities, districts and quarters ▪ R&D-Projects with at least one German and Korean partner from a research institution + one German SME + one Korean industrial partner ▪ Funding: 600.000 EUR per project for 36 months from German side. ▪ 1 Project funded ▪ Project starts April 2021 ▪ German Federal Ministry for Education and Research (BMBF) ▪ Ministry of Science and ICT (MSIT) ▪ Supporting agencies: DLR-PT (German side), National Research Foundation (Korean side) www.internationales-buero.de, www.nrf.re.kr

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University Cooperation Programme	■ Promotion of conceptual and implementation activities with the aim of establishing joint research presences in green hydrogen technologies with partners in Australia, India, Japan, Korea, Malaysia, New Zealand, Singapore, and India ■ Unilateral call: July 2020 ■ Focus research areas: Green Hydrogen ■ Budget: 760.000 EUR per project for 60 months ■ 2 projects with focus Korea funded ■ Projects start: July 2021 ■ German Federal Ministry for Education and Research (BMBF) ■ Supporting agencies: DLR-PT (German side), www.internationales-buero.de
Bilateral programme for joint R&D projects for SMEs	■ First German-Korean call for joint R&D projects for SMEs in July 2014 ■ 9th call: April 2023 ■ Joint R&D projects, focusing on developing innovative products and applications in all technological and application areas ■ Open for SMEs ■ German Federal Ministry for Economic Affairs and Energy (BMWi) Korean Ministry of Trade, Industry and Energy (MOTIE) ■ Agencies: Aif Project GmbH, Korea Institute for the Advancement of Technology (KIAT) ■ www.zim-bmwi.de, www.kiat.or.kr
Joint R&D Workshops	■ In 2022 two virtual workshops with participation of German and Korean researcher took place. ■ Topic workshop June 2022 Service Robotic ■ Topic workshop September 2022 Energy Transition

List of Planned Programmes or Activities with RoK in 2023

Programme Title	Contents
S&T	■ Korea-German Cooperation Committee on Science and Industrial Technology (KGCCSIT) in September 2023
H2	■ Korean-German Hydrogen Conference in October 2023
ADeKo Conference	■ German Korean Alumni Conference in September 2023
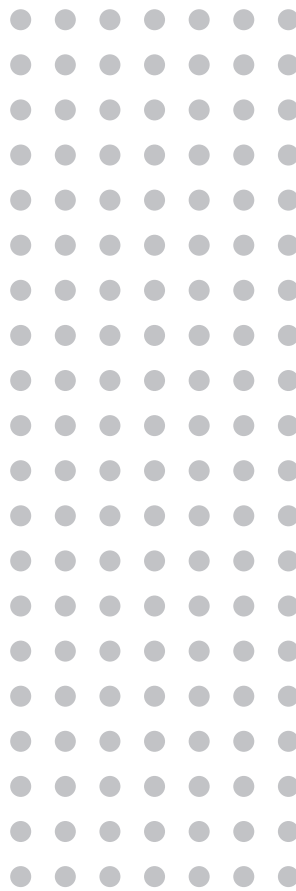
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1. Policies and Strategies in Science, Technology and Innovation

2. National STI Programmes and Initiatives

3. Joint Activities with Korea

4. Science, Technology and Innovation Cooperation Partners

GREECE

Country Outline

- GDP: 206,620 million euros (Eurostat 2022)
- GDP Per capita: 18,710 euros (Eurostat 2022)
- Areas of marked S&T specialisations: Agrofood, Life Sciences & Health – Medicine, Information and Communication Technologies, Energy, Environment and Sustainable Development, Transport and logistics, Materials – Construction, Culture - Tourism - Cultural & Creative Industries

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1. Policies and Strategies in Science, Technology and Innovation

The Operational Programme for Entrepreneurship, Competitiveness and Innovation 2014-2020, based on the National Research and Innovation Smart Specialization Strategy has been developed. In parallel, 13 Regional Operational Programmes (one for each of the 13 Greek regions), including research and innovation items have been adopted as well. In line with the European practices, a National Road Map for research infrastructures is at stake for the same time frame.

In Greece, the efforts so far to mobilize key players through the development and support of structures that promote research and innovation and through financial support for research in the public and private sector, led to an improvement of the country's performance. However, it was not possible to reduce the gap from the European average or to achieve the national targets concerning domestic expenditure on Research and Development (R&D). The total gross domestic expenditure on research as a percentage of Gross Domestic Product (GDP) increased from 0.57% in 2003 to 0.80% in 2013 and to 1,13% in 2017 (provisional), while the relevant EU-28 indicator increased during the same period from 1.85% to 2.07% (2017). This increase is mainly due to private sector's impressive investments on R&D from 488,7 in 2013 to 990,8 in 2017.

The Greek Research, Technological Development and Innovation (RTDI) System shows strengths including good performance in co-financed EU Framework Programmes, a substantial Greek representation in international research networks and projects of the European Research Infrastructure Road Map, a strong Greek research community abroad, manpower quality and 'islands' of excellence in the public research institutions and the private sector, and also successful Greek presence regarding scientific publications (above the EU average). On the other hand, the main weaknesses include low expenditure in R&D compared to the EU average, extremely low performance in patent filing as well as underperformance

in risk financing and venture capital. Recent economic crisis has dramatically affected some critical aspects of the Greek RTDI system, such as research careers and opportunities, leading to severe brain drain of junior and senior scientists to advanced countries in Europe, in the US and beyond.

Responding to the current situation, the Smart Specialization Strategy (RIS3) is inspired by the vision of Greece that gives priority to people and society, with high quality of life and low environmental footprint, and takes advantage of the cultural heritage and creation. The objective of RIS3 is the targeted reform of the country's productive sector, having as main driving forces RTDI activities, in order to better balance the existing regional disparities and to create sustainable employment to the benefit of people and society preserving environment and culture. In the new emerging era, the innovation policy goes beyond the simple strengthening of research and technological development in businesses and the research fabric. It aims to support the improvement of the innovation system as a whole. Components of the this whole are the human factor producing the new knowledge, the firms, especially those who experiment on new ideas, technologies and business models to grow and become more competitive, and a system that creates and diffuses new knowledge removing the barriers to innovation.

Research bodies (Universities and Research Centres) have an important role to play in ensuring the robustness of RIS3 as they form the dynamic and internationally recognized part of the national innovation system and they provide the broad technological base that is necessary for innovations. One of the concerns of the strategy is not to trap the spectrum of activities of research institutions through sectoral specialization, but to ensure their mobilization towards the new business model of the country, increasing the synergies between public and private investments.

On the other hand, the emergence of new innovative firms and the strengthening of those who currently persist and are distinguished internationally are important in order for the country not "invent here, exploit elsewhere". Key factor in this effort is the encouragement of risk taking attitudes risk and the identification of opportunities arising from the uncertainty of RTDI activities. In this direction, the "learning from failure" process is also element of RIS3. Thus, RIS3 ensures the development of all RTDI types:
- Innovation from the "market needs" (demand driven)
- Innovation from scientific curiosity (curiosity-driven) and
- Innovation produced to fulfill strategic mission (mission-led)

To achieve the vision, the country has set a target, in the context of the Medium Term Fiscal Strategy and the National Reform Program, that investments in research will reach 1.25% of GDP in 2020 starting from 0.80% in 2013. Respectively, business investment in research is expected to rise from 0.27% of GDP in 2013 to around 0.38% of GDP in 2020. These targets could be amended upwards in the mid-term revision of RIS3.

Through the process of entrepreneurial discovery carried out so far, the National RIS3 identifies 8 priority sectors, as follows:

Greece

- Agrofood
- Information and Communication Technologies
- Environment and Sustainable Development
- Materials - Construction
- Culture - Tourism - Cultural & Creative Industries.

- Life Sciences & Health – Medicine
- Energy
- Transport and logistics

The most important financial tools for the implementation of RIS3 are the European Structural and Investment Funds.

2. National STI Programmes and Initiatives

Programme Title	Contents
1. National Programmes and Initiatives BILATERAL R&D AGREEMENTS	**About** Bilateral research agreements aim to enhance cross-border research collaboration. **Trends and background** Bilateral research agreements are a well-established practice for Greece. Although at first their budgets were relatively small and participants were mainly academics, lately calls of significant larger budget (around 5 M€) have been launched with the participation of enterprises (cases of China, Israel, Greece). The following specific agreements have been launched since 2015: • Bilateral Cooperation with Germany (2016) • Bilateral Cooperation with Russia (2017), next by the end of 2019 • Bilateral Cooperation with Israel (2017 & 2019) • Bilateral Cooperation with China (2018) **Instruments** Bilateral research agreements mainly support networking and visits as well as the implementation of common research projects. The research areas selected for funding are chosen on the basis of the common interests. Selected areas are for example ICT, biotechnology, life-sciences, agro-food, fisheries, marine sciences, agriculture, health, renewable energy, energy saving and environment. The beneficiaries of agreements are enterprises, universities, technological institutes, research and technological organizations and public organizations. **Target population** Enterprises, Universities, PRIs **Budget / Cost estimate** EUR 50 millions

EUROPEAN R&D COOPERATION (P2P cooperation)	**About**
	The Government supports the Greek participants to the Joint Initiative ERA-NETS (7th Framework programme and Horizon 2020) in specific thematic areas. The main objectives are to facilitate the networking of Greek research teams and dynamic SMEs in terms of European and International Cooperation in specific sectors and the exchange of technological know-how and best practice.
	
	Instruments
	The beneficiaries are universities, technological institutes, research and technological organizations, enterprises and public organizations which participate successfully to evaluation procedures of Joint Actions and Calls of the respective Networks.
	
	Target population Universities, PRIs
	
	Budget / Cost estimate
	Proposal for 25 million Euro through the new operational programme 2014-2020
	
	The currently supported ERANETS by the Greek side are:
	  1. ACT ERANET COFUND
	  2. E-RARE 3
	  3. EJPRARE-D
	  4. TRANSCAN
	  5. ERANET-RUS-PLUS
	  6. EURONANOMED
	  7. CHISTERA
	  8. QUANTERA
	  9. FLAGERA
	  10. COFUND ON BLUE-BIOECONOMY
	  11. SOLARERANETCOFUND
	  12. CSP
	  13. ERAMIN
	  14. ICT-Agri
	  15. HERA JRP PS
	  16. PERMED
	  17. NEURON
	  18. AQUATIC POLLUTANTS
	  19. PRIMA
	
	In addition Greece participates in JU-EXSEL without national funding. Furthermore Greek participation in others JTIs and JPIs is under consideration.

3. Joint Activities with Korea

Joint Bilateral activities with Korea are not currently implemented.

However Greece cooperates with Korean in R&D issues in the context of the EU Framework Programmes for Research, Technological Development and innovation, by participating research institutions/enterprises of both countries in joint projects.

Specifically, under the European Union's Research and Innovation funding programme for 2007-2013 (FP7), participants from Greece and the Republic of Korea cooperated in 15 projects. The majority of those projects (10) were under the *Cooperation* programme while the others were under the *Capacities* programme.

Within the EU Research and Innovation programme (Horizon2020) multiple collaborations between partners from Greece and the Republic of Korea have already been formed. Specifically there are 3 ongoing projects involving Greek and Republic of Korea beneficiary's under the policy sectors "Industrial Leadership" and "Societal Challenges".

4. Science, Technology and Innovation Cooperation Partners

In order to promote cooperation between Korea and Greece in various areas including S&T, a draft-Agreement was proposed by Greece to the Korean colleagues.

A detailed description of all Research & Technological Organizations under the supervision of GSRT is provided in the following link:
http://www.gsrt.gr/Financing/Files/ProPeFiles74/Entypo%20GGET%20EU_white.pdf
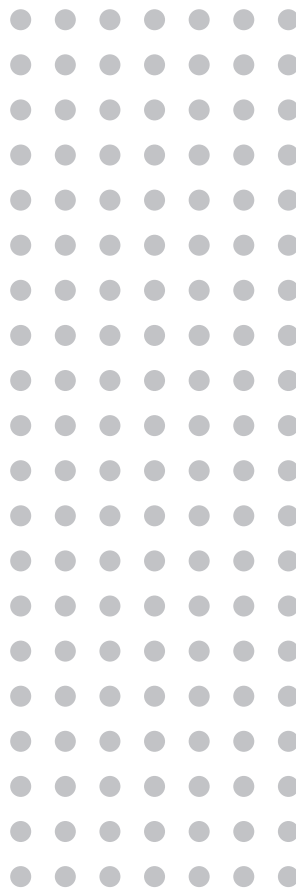
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HUNGARY

Country Outline

- GDP: 168,865 million euros (Eurostat 2022)
- GDP Per capita: 14,350 euros (Eurostat 2022)
- Areas of marked S&T specialisations: health research, automotive industry, biotechnology, advanced materials, laser science, ICT, energy technologies, brain research, material sciences, natural sciences

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Hungary was the first country from the former Eastern Bloc that established diplomatic relations with the Republic of Korea, and shortly afterwards the two governments signed a bilateral Science and Technology cooperation agreement.

In 2014 the Hungarian National Assembly adopted the Act LXXVI of 2014 on scientific research, development and innovation (RDI Act) that created the National Research, Development and Innovation Office (NRDI Office). The NRDI Office develops Hungary's national strategy for scientific research, development and innovation and manages the National Research, Development and Innovation Fund as the research funding agency of Hungary.

The main focuses of science and technology in Hungary are digitalization, ICT, industry 4.0, electric and autonomous vehicles, smart cities, start-ups, laser research, water research, biotechnology, life sciences and agricultural sciences.

1. Policies and Strategies in Science, Technology and Innovation

The vision of **Hungary's RDI strategy for 2021-2030** is a knowledge-based, balanced, sustainable economy and society capable of creating high added value in all areas of the country, a vision supported by the Government through the instruments of RDI policy.

The RDI policy aims to put Hungary among the strong innovator countries in the EU by the end of the decade, through the value-creating capacity of the RDI ecosystem, intensive improvement of the innovation performance of the business sector and consistent implementation of smart specialisation. To this end, the Government has committed in its RDI strategy to increase R&D expenditure as a share of GDP to 3% by 2030.

To achieve the government's goals, competitiveness needs to be enhanced with a high value-added, innovation-open economy and a business sector that uses and develops modern technology and is able to respond flexibly to global trends.

The RDI strategy sets out three main overarching objectives for domestic innovation policy:
1. making more use than at present of the research results of public research institutions (research institutes and higher education institutions);
2. improving the innovation performance of domestic enterprises, especially small and medium-sized enterprises;
3. strengthening cooperation between actors in the R&D and innovation system.

The objectives of the RDI strategy are structured around three main pillars, as outlined below:
• strengthening **knowledge production** by expanding and modernising the capacity of the RDI institutional system and ensuring a supply of researchers;
• enhancing **knowledge flows** by encouraging more effective cooperation between actors in the RDI ecosystem, increasing interoperability between sectors and expanding opportunities for knowledge transfer;
• making more effective **use of knowledge** by boosting innovation in enterprises.

Increasing the efficiency of knowledge production, knowledge flows and knowledge use is the basis of the strategy, but to achieve its vision, it is also necessary to move forward on horizontal issues that have a major impact on the functioning of the innovation ecosystem. However, RDI actors have only limited influence on these, so government intervention is essential.

Horizontal objectives of the RDI strategy:
• Encouragement of openness to innovation, creative thinking and value creation
• Creation of an RDI-supporting regulatory framework and business environment
• Strengthening of regional, social and economic cohesion through RDI
• Creation of a funding system that promotes both stability and incentivisation
• Stimulation of challenge- and demand-driven RDI
• Ensuring gender equality in the RDI system

In parallel with the development of the RDI strategy, Hungary also designed the **2021-2027 National Strategy for Smart Specialisation (S3)**. S3 can be seen as an umbrella strategy for the strategic planning documents of three areas. These are: the RDI Strategy, the Strategy for Strengthening Hungarian Micro, Small and Medium Enterprises, and the National Digitalisation Strategy, which is about to be adopted by the government.

The integration and alignment of the S3 and the RDI strategy are essential to boost Hungary's RDI performance in this decade. While the former defines the horizontal objectives and RDI-specific areas of intervention necessary for the development of the innovation ecosystem, S3 builds on the pillars of the strategic objectives of the three areas and sets priorities with high development potential, where the concentration of resources can contribute to increasing the competitiveness of the economy.

The **Smart Specialisation Strategy (S3)** is a policy tool that has been used in the European Union since the 2014-2020 period. In the EU financial programming cycle 2021-2027, smart specialisation strategies are expected to contribute in their implementation to the EU's "Smarter Europe" policy objective, as well as to the development of regional economies and the strengthening of structural adjustment to industrial transformation and digitalisation.

In the European Union, Hungary currently ranks among the emerging innovators according to the European Innovation Scoreboard (EIS), which is produced annually by the European Commission. The Government's goal is to become one of Europe's major innovators by 2030, through boosting the value creation capacity of the innovation ecosystem and the productivity of the business sector.

Achieving this ambitious goal requires a complex approach to economic development: in addition to a continuous increase in resources, success will also require a more results-oriented and efficient planning and use of EU and national funding.

In the seven-year period starting in 2021, S3 will contribute to this government goal by identifying our national strengths and setting out the so-called smart specialisation priorities.

The development of the National Smart Specialisation Strategy (S3) for 2021-2027 was launched in late 2019 under the professional supervision of the Ministry for Innovation and Technology and coordinated by the NRDI Office. A change compared to the previous strategy is that the new S3 was designed with the active involvement of the government departments responsible for ICT and enterprise development, in addition to that responsible for innovation. The sectoral deputy state secretariats of the Government will continue to work together throughout the implementation of the strategy.

The selection of the S3 priorities started with the application of the so-called "entrepreneurial discovery process" (EDP), in line with EU methodological recommendations, and with the involvement of a wide range of stakeholders.

One of the instruments of the national EDP was a national questionnaire survey, in which the NRDI Office assessed the experiences, suggestions and needs of smart specialisation among the participants of the innovation ecosystem at national level.

Another important step in the entrepreneurial discovery process was the setting up of the Territorial Innovation Platforms (TIP) network, building on university centers. The platforms will also play a major role in monitoring and evaluating the implementation of the strategy.

The Government adopted the National Smart Specialisation Strategy (S3) with Government Decision 1428/2021 (VII. 2.).

In S3, eight national economic priorities identify smart specialisation pathways where the concentration of resources and the promotion of RDI development can provide a significant competitive edge for Hungary.

S3 also includes two horizontal priorities on skills development and modernising the business environment, which support the effective delivery of the national economic priorities. The objectives of the priorities must be contributed to by the proposals receiving funding in the 2021-2027 programming cycle.

NATIONAL ECONOMIC PRIORITIES

Agriculture, food industry

Health

Digital economy

Creative industry

Resource-efficient economy

Energy, climate

Services

Cutting-edge technologies

HORIZONTAL PRIORITIES

Rublic sector and university innovation

Training, education

The **Innovation ecosystem** in Hungary consists Territorial Innovation Platforms, the University Innovation Ecosystem and the National Laboratories Program. The **Territorial Innovation Platforms (TIP)** initiative aims to facilitate territorial partnerships across the country based on university knowledge bases with an aim to ensure direct access to information about innovation policy directions, enable and strengthen cooperation between local innovators, and create new professional foundations. **University Innovation Ecosystem**: it is a top priority among the comprehensive objectives of the renewing Research, Development and Innovation Strategy to encourage active knowledge and technology transfer between the actors of the innovation ecosystem, including in particular making greater use of the knowledge dissemination function of higher education institutions. Eighteen **National Laboratories** already launched another nine will be launched in 2023 around four headline initiatives: *A safe society and environment, Health, Industry and digitalization and Culture and family.*

2. National STI Programmes and Initiatives

International Cooperation Programmes/Initiatives

Programme Title	Contents
Horizon Europe	https://ec.europa.eu/info/horizon-europe_en
EUREKA	https://www.eurekanetwork.org https://www.eurekanetwork.org/countries/hungary https://www.eurekanetwork.org/countries/south-korea
Stipendium Hungaricum Scholarship http://studyinhungary.hu/study-in-hungary/menu/stipendium-hungaricum-scholarship-programme	The Stipendium Hungaricum scholarship was established to provide support for foreign students studying in Hungarian higher education institutions. Based on the Eastern Opening, the program primarily finances the studies of students from Far East countries, Central Asian countries, Arabic countries and from the Western Balkans. The call for the 2024/25 round will be published in November 2023.

3. Joint Activities with Korea

Activities with the RoK in 2023-2024

Programme Title	Contents
KSP (Knowledge Sharing Program) Hungary (2013-)	Korea's Knowledge Sharing Program (KSP) is a policy research and consultation program which utilizes Korea's knowledge and experiences to assist the development of partner countries. Based on a MoU signed by the two governments the KSP with Hungary started in 2013 in the following fields: crisis management; industrialization and export promotion; knowledge-based economy; economic development strategy and human resources development. 2022/23 KSP Project: Capacity Building in the Big Data Field - Design and Development of the Area to Increase the Effectiveness of Other Fields (Risk Analysis, Audit and Declaration) https://www.ksp.go.kr/english/pageView/info-eng/909?nationCd =HU

EIPP (Economic Innovation Partner Program) (2022-)	EIPP is a 3 to 5 year whole support package program that provides from the country analysis to master plan, pre-feasibility study, feasibility study, mid/long-term strategies, investment, and financing plans on projects. From 2022, EIPP with Hungary will focus on Hungary's eco-friendly future mobility sector. In line with "carbon-neutral Hungary", cooperation projects such as developing of skilled workforce in EV-battery industry, smart EV charging facilities, and C-ITS environment will be implemented.
Korea-Hungary Joint S&T call (2022-2024)	Joint call of the National Research, Development and Innovation Office and the National Research Foundation of Korea aiming to support research development projects in Hungarian–Korean cooperation that result in new or further developed, market-oriented products and services. Program objectives: Promote cooperation and development between both countries in the area of S&T by promoting Korea-Hungary bilateral joint research projects Support joint research in the five main areas that are expected to generate a synergistic effect through bilateral cooperation Research areas: Bio/life science, materials engineering (including nanomaterials), ICT, environmental engineering https://nkfih.gov.hu/english/nrdi-fund/funded-projects-2022-125-tet-ipari-kr https://www.nrf.re.kr/eng/page/31752ceb-b028-4721-a493-1d46d43b2285
Call for international cooperation applications for researchers from Korea and the V4 countries (2023-2026)	In cooperation among the National Research Foundation of Korea, the Hungarian National Research, Development and Innovation Office (NKFIH) the Ministry of Education, Youth and Sports of the Czech Republic, the National Center for Research and Development of Poland and the Slovak Academy of Sciences, they have launched an international cooperation call for researchers from Korea and the Visegrad countries in the following fields of science: clean energy and bio- and materials science. Each applicant consortium shall consist of at least one research group from Korea and two research groups from V4 countries. Preference will be given to applications that involve research groups from all four V4 countries in addition to Korea. https://nrf.re.kr/biz/notice/view?menu_no=362&nts_no=195536 (in Korean & English)

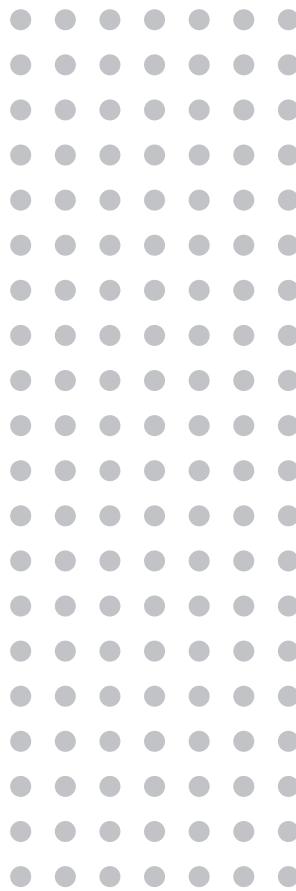# 4. Science, Technology and Innovation Cooperation Partners

Organisation Name	Detailed Information
National Research, Development and Innovation Office (NKFIH) https://nkfih.gov.hu/about-the-office	• Organisation type: Research funding organisation • Major research product: It funds research projects in all branches. • Current cooperation status with Korea: joint call with NRF • Contact point: nkfihivatal@nkfih.gov.hu
Hungarian Research Network * https://elkh.org/en	• Organisation type: (formerly ELKH*) is an independent public budgetary institution • Major research areas: manage and operate the publicly funded independent research network. The Hungarian Research Network currently comprises of 11 research centers, 7 research institutes and 116 additional supported research groups operating at universities and other public institutions, conducting basic and applied research, exploring the most varied disciplines of mathematics and natural sciences, life sciences, social sciences and the humanities • Current cooperation status with Korea: to be established • Contact point: fotitkar@elkh.org * *renamed from Eötvös Loránd Research Network (ELKH) as of 1.9.2023.*
Hungarian Academy of Sciences (HAS - MTA) https://mta.hu/english	• Organisation type: Academy of sciences • Major research areas: research in all branches. • Current cooperation status with Korea: MoU with NST • Contact point: info@titkarsag.mta.hu
ELI-ALPS Research Institute https://www.eli-alps.hu	• Organisation type: Laser research facility • Major research: valence and core electron science, 4D attosecond imagining, THz radiation based research, biological and medical application, nanomaterials • Contact point: info@eli-alps.hu
ZALAZONE https://zalazone.hu	• Organisation type: Proving ground • A unique proving ground for conventional, connected and autonomous vehicles. Incorporates test tracks, integrated research and innovation facilities and an industrial park. • Contact point: https://zalazone.hu

Territorial Innovation Platforms	■ Established Territorial Innovation Platforms ■ https://nkfih.gov.hu/for-the-applicants/territorial-innovation-platforms/established-tip ■ Participating national professional organisations: https://nkfih.gov.hu/for-the-applicants/territorial-innovation-platforms/participating-organisations
National Laboratories Programme	■ https://nkfih.gov.hu/for-the-applicants/innovation-ecosystem/national-laboratories-programme ■ Description of the National Laboratories: https://nkfih.gov.hu/for-the-applicants/innovation-ecosystem/national-laboratories-programme/laboratories
Universities in Hungary	■ Currently there are 6 state, 10 private, 21 model-changing and 26 religious universities in Hungary. Many of these have bilateral relations with one or more Korean Universities ■ The list and up-to-date contact of these universities can be found at the Hungarian Rectors' Conference (MRK) site: http://www.mrk.hu/en/members

**Science, Technology
and Innovation
of the European Countries**

14 IRELAND

1. Policies and Strategies in Science, Technology and Innovation

2. National STI Programmes and Initiatives

3. Joint Activities with Korea

4. Science, Technology and Innovation Cooperation Partners

IRELAND

Country Outline

- GDP: 506,282 million euros (Eurostat 2022)
- GDP Per capita: 77,430 euros (Eurostat 2022)

Contact Information

- Organisation: Embassy of Ireland
- Name / Position: Mr Alan McGreevey / Deputy Head of Mission
- Phone no. / e-mail: (+82) 010-4997-7202 / alan.mcgreevey@dfa.ie

As a small, open economy, Ireland relies on external demand and international markets for sustainable and continued growth. Research and innovation have long been recognised as the engine of sustainable economic growth. Now they must play a role in helping to address emerging trends, urgent climate action, digital transformation, pandemic preparedness and building resilience to shocks in the context of rising global competition and instability. Building long lasting and meaningful relationships with international partners of excellence is important to drive Ireland's research and innovation performance. Ireland has a strong reputation for scientific excellence and is a world leader in generating and using new knowledge for economic and social progress. Our global rankings for individual subject areas further demonstrate that we continue to play an important role globally. Ireland is now 2nd in immunology, 3rd in agricultural sciences, 3rd in pharmacology and toxicology, and 4th in neuroscience and behaviour. By transforming the level and quality of interactions between our higher education research institutions and businesses, and investing in a network of Technological Universities across the country, we have developed a world-beating capacity to commercialise our public research. We are proud that Ireland remains first in the world for knowledge diffusion, but are continuing to make the necessary reforms to remain competitive in a highly dynamic EU and global research environment.

1. Policies and Strategies in Science, Technology and Innovation

In 2020, Ireland established a new ministry – the Department of Further and Higher Education, Research, Innovation and Science – which brings higher education, research and innovation together for the first time. In 2023, the Department launched a new Research and Innovation Strategy, called *Impact 2030*, with accompanying new legislation passed in May 2023. *Impact 2030* is a whole-of-Government strategy, designed as such to involve a range of stakeholders across priority sectors, including climate action, environment and sustainability, digital

transformation, economic competitiveness, health and well-being, and agriculture, food and the marine.

The most important action in the Strategy is the amalgamation of Science Foundation Ireland and the Irish Research Council, into a new multidisciplinary body, currently under establishment. The streamlined architecture will create benefits across a range of areas, such as deepening enterprise R&I, building capability across the network of research institutions, talent development across a whole-of-career, researcher mobility, and research culture. It will also include the establishment of science advice structures across Government.

In the space of 25 years, Ireland has gone from a base of 800 R&D active firms, with a research spend of €300 million, to approximately 1,800 R&D active enterprises spending almost ten times that. In 2019, 72.5% of total R&D expenditure in Ireland was performed in the business sector. The top 100 enterprises in terms of R&D spend account for almost 75% of BERD. This reflects a trend observed across OECD members where a smaller concentration of larger enterprises account for an increased share of R&I investment.

2. National STI Programmes and Initiatives

Ireland's R&I policy, *Impact 2030*, has five cross-cutting pillars:
1) Maximising the impact of research and innovation on our economy, society and the environment.
2) Impact of research and innovation structures on excellence and outcomes
3) Innovation driving enterprise success
4) Talent at the heart of the research and innovation ecosystem
5) All-island, EU and Global connectivity

Pillar 5 in particular places a strong emphasis on our cooperation within EU frameworks and programmes, including Horizon Europe. Ireland currently participates in 3 so-called Important Projects of Common European Interest (IPCEIs), on batteries, high-performance computing and microelectronics. We will build on already strong participation by Irish researchers in cross-EU initiatives, with a goal of securing €1.5 billion from Horizon Europe. The strategy also aims to deepen footprint beyond the EU, including in Asia, and specifically Korea.

Ireland does not have specific programmes targeted at the Republic of Korea. However, there are a range of programmes which can facilitate interactions (both business and academic) with Korean counterparts.

International Cooperation Programmes/Initiatives

Programme Title	Contents
SFI Industry Fellowships https://www.sfi.ie/ funding/funding-calls/ sfi-industry-fellowship-programme	The purpose of the Industry Fellowships Programme is to facilitate the placement of researchers in industry or academia to stimulate excellence through knowledge transfer and training. Fellowships will enable access for researchers to new technology pathways and standards and will facilitate training in the use of specialist research infrastructure. Fellowships can be awarded to academic researchers wishing to spend time in industry worldwide or to individuals from industry anywhere in the world (including Ireland) wishing to spend time in an eligible Irish Research Body.
SFI Strategic Partnerships https://www.sfi.ie/ funding/funding-calls/ sfi-strategic-partnership	The SFI Strategic Partnerships Programme provides a flexible funding mechanism intended to support ambitious research projects of scale between industry and academia. The scheme provides an opportunity for industry to engage with world class academic researchers and have access to infrastructure and intellectual property using a shared risk funding model in which SFI matches the investment made by industry. A key feature of the Partnerships Scheme is the recognition that collaboration with industry must be responsive and flexible. For this reason, the scheme employs adaptive partnership models that have been developed to meet industry partner needs.
SFI Research Centres https://www.sfi.ie/ sfi-research-centres	These are world-leading, large-scale Research Centres with a major economic impact for Ireland. They consolidate research activities across higher education institutes to create a critical mass of internationally leading researchers in strategic areas which will lay the foundation for effective and productive academic and industrial partnerships. SFI currently funds 17 Research Centres in areas of strategic importance.
SFI Research Centre Spokes	The SFI Spokes Programme provides a mechanism to allow new industrial and academic partners and projects to join the existing SFI Research Centres, allowing the Centres to expand and develop in line with new priorities and opportunities. This will ensure that the Research Centres retain their ability to do cutting edge research and their industrial relevance, and so enhance their sustainability.
SFI Industry Research, Development and Innovation Fellowship programme SFI Industry RD&I Fellowship Programme	The SFI Industry RD&I Fellowship Programme 2023 seeks to support academia-industry interactions in order to address industry -informed challenges. Awards under this programme can be made to academic researchers (at faculty and postdoctoral level) wishing to spend time in industry worldwide through the temporary placement of academic researchers with an industry partner.

The President of Ireland Future Research Leaders Programme https://www.sfi.ie/ funding/funding-calls/ sfi-president-of-ireland	The President of Ireland Future Research Leaders Programme is a recruitment-only programme designed to attract to Ireland outstanding new and emerging research leaders in both scientific and engineering domains, where candidates may have both academic and/or industry relevant backgrounds with a focus on research excellence with impact. The programme aims to address current gaps in leadership, methodologies and skill sets in specific discipline areas.
SFI Academic Led Programmes https://www.sfi.ie/ funding/funding-calls	SFI's suite of programmes supports research that has the potential for economic and societal impact. Academic led programmes such as the SFI Investigators Programme address crucial research questions that expand educational projects and career opportunities in Ireland, in science and engineering and prepare the research community to lead and win in the EU R&I Framework Programmes and other non-exchequer funding programmes. SFI also has a range of programmes to attract leading researchers to Ireland at various career stages, from early-career researchers through to world-leading professors.

3. Joint Activities with Korea

Activities with the RoK in 2023-2024

| Programme Title	Contents
Medical Technology Research	Biomedical Manufacturing Technology Centre (BMTC) at the Korea Institute of Industrial Technology (KITECH) and CURAM, the Science Foundation Ireland Centre for Research in Medical Devices, have established a programme of research collaboration allowing for joint conferences, workshops, and researcher exchange.
Artificial Intelligence Research	Samsung Electronics and Insight Centre for Data Analytics at University College Dublin (UCD) are collaborating on a major research project involving a team of more than 25 researchers from Korea and Ireland. The Samsung/Insight project aims to leverage Insight's data science and AI expertise to develop smarter products using machine learning, user modelling and recommender systems.

4. Science, Technology and Innovation Cooperation Partners

Organisation Name	Detailed Information
Knowledge Transfer Ireland (KTI)	Knowledge Transfer Ireland (KTI) works with Ireland's universities, institutes of technology and publicly funded research organisations to help businesses and investors commercialise publicly-funded research. KTI also updates Ireland's National IP Protocol and produces suites of IP related templates and guidelines. http://www.knowledgetransferireland.com
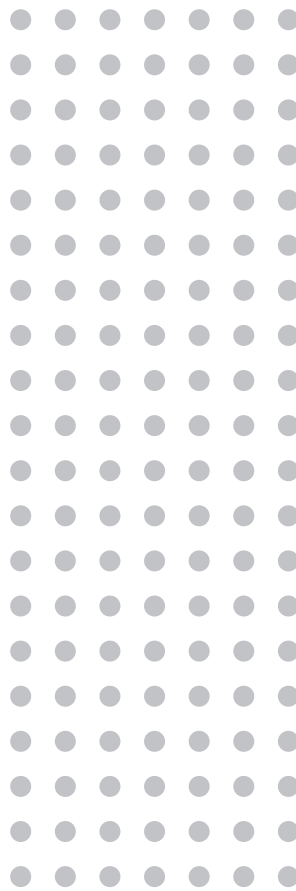
15 ITALY

1. Policies and Strategies in Science, Technology and Innovation

2. National STI Programmes and Initiatives

3. Joint Activities with Korea

4. Science, Technology and Innovation Cooperation Partners

ITALY

Country Outline

- GDP: 1,946,479 million euros (Eurostat 2022)
- GDP Per capita: 28,180 euros (Eurostat 2022)
- Areas of marked S&T specialisations: Life sciences, biotechnology, aerospace, aeronautics, biomedicine, engineering, food sciences, oil industry, microelectronics, physics, material sciences, advanced materials, ICT, robotics, environment and energy, transportation, automotive

Contact Information

- Organisation: Embassy of Italian Republic
- Name / Position: Dr. Massimo Passera / Science and Technology Counsellor
- Phone no. / e-mail: (+82) -2-7500240 / seoul.scienza@esteri.it

The public research system, with HERD (High Education Research and Development) of 0.37% and GOVERD (Government Expenditure on R&D) of 1.50% of GDP in 2019, performs the greater part of R&D. Higher education and Public Research Institutions (PRIs) contribute to innovation in a number of ways but their co-operation with business firms needs to be improved. In order to improve public research performance, a reform of funding mechanisms for and management of universities was approved in 2010 by Parliament and is being implemented. The reform of the PRIs under MIUR has also recently been undertaken.

Various initiatives aim at bridging the gap between academia and industry. Technological districts and high technology poles as well as public-private laboratories are established in different parts of the country. The National Innovation Fund (FNI) was created in 2012 by MiSE to facilitate the financing of innovative projects based on the exploitation of industrial designs and patterns. In addition, the Innovation Package introduced in 2011 supports the patenting activity of SMEs. The National Technology Platforms and Industrial Innovation Network (RIDITT) were set up in 2010 to ensure dissemination of innovation and technology between research system and enterprises.

Italy is addressing various cross-cutting research issues considered crucial for enhancing economic growth, *e.g.* research on the natural and cultural heritage and on the complex systems of smart cities.

Moreover Italy has improved its Revealed Technological Advantage (RTA) in environment-related technologies over the past decade and will soon develop a specialization if this trend continues.

[Government funding for R&D by sector of performance]

Private non-profit 6%

Business enterprise 24%

Public Research organisations 41%

Higher Education 29%
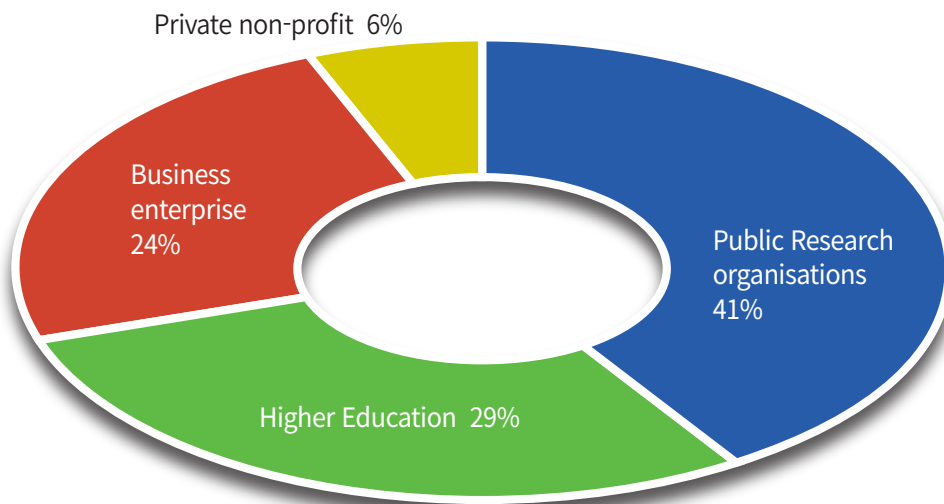
Source: Eurostat February 2014

1. Policies and Strategies in Science, Technology and Innovation

STI policy governance: The Ministry for Economic Development (MISE) is in charge of industrial innovation, the Ministry for Education is responsible for the national education system, and the Ministry of University and Research (MUR) is responsible for academic activities as well as for promoting research at national and international level. The National Agency for the Evaluation of Universities and Research Institutes (ANVUR) has operated under MIUR since 2010.

Science policy: The public research system, with HERD of 0.37% and GOVERD of 1.50% of GDP in 2019, performs the greater part of R&D. Higher education and PRIs contribute to innovation in a number of ways but their co-operation with business firms needs to be improved. In order to improve public research performance, a reform of funding mechanisms for and management of universities was approved in 2010 by Parliament and is being implemented. The reform of the PRIs under MIUR has also recently been undertaken.

Business R&D and innovation: As in other OECD countries, there has been a shift towards indirect funding of R&D in recent years. As stated in the National Reform Programme 2011, for 2011/12, tax incentives have been strengthened for research commissioned by firms to universities and PRIs as well as for research developed in collaboration with them.

Public-sector innovation: The e-Government Plan 2012 of the Department for Public Administration defined a set of digital innovation projects to modernize the public administration, to make it more efficient and transparent, and to improve the quality of services and reduce costs. The plan sets out some 80 projects and 27 targets to be achieved by 2020.

Knowledge flows and commercialization: Various initiatives aim at bridging the gap between academia and industry. Technological districts and high technology poles as well

as public-private laboratories are established in different parts of the country. The National Innovation Fund (FNI) was created in 2012 by MiSE to facilitate the financing of innovative projects based on the exploitation of industrial designs and patterns. In addition, the Innovation Package introduced in 2011 supports the patenting activity of SMEs. The National Technology Platforms and Industrial Innovation Network (RIDITT) were set up in 2010 to ensure dissemination of innovation and technology between research system and enterprises.

Globalization: The Strategy for the Internationalization of Italian Research (SIRIT 2010-15) integrates the national research priorities, notably the EU's 2020 Strategy. Italy actively participates in EU R&D programmes, the European Strategy Forum on Research Infrastructures (ESFRI) and other European initiatives such as EUREKA (for international S&T cooperation) and Erasmus (for mobility of students and researchers).

Emerging technologies: Italy is addressing various cross-cutting research issues considered crucial for enhancing economic growth, e.g. research on the natural and cultural heritage and on the complex systems of smart cities.

Green innovation: Italy has improved its RTA in environment-related technologies over the past decade and will soon develop a specialization if this trend continues. The government provides a number of incentives for renewable energy production. The Energy Account (Conto Energia) initiative promotes solar photovoltaic, and a Kyoto Fund was set up to finance measures to reduce greenhouse gas emissions. Green Certificates (CV) promote electrical energy produced from renewable sources and White Certificates – energy efficiency labels (TEE) – encourage energy-saving measures. A package of fiscal incentives for energy efficiency interventions in existing and new buildings was approved by Parliament in 2011.

2. National STI Programmes and Initiatives

The last National Research Plan, for the period 2015-2020, identified several thematic priorities for the national research policy. These include energy, sustainable mobility, the environment, and 'made in Italy' –a programme promoting the industrial sectors that characterized national productivity. The Plan aimed to promote research by strengthening business sector co-operation with the public sector and supporting the internationalisation of research.

The Industry 2015 programme (2006-15) sets out to support business networks and industrial innovation projects and includes a fund for enterprise finance. However, the National Reform Programme 2011-12 requires general policies to have a small impact on the national budget. The country's south and SMEs have attracted special attention in STI strategies and policies. The National Strategic Framework 2007-13 includes the National Operational Programme (PON) Research and Competitiveness 2007-13, funded by the European Regional Development Fund (ERDF) and by the national Revolving Fund (Fondo di Rotazione), which is of high importance for regional cohesion and competitiveness.

To put the economy on a sustainable growth path based on sound macroeconomic fundamentals, the Italian government has embarked since 2011 on a substantial process of fiscal consolidation and structural reform. Innovation will be crucial for boosting competitiveness and sustainable growth in the longer term. Although many indicators point to a modest level of STI activity, attention is being given to increasing it.

In 2019 GERD (Gross Expenditure on R&D) was just 1.80% of GDP, about half of the OECD average, and more in line with the R&D intensity of emerging economies. The business sector performs only around half of GERD, a low share for an advanced economy. At 0.80% of GDP in 2019, BERD lags behind the OECD average, with business sector innovation performance varying across firms and regions. In fact, a segment of innovative firms, including flexible SMEs, coexists with many non-innovative firms operating at low levels of productivity. Moreover, much R&D and innovation capacity is concentrated in northern and central regions of the country. The low share of industry-financed public R&D is indicative of weak industry-science linkages. Venture capital is in short supply and the patenting rate of young firms is low. In general, Italy tends to perform better on indicators of non-R&D-based innovation (for example, it leads in Community designs).

3. Joint Activities with Korea

Programmes of Joint Activities with RoK in 2023

Programme Title	Contents
Ethics in Metaverse: a Korean-Italian Symposium	Date: July 3rd, 2023 Venue: Korean National Assembly, Seoul
Metaverse RenAIssance: Perspectives and developments in Italy and Korea	Date: July 4th, 2023 Venue: Korea University, Seoul
Korea-Italy International Workshop 2023: From macro to micro 3D high-content screening platform for anti-cancer drug testing using multicellular spheroids	Date: June 14th, 2023 Venue: Yonsei University, Seoul

Joint labs:
- Italian National Agency for New Technologies, Energy and the Sustainable economic development (ENEA) – Korea Institute of Science and Technology (KIST): Fuel Cells and Hydrogen applications
- University of Pavia – Korea National University of Culture Heritage: Applied technologies to the conservation of textiles and wooden manufacts

Bilateral projects:
- Italian Institute of Marine Sciences (CNR-ISMAR) – Korea Institute of Ocean Science and Technology (KIOST)

- Italian Institute of Polar Science (CNR-ISP) – Korea Polar Research Institute (KOPRI)
- Italian National Institute for Nuclear Physics (INFN) – Korea Institute for Basic Science (IBS)
- Italian National Agency for New Technologies, Energy and Sustainable Economic
- Development (ENEA) – Korean Electronics and Telecommunications Research Institute (ETRI)
- Italian National Agency for New Technologies, Energy and Sustainable Economic
- Development (ENEA) – Korea Superconducting Tokamak Advanced Research (KSTAR)
- Italian National Institute for the Treatment of Cancer (INT) – Korea National Cancer Center (KNCC)
- Polytechnic of Milano – Sungkyunkwan University
- University of Bergamo – Inha University, Kyungpook National University
- University of Firenze – Korea University, University of Seoul, Sungkyunkwan University
- University of Padova – Korea University, Seoul National University, University of Seoul
- University of Palermo – Pusan National University, Busan University of Foreign Studies
- University of Pavia – Korea National University of Culture Heritage
- University of Pisa – Hankuk University of Foreign Studies and Dankook University
- University of Rome "Tor Vergata" – Hoseo University
- University of Siena – University of Seoul
- University of Torino – Ewha Women's University
- University of Trento – Chonbuk National University and Hallym University

Bilateral projects selected within the Italy-Korea Executive Programme 2023-2025

RESEARCH AREA	TITLE	ITALIAN COORDINATOR	KOREAN COORDINATOR
Environmental sciences and energy transition	Electrochemical Membrane Bioreactors for Water Reuse with Hydrogen Fuel	NADDEO Vincenzo (Università di Salerno)	CHOO Kwang-Ho (Kyungpook National University)
Agrifood for biotech and biopharma applications	EV-C@p: Plant-derived Extracellular Vesicles as novel biotechnological platform for biopharma applications	POCSFALVI Gabriella (CNR-IBBR)	KIM Kwang-Pyo (Kyunghee University-Global Campus)
Physics and astrophysics	Magnetism and metallicity in the Mott insulator Ca2RuO4: a Platform for quantum phases driven by strain and doping (MAP)	FITTIPALDI Rosalba (CNR-SPIN)	KIM Yeong-Kwan (KAIST)
Advanced materials and nanotechnologies	Cascaded second-order processes in centrosymmetric plasmonic systems	CIRACI Cristian (Fondazione Istituto Italiano di Tecnologia)	RHO Jun-Suk (POSTECH)

Advanced materials and nanotechnologies	Development of a gas sensor fabrication method for the integration of a highly selective sensing material and low power-consuming heater	COMINI Elisabetta (Università di Brescia)	YOON Jun-Bo (KAIST)
Biomedicine, and technologies to face new infectious diseases	From macro to micro 3D high-content screening platform for anti-cancer drug testing using multicellular spheroids	PICCININI Filippo (Università di Bologna)	PYUN Jae-Chul (Yonsei University)
Prevention of natural disasters, including Vulcanology	Understanding Holocene to historical volcanic eruptions and related hazards in Korea: Lessons from active volcanoes of Italy	GROPPELLI Gianluca (CNR-IGAG)	SOHN Young-Kwan (Gyeongsang National University)
S&T applied to cultural heritage	Conservation of Textile and Wooden Artifacts Through Selective Gel Cleaning Applications Including Innovative Gel	MALAGODI Marco (Università di Pavia)	CHUNG Yong-Jae (Korea National University of Cultural Heritage)

4. Science, Technology and Innovation Cooperation Partners

Organisation Name	Detailed Information
National Research Council www.cnr.it	■ Organisation type: Research Organisation ■ Major Research Area: All basic sciences and applied sciences ■ Major Activities with Korea: Joint projects, joint labs, MoUs ■ Contact Information: virginia.codanunziante@cnr.it
Italian Institute of Technology www.iit.it	■ Organisation type: Research Organization ■ Major Research Area/Product: Applied sciences ■ Contact Information: Francesca.Cagnoni@iit.it
Italian National Institute for Nuclear Physics www.infn.it	■ Organisation type: Research Organization ■ Major Research Area: theoretical and experimental research in the fields of subnuclear, nuclear & astroparticle physics ■ Contact Information: eleonora.cossi@presid.infn.it

Italian National Agency for New Technologies, Energy and Sustainable Economic Development www.enea.it	■ Organisation type: Research Organization ■ Major Research Area/Product: energy, the environment and sustainable economic development ■ Contact Information: relint@enea.it
IRCCS National Cancer Institute Foundation www.istitutotumori.na.it	■ Organisation type: Research Organization ■ Major Research Area/Product: study and treatment of cancer ■ Contact Information: direzionescientifica@istitutotumori.na.it
STmicroelectronics www.st.com	■ Organisation type: SME ■ Major Research Area/Product: Microelectronics for automotive, mobile and telecommunication industries ■ Contact Information: nunzio.abbate@st.com
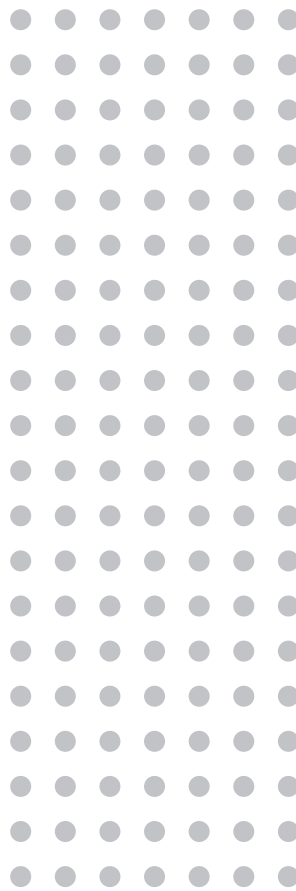
16 LATVIA

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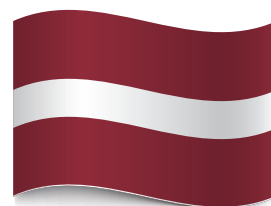
Country Outline

- GDP: 38,870 million euros (Eurostat 2022)
- GDP Per capita: 13,280 euros (Eurostat 2022)
- Areas of marked S&T specialisations: Knowledge-based Bio economics, Bio medicine, Medical Technologies, Bio-pharmacy and Biotechnologies, Advanced Materials, Technologies and Engineering Systems, Smart Energy, ICTs

Contact Information

- Organisation: Embassy of the Republic of Latvia to the Republic of Korea / LIAA Representative office in the Republic of Korea, Foreign Trade Promotion Department
- Name / Position: Mārtiņš Baumanis / Counsellor of the Ministry of Economics / Head of LIAA Representative office in the Republic of Korea
- Phone no. / e-mail: (+371) 27883654 / martins.baumanis@liaa.gov.lv

Latvia is a country with strong scientific traditions with a high share of the population having completed tertiary education. The overall business conditions are good and that provides an opportunity for innovation-driven growth. The main goals for research in Latvia as defined in the Smart Specialization Strategy is to specialize in five priority areas that will transform the national economy towards the production of the goods and services with greater added value.

In order to achieve this goal, major reforms in the research and development sector were implemented that allowed to modernize the existing research infrastructure and consolidate research potential in 20 internationally competitive research institutes that are integrated with higher education and industry.

As a result, the share of high technology products in Latvia's exports and the overall productivity of the economy are gradually increasing and our research system is becoming more open and internationally competitive what can be seen in our high activity in Horizon 2020. The overall goal is to increase the total R&D investment to 1.5% of GDP. These investments should also include an increase in private R&D funding from 21% in 2016 to 48% in 2020.

1. Policies and Strategies in Science, Technology and Innovation

Latvian National Innovation Strategy (RIS3) is defined in the Guidelines for Science, Technology Development, and Innovation 2014-2020. It has the following priorities:

1) High added-value products
2) Productive Innovation System
3) Energy Efficiency
4) Modern ICT
5) Modern education
6) Knowledge base (bio-economy; bio-medicine, medical technologies, bio-pharmacy and bio technology; smart materials, technology and engineering, smart energy; ICT)
7) Polycentric development

Research environment	
22 state funded research institutions, including 15 internationally competitive scientific institutes or their separately evaluated departments	7500 researchers (3 482 in FTE), 16% work in the industry
Finance	
In 2017, 137.9 million EUR was invested in R&D, which is 0.51% of GDP (the target goal is 1.5%)	25% of companies are active in innovations
Human resources	
Amongst the population aged 25–34 about 1% are PhD holders	56% of PhD graduates are women, Proportion of women researchers in 2013– 52% (the highest rate in the EU, average in the EU–33%)
Priorities	
More than 20 000 students in 2017/18 academic year are studying in STEM fields (Natural Sciences and Engineering) and almost 90% of them are studying in state owned HEI's	In the 2017/18 academic year, foreign students constitute 11% of all students in Latvia (constant increase over previous years)
Ongoing projects	

The Investment and Development Agency of Latvia as the National Technology Transfer Centre provides different kinds of activities to support technology transfer and cooperation between research institutions and industry. The agency supports international cooperation opportunities for foreign investors, researchers, enterprises and governmental organisations.

2. National STI Programmes and Initiatives

International Cooperation Programmes/Initiatives

Programme Title	Contents
Programme 1 https://www.viaa.gov.lv/en/latvian-state-scholarships	- Programme name: Latvia state scholarships - Cooperation Type: Latvia offers scholarships to foreign students, researchers and teaching staff for studies and participation in summer schools in Latvian higher education institutions (HEIs) in the 2023/2024 academic year. - Funding Organisation: The Ministry of Education and Science of Latvia - Call Opening/Closing Date: Follow on: https://www.viaa.gov.lv/en/latvian-state-scholarships - Project Duration: 2023/2024 - Funding Scale and Funding Scheme: Not announced yet - Research Fields: All - Matching fund from Korean government: Not required - Others: In accordance to the Agreement on co-operation in education and science

3. Joint Activities with Korea

Activities with the RoK in 2023-2024

Programme Title	Contents
TEKTiTE: Digital Economy 2023 Forum, Conference and Matchmaking	- Major topic or agenda: Digital Economy - Date and Venue: Online, 28.-31.03.2023 - Objective: Networking for technology cooperation - Target Participants: Innovation seekers, solution providers, intermediaries, technology transfer organisations, entrepreneurs, scientists. - Detailed Information: Cooperation with Deltatech Korea and Enterprise Europe Networok https://deltatechkorea.com
Forum and Matchmaking with KITECH (Korea institute of Industrial Technology)	- Major topic of agenda: Technology transfer between LV and KR - Date and Venue: Seoul, Q4 2023 - Objective: Matchmaking according to companies' survey - Target Participants: SMEs in Korea and Latvia - Detailed Information: https://eng.kitech.re.kr/main

4. Science, Technology and Innovation Cooperation Partners

In order to promote the development of young scientists' and researchers' skills in their careers, research institutions or enterprises can implement post-doctoral research in cooperation with Latvian or foreign researchers, who have obtained a PhD degree no earlier than five years before the research application with the support of the EU Funds programme "Support for Postdoctoral Research".

In order to facilitate the preparation of qualified specialists, research institutions or enterprises can apply for the EU Funds programme "Support for Practical Research Projects" for research implementation in order to attract not only experienced scientific employees of Latvian research institutions, but also to attract foreign researchers, thereby encouraging the exchange of knowledge and experience.

Key Research Organisations and Companies

Organisation Name	Detailed Information
University of Latvia www.lu.lv	▪ Organisation type: university & research institutes ▪ Major Research Area/Product: The University of Latvia (UL) with its 15,000 students, 13 faculties and more than 20 research institutes is the largest research university in the Baltic States, with major research fields in Natural Sciences, Humanities, Medicine, Education and Social Sciences. ▪ Major Activities with Korea: UL has concluded bilateral cooperation agreements with the following universities in South Korea: Kyungpook National University, University of Incheon, Pukyong National University. ▪ In the 2017/2018 academic year, 13 students from South Korea studied at the UL. For local students the UL offers Asian Studies, including Korean regional studies module (e.g. courses like "Contemporary Korean Society", "Philosophical and Religious Streams in Korea") at both bachelor and master levels. It is possible to study Korean language at 4 different levels of difficulty. In March 2016, the Korean Study Centre was established at the University of Latvia. In July 2015, the student-sportsmen of the UL participated in the Summer Universiade in Gwangju, Korea. ▪ Future Plans: UL plans to intensify the exchange of students and staff by preparing proposal for Erasmus+ mobility scheme with several South Korean universities. ▪ Contact Information: www.lu.lv / International Relations Department / ad@lu.lv

Riga Technical University http://www.rtu.lv/en	- Organisation type: university & research institutes - Major Research Area/Product: Riga Technical University (RTU) is the largest university in Latvia and leading engineering university in Baltic States with more than 15,000 students in nine faculties. RTU offers engineering and business programmes, e.g. Business Management, Civil Engineering, Chemistry, Chemical Technology, Mechanics, Computer Systems, Telecommunications, Aviation Transport, Power Engineering, Medical Engineering, Applied Linguistics, at bachelor, master and doctoral level fully in English. Modern laboratories and approaches in all engineering, natural science and business study programmes. Students from more than 50 countries. Multicultural Environment at the university campus and all university faculties. - Major Activities with Korea: RTU has bilateral cooperation agreements with the following universities in South Korea: Kyungpook National University, Pukyong National University, Kongju National University, Handong Global University. - RTU has been working with exchange students from Korea since 2007. In the 2017/2018 academic year, there were 9 students from South Korea. In September 2016, the Riga King Sejong Institute opened at the Riga Technical University. - Contact Information: RTU Foreign Students Department Address: 1 Kalku Street, Riga LV-1658, Latvia Phone: (+371) 67 089 766 Fax: (+371) 67 089 020 E-mail: info@rtuasd.lv
The Institute of Solid State Physics, University of Latvia http://www.cfi.lu.lv/eng	- Organization type: research institute - Major Research Area/ Product: The Institute of Solid State Physics, University of Latvia (ISSP UL) is one of the largest institutes in Latvia. The main field of its research is material science, with emphasis on nanoscience and nanotechnology of new advanced functional materials, with a special focus on materials applicable for sustainable energetics. ISSP UL is a national coordinator and leader in several research projects. It has an active International Supervisory Board consisting of internationally recognized experts. The mission of ISSP UL is to carry out high-level scientific activity, and to use its knowledge in the fields of education and innovation. The ISSP UL is the only scientific institution in the Baltic Sea region, which was granted support from the European Commission for the Horizon 2020 programme "Spreading Excellence and Widening Participation". The project CAMART2 (Excellence Centre of Advanced Material Research and Technology Transfer) from Latvia was ranked as the 5th best project. The European Commission has granted 15

	million Euro for the development of the Centre of Excellence during the next seven years. In addition, more than 16 million Euro from the European Regional Development Funds, administrated by the Ministry of Education and Science of Latvia and Ministry of Economics of Latvia, will be invested in the development of research and technology transfer infrastructure, thus making the total investment amount more than 30 million Euro. ■ Contact Information: Address: 8 Kengaraga street, Riga, LV-1063, Latvia Phone: (+371) 67 187 816 Fax: (+371) 67 132 778 E-mail: issp@cfi.lu.lv
Latvian Institute of Organic Synthesis http://www.osi.lv/en	■ Organization type: research institute ■ Major Research Area/ Product: The Latvian Institute of Organic Synthesis (IOS) is a large research unit devoted mainly to drug discovery. IOS received the best score (5) among all Research Organizations in Latvia in "Research Evaluation Exercise", which was a part of the international assessment "Latvia in Innovation System Review and Research Assessment Exercise". ■ IOS develops very important activities in the fields of chemistry, pharmacy, pharmacology and biology. The work of IOS resulted in a high number of patents, which are held together with industrial partners. Several drugs developed at IOS are on the market. However, beside the synthetic work driven by the need to fulfil the capital risks investors, basic research is nevertheless performed. A very large number of doctoral students are being trained and educated at IOS. ■ Contact Information: Latvian Institute of Organic Synthesis Aizkraukles 21, LV-1006, Riga, Latvia Tel: (+371) 67 014 801 Fax: (+371) 67 550 338 Email: sinta@osi.lv

17 LITHUANIA

LITHUANIA

Country Outline

- GDP: 67,399 million euros (Eurostat 2022)
- GDP Per capita: 15,100 euros (Eurostat 2022)
- Areas of marked S&T specialisations: 1. Health technologies and biotechnologies / 2. New production process, materials and technologies (including photonics) / 3. Information and communications technologies

Contact Information

- Organisation: Embassy of the Republic of Lithuania in the Republic of Korea
- Name / Position: Ms. Asta Slavinskaite / Minister Counsellor
- Phone no. / e-mail: (+82) 2-2031-3500 / asta.slavinskaite@urm.lt

What makes Lithuania the perfect partner in Science, Technology and Innovation (STI)?
- Lithuania ranks first in EU for GDP per capita growth (2000-2020).
- Lithuania is the 11th freest economy in the world.
- Lithuania is among the top 5 of the most rapidly growing countries in the EU in the field of R&I in the time period from 2015 to 2022 according to the European innovation scoreboard 2022.
- By the end of 2030, public funding of R&I is to reach 1 % of the GDP, thus ensuring further growth of high value added economy and fruitful international cooperation opportunities in STI.
- Lithuania has a world-renowned players open for collaboration in the field of biotechnology (for example, Nobel prize-candidate prof. Virgnijus ik nys from Vilnius University with revolutionary CRISPR-Cas9 technology), photonics (with Teltonika, Light conversion, Ekspla, Brothers Semiconductors and etc.) and fintech.
- Lithuanian industrial parks are hubs of industrial collaboration, providing ready-to-use facilities for R&D and production.
- With two unicorns and more than 760 active startups, Lithuania is a hotbed for developing, testing and scaling cutting-edge innovation.
- In Lithuania 58% of 25-34-yearolds have tertiary education (7th in the OECD).
- Lithuania is the 2nd globally for digital skills.

1. Policies and Strategies in Science, Technology and Innovation

The National Agreement on Education Policy signed by all political parties represented in Seimas (the Parliament of Lithuania) in year 2021 sets out the goals of financing and envisions for a steady increase in the state budget allocations to the R&D sector (up to 1 % of the GDP by 2030). In 2022 the Research Development Program 2022-2030 was adopted by the Government. The program consists of three progress measures: 1) strengthen innovation ecosystems in science centres, 2) improve the research and higher education environment, and 3) implement mission-based research and innovation programs (joint measure in collaboration with the Ministry of Economy and Innovation). All measures aim to ensure and promote an attractive career for researchers, high level R&D, knowledge transfer and cooperation with business, as well as science role for solving societal challenges, mission orientation.

To strengthen R&D role in all policy fields the Research Development Program envisages an establishment of the positions of science and innovation advisors in all ministries and the Government office. To boost visibility of Lithuania's science sector internationally the "Horizon Europe" acceleration plan with specific measures was created.

The Economic Transformation and Competitiveness Development Program of the Ministry of Economy and Innovation of the Republic of Lithuania was approved by the Government in 2022.

The program includes specific measures to encourage companies to digitalize, to implement mission-driven science and innovation programs (joint measure in collaboration with the Ministry of Education, Science and Sport) and to create a coherent system to promote innovation activities.

The concept of smart specialization for 2021-2027 was approved in 2022. It aims to strengthen research and innovation capacities, create new technologies and simultaneously increase the country's competitiveness and positions in global markets.

Three R&I priorities have been approved, which will be the basis for the promotion and support of research and innovations in the country:
1. Health technologies and biotechnologies,
2. New production processes, materials and technologies,
3. Information and communications technologies.

2. National STI Programmes and Initiatives

International Cooperation Programmes/Initiatives

Programme Title	Contents
Eurostars (https://www.lmt.lt/lt/ mokslo-finansavimas/ mokslo-ir-verslo- bendradarbiavimo- priemones/eurostars-3/ 4102) Or https:// www.eurekanetwork. org/countries/lithuania/ eurostars	■ Programme name: Eurostars ■ Cooperation Type: Joint research projects for SMEs that create innovative products, processes or services for commercialisation. ■ Funding Organisation: Research Council of Lithuanian (www.lmt.lt/en) ■ Call Opening/Closing Date: Two times per year (earliest – 07.14-09.14) ■ Participation Qualification: The project consortium is led by an innovative SME* from a Eurostars country. The project consortium is composed of entities from at least two participating countries with a minimum of one organisation from an EU or Horizon Europe Associated Country. The project consortium is composed of at least two entities that are independent from one another. ■ Project Duration: up to 36 months ■ Funding Scale and Funding Scheme: Research Council of Lithuania covers up to 75% of applied research project costs in grants or up to 50% of pre-competitive development project costs in grants for SMEs. R&D activities can cover TPL 2-9. ■ Research Fields: The project must have a civilian purpose. ■ Matching fund from Korean government (if yes, what is funding process?): If you are based in South Korea and seeking funding for Eurostars R&D project, your first point of contact is with the Korea Institute of Advancement of Technology (KIAT). KIAT supports South Korean organisations interested in international collaboration giving them access to expertise and supporting their growth (https://kiat.or.kr/front/user/main.do). ■ Others: The budget of the SMEs from the participating countries (excluding any subcontracting) is 50% or more of the total project cost. No single participant or country is responsible for more than 70% of the budget of the project.

Network projects (https://www. eurekanetwork.org/ countries/south-korea/ network-projects)	- Programme name: Eureka Network projects - Cooperation Type: Joint research project directed at researching or developing a product, process or service. - Funding Organisation: Research Council of Lithuanian (www.lmt.lt/en) - Call Opening/Closing Date: To be confirmed. - Participation Qualification: consortium must include at least two independent legal entities from a minimum two Eureka countries. - Project Duration: up to 36 months. - Funding Scale and Funding Scheme: Applied scientific research, starting from the TRL 5. Experimental development (project implementation can cover TRL 6-9). - Research Fields: The project must have a civilian purpose. The scheme supports the implementation of market-oriented science-business R&D projects through the intergovernmental Eureka network. - Matching fund from Korean government (if yes, what is funding process?): If you are based in South Korea and seeking funding for Networking project, your first point of contact is with the Korea Institute of Advancement of Technology (KIAT). KIAT supports South Korean organisations interested in international collaboration giving them access to expertise and supporting their growth (https://kiat.or.kr/front/user/main.do). - Others: No single organisation or country can be responsible for more than 70% of the project budget.

3. Joint Activities with Korea

The planned South Korea's association to Horizon Europe programme presents itself with new collaboration opportunities between Lithuanian and Korean researchers on Horizon Europe Pillar II topics. The Research Council of Lithuania with the Embassy of Lithuania in South Korea are planning online brokerage events on mutually agreed Horizon Europe thematic topics, which will allow researchers and SMEs to present their innovations and forge collaborations with aim of submitting joint grant proposals.

Activities with the RoK in 2023-2024

Programme Title	Contents
Brokerage event with Lithuanian and Korean researchers	■ Major topic or agenda: Bilateral collaboration on AI in Horizon Europe ■ Date and Venue: Online, TBC ■ Objective: To share expertise and showcase innovative research taking place in Lithuania and Korea in order to start forging collaborations ■ Target Participants: Researchers ■ Detailed Information: TBC
Korea-Nordics Science & Technology Cooperation Center's Science and policy seminar "Challenges and opportunities for research and innovation in the AI Date and era"	■ Major topic or agenda: Potential cooperation strategies of the research administrators in the AI era ■ Date and Venue: May 31st, 2023, at KNTEC in Solna, Sweden ■ Objective: to facilitate discussions on key policy issues related to emerging technologies, cooperation strategies, and scientific measurement, with a particular focus on the Nordics and Baltic states. Through this event, participants will have the opportunity to share the best practices and insights on science policy and explore potential areas of collaboration. ■ Target Participants: Attendees: around 20 research administrators from research councils in Korea, the Nordics and Baltic states. ■ Detailed Information: Sessions: (1) Challenges, opportunities, and ethics for research by using natural language generation systems; (2) Practical Strategies for fostering cooperation in high technology; (3)Quality-driven Evaluation in the era of Artificial General Intelligence
Center for Physical Sciences and Technology (FTMC) (https://www.ftmc.lt/en) Memorandum of Understanding	■ Major topic or agenda: cooperation agreement ■ Date: agreement came into force on May 9, 2022 and valid for three years, until May 8, 2025 ■ Objective: to promote cooperation in areas of mutual interest for the benefit of both institutions ■ Target Participants: Korea Institute of Machinery and Materials (KIMM) (https://www.kimm.re.kr/eng) and Center for Physical Sciences and Technology (FTMC) (https://www.ftmc.lt/en) ■ Detailed Information: KIMM and FTMC engage in cooperation in the following fields: • Ultra Short pulsed laser • Laser micro processing • Laser optics

4. Science, Technology and Innovation Cooperation Partners

| Organisation Name	Detailed Information
Research Council of Lithuania www.lmt.lt/en	■ Organisation type: Governmental (research funding organization) ■ Major research areas/products: Scientific, technical and social areas ■ Current cooperation status with Korea: collaboration in different scientific projects ■ Contact point: info@lmt.lt ■ Others: The Research Council of Lithuania is open to any kind of cooperation aimed to support and promote bilateral and multilateral scientific activities and to facilitate networking and mobility of researchers. The Research Council of Lithuania can help organisations collaborating on international R&D projects to find project partners and offers advice and support ranging from a concept to commercialisation of research results.
Innovation Agency https://innovationagency.lt	■ Organisation type: Innovation agency/Public Agency ■ Major research areas/products: ICT, Smart manufacturing, LifeScience's, GovTech. ■ Current cooperation status with Korea: under the inner consideration to have joint projects in the field of research and development activities. ■ Contact point: info@inovacijuagentura.lt ■ Others: Innovation Agency is: • Responsible for the development of Lithuanian innovation ecosystem and the promotion of innovation at all stages of business development – from developing ideas to delivering products and services to end-users. • Supporting SME's establishment and development by consulting businesses and providing them with e-tools and services. • Providing business-partner search services for both local and foreign businesses. • Organizing trade missions and participation in international trade fairs and exhibitions. • Consulting on regulations, requirements, licenses as well as quality support to establish business in Lithuania. • Implementing and administrating financial and other support measures for Lithuanian businesses. • Facilitating and developing high value-added industries and ecosystems, including startup community.

The Lithuanian Academy of Sciences https://www.lma.lt/en	■ Organisation type: budgetary institution, providing independent expertise and advice to the parliament and the Government on research and higher education, culture, social development, economy, environmental protection, health care, technology, and other issues. ■ Major research areas/product: consistent encouragement of high-level studies and scientific research, cultivation of critical scientific thinking among the general public, nurturing of academic and scholarly freedom and the ethics of scientific research. ■ Current cooperation status with Korea:- ■ Contact point: Limas Kupčinskas, Email: limas.kupcinskas@lsmu.lt
Vilnius University https://www.vu.lt/en	■ Organisation type: Higher education institution ■ Major research areas/product: Life Sciences, Laser and light technologies, Chemistry, Mathematics and Informatics, Economics, Political Sciences, Biochemistry, Biotechnology, Physics. ■ Current cooperation status with Korea: Two-year postdoc fellowship of a post-doctoral researcher from South Korea funded by Vilnius University "Transformations in Love, Marriage and Gender Relations in Contemporary South Korea: An Anthropological Perspective". Vilnius University is actively engaged in student exchange having signed cooperation bilateral cooperation agreements with 22 Korean Universities. ■ Contact point: Julius Pukelis, International Relations Manager (Tel. (+370) 5 268 7156; Email: julius.pukelis@cr.vu.lt)
Lithuanian University of Health Sciences https://lsmu.lt/en	■ Organisation type: Higher education institution ■ Major research areas/product: biomedical sciences ■ Current cooperation status with Korea: close contacts with specialists at Asan Medical Center, Ulsan University Medical Center (Seoul, Republic of Korea). In 2022 and 2023, the Asan Medical Center was visited by a group of Lithuanian scientists studying the problems of inflammatory and oncological digestive diseases and organ transplantation. At the end of 2023, a visit of Korean specialists to Lithuania is planned, together with plans to sign a university cooperation agreement. ■ Contact point: Limas Kupčinskas, the Institute for Digestive Research (Email: limas.kupcinskas@lsmu.lt)

Lithuanian Energy Institute https://www.lei.lt/en	▪ Organisation type: Research Institute ▪ Major Research Area/Product: Hydrogen and fuel cells, energy sector and energy systems, bioenergy, nuclear safety & decommissioning ▪ Current cooperation status with Korea: - ▪ Contact Information: Director Sigitas Rimkevičius, dr (Tel: +370-37-401924; E-mail: Sigitas.Rimkevicius@lei.lt)
Center for Physical Sciences and Technology (FTMC) https://www.ftmc.lt/en	▪ Organisation type: Research and Technology Organization (RTO) ▪ Major Research Areas/Products: laser technologies, optoelectronics, nuclear physics, organic chemistry, bio and nanotechnologies, electrochemical material science, functional materials, and electronics ▪ Current cooperation status with Korea: one ongoing collaboration activity with Korea Institute of Machinery and Materials (KIMM) ▪ Contact Information: Tel: (+370 5) 264 9211, 266 1640/1643, +370 629 85166; e-mail: office@ftmc.lt
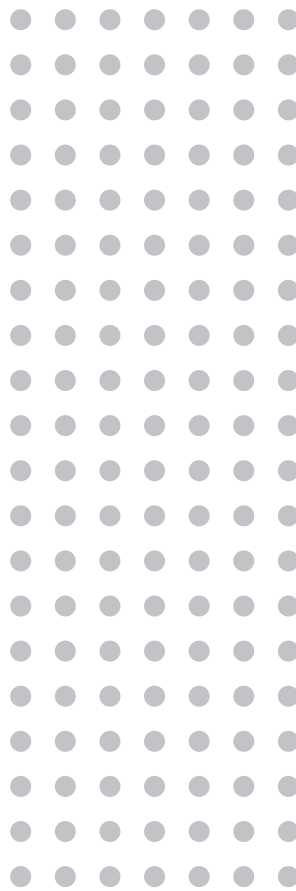
18 LUXEMBOURG

1. Policies and Strategies in Science, Technology and Innovation

2. National STI Programmes and Initiatives

3. Joint Activities with Korea

4. Science, Technology and Innovation Cooperation Partners

LUXEMBOURG

Country Outline

- GDP: 77,529 million euros (Eurostat 2022)
- GDP Per capita: 86,130 euros (Eurostat 2022)
- Areas of marked S&T specialisations: Environment

1. Policies and Strategies in Science, Technology and Innovation

The steady increase in the public R&D budget between 2000 and 2009 reflects the government's resolve to make investment in RDI part of a long-term policy for Luxembourg's economic development and diversification. The country's national RDI strategy is founded on multi-annual planning and focuses on targeted priorities. Following the establishment of the public research centres (PRCs) and of the university between 1987 and 2003 key steps have included the OECD review of Luxembourg's national research system in 2006 and a Foresight Study in 2006, 2007 that identified the thematic domains which now make up the CORE public research funding programme. A major outcome of the OECD review was the recommendation to implement performance contracts between the ministry and the National Research Fund (FNR), the university, the PRCs and Luxinnovation. Two important draft laws are currently in the legislative process, with adoption expected in 2014:

- The first one aims to consolidate the public research organisations with, in particular, the merger of the Tudor and Lippmann Public Research Centres. This merger should allow for the building of critical mass in areas with major prospects for cooperation with Luxembourgish industry such as materials and sustainable development with some less-promising research subjects being discontinued.

- The second one aims to reform FNR which allocates funds on a competitive basis. This reform targets better valorisation of research results notably through enabling actions to support 'proof-of-concept'. In this context a reform of the FNR's researchers training scheme (AFR) is foreseen. It will foster inter-sectoral (public/private) mobility. Many initiatives have been developed to foster private R&D, public-private cooperation, innovation and entrepreneurship:

  - The law of 5 June 2009 provides state aid for the private sector with a special focus on SMEs and services-sector innovation. The law of 18 February 2010 provides public aid to the private sector in the field of eco-innovation. The law on Intellectual Property (IP) tax incentives (21 December 2007) encourages companies to patent and licence the results of their R&D work, and also fosters spinoffs and start-ups based on IP.

- Measures to encourage the development of small innovative companies include: IP/spin-off requirements in PRCs' performance contracts, the creation of a Master's degree in Entrepreneurship and Innovation, the setting up of business incubators, a partnership with a business accelerator located in Silicon Valley (Plug and Play Tech Centre) in order to help start-ups in Luxembourg to gain access to the United States market.

- The massive (EUR 565 million) infrastructure project Cité des Sciences aims at reinforcing relations between research, education and innovation, by hosting on one site all of Luxembourg's major public R&D institutes, as well as private and start-up companies, a new technical school, the university campus, the national archives and some cultural centres. It will provide facilities for public-private partnerships and a business incubator.

- Luxembourg has set up a cluster programme around five thematic clusters (in materials, ICT, space, bio-health, and eco-innovation). This policy was reinforced in 2013, with new missions given to clusters in relation to internationalisation and business developments as well as the setting up of a new cluster in the automotive field

Moreover the new government announced its intention to put in place a process to enable public research organisations and firms to develop common research agendas focused on middle- and long-term targets.

2. National STI Programmes and Initiatives

| Programme Title	Contents
Luxembourg National Research Fund (FNR)'s CORE http://www.fnr.lu/funding-instruments/core	▪ Programme definition: It is the central programme of the FNR as well as a multi-annual thematic research programme. ▪ Cooperation Type: Research Funding ▪ Funding Organisation: Luxembourg National Research Fund ▪ Call Opening/Closing Date: 2016 annual call deadline is 21 April 2016 ▪ Participation Qualification: Early career stage researchers and principal investigators; Public institutions performing research in Luxembourg ▪ Project Duration: 2 to 3 years ▪ Funding Scale and Funding Scheme: The total budget allocated to the CORE programme for the period 2014-2017 is EUR 70 million ▪ Research Fields: Innovation in Services (IS), Sustainable Resource Management in Luxembourg (SR), New Functional and Intelligent Materials and Surfaces and New Sensing Applications (MS), Biomedical and Health Sciences (BM), Societal Challenges (SC)

3. Joint Activities with Korea

Not Applicable

4. Science, Technology and Innovation Partners

Organisation Name	Detailed Information
Luxembourg Institute of Science and Technology http://www.list.lu	■ Organisation type: Research centre ■ Major Research Area/Product : environment, IT, materials ■ Major Activities with Korea: None ■ Future Plans/Strategy: contribute to Luxembourg's reputation, participate in the socio-economic development ■ Contact Information: Phone: +352 275 888 1, Fax: +352 275 885, email: info@list.lu
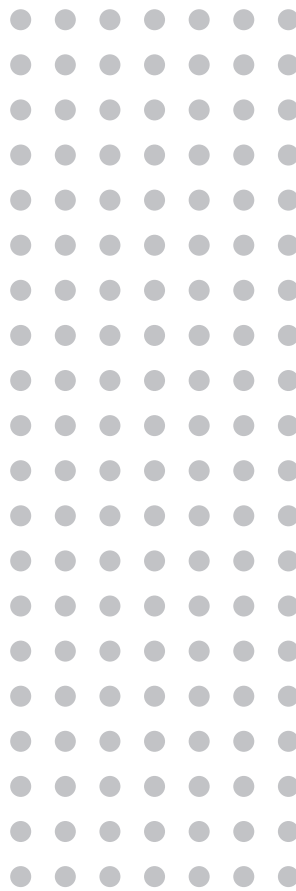
19 MALTA

1. Policies and Strategies in Science, Technology and Innovation

2. National STI Programmes and Initiatives

MALTA

Country Outline

- GDP: 17,450 million euros (Eurostat 2022)
- GDP Per capita: 24,650 euros (Eurostat 2022)

Contact Information

- Organisation: The Malta Council for Science and Technology
- Name / Position: Ms Ramona Saliba Scerri / Deputy Director
  Strategy, Policy & Internationalisation Unit
- Phone no. / e-mail: (+356) 23602121 / ramona.saliba-scerri@gov.mt

Malta has a population of 436,947 (2016) living in an area of 316 square kilometres, making the country one of the smallest and most densely populated countries in the world. Whilst having a very open economy, the country has a narrow export base and this makes Malta highly susceptible to external economic fluctuations. Therefore, when looking at Malta's Research and Innovation system, the international context cannot be ignored. At a macro level, Malta has a stable political, economic and financial system, and a number of high value-added economic sectors stimulated by foreign direct investment. On the other hand, Malta's R&I system is very young and small, resulting in a relatively fragmented system and sub-optimal critical mass. Brain drain is an ongoing threat and the lack of public research institutes and large-scale research infrastructures can provide a challenge when attracting local and foreign researchers. However, Malta's National R&I Strategy 2020 attempts to address the gaps of the system and provide measures to build a stronger and enabling R&I framework, whilst making the most of the opportunities at hand, such as Malta's geographical location, its membership to the European Union, its international linkages thanks to the diasporas of Maltese researchers and innovators, and marketing Malta as a test-bed for new technologies due to its small size.

1. Policies and Strategies in Science, Technology and Innovation

Malta's STI Policy is governed by the National Research and Innovation Strategy, 2014 - 2020. The ultimate goal of this strategy is that of embedding research and innovation at the heart of the Maltese economy to spur knowledge-driven and value-added growth and to sustain improvements in the quality of life. The mission of this strategy is that of providing an enabling framework for achieving this vision, building on achievements as well as lessons learnt. This in turn depends on establishing the necessary 'building blocks' including a comprehensive R&I support ecosystem, a stronger knowledge base and smart, flexible specialisation. Malta'

s approach to R&I is strongly business oriented and focused on close to market research and transition to innovation. Supporting the route from ideas to market in a holistic manner is a prime goal of Malta's new R&I Strategy. Within this context, industry-academia collaboration, support to private sector investment and effective transfer of knowledge are of crucial importance in making sure that good ideas and research efforts yield the desired results. The document may be downloaded from the following link http://mcst.gov.mt/policy-strategy/national-research-innovation-strategy. Following the finalisation of the National R&I Strategy, Malta also prepared an R&I Action Plan in order to map out the operationalisation of the R&I Strategy.

As stated, one of the Strategy's pillars is Smart Specialisation, a new strategic approach conceived within the reformed Cohesion policy of the European Commission and hence tied with funding of research and innovation under the respective priority axis. Smart Specialisation is a place-based approach characterised by the identification of strategic areas for intervention based both on the analysis of the strengths and potential of the economy and on an Entrepreneurial Discovery Process (EDP) with wide stakeholder involvement. It is outward looking and embraces a broad view of innovation including technology-driven approaches. Malta's areas of specialisation were identified through a bottom-up process and work is ongoing to continue developing our competitive areas through focus groups, workshops and dedicated seminars, the monitoring system and technical and political committees. The current areas are high value-added manufacturing, health with a focus on e-health and healthy living and active ageing, aviation and aerospace, aquaculture, maritime services, resource efficient buildings, tourism product development and ICT.

One of the main indicators for monitoring the implementation of the Strategy is investment of R&D expenditure as a percentage of GDP. Over the years, R&D expenditure as a percentage of GDP and also in real terms, show that Malta's investment has been increasing over time, and in the past few years has remained more or less stable, reaching an investment of 0.61% in 2016 (latest available data). Most of R&D investment comes from the business sector, yet over the years the higher education sector showed the largest increase in expenditure, and investment from government remaining mostly stable. Another indicator used to measure progress is the number of researchers expressed as full-time equivalents, which since 2011 has shown a steady increase towards the targets set in the Strategy (746 in 2011 compared to 829 in 2016). The number of PhD holders as a percentage of the active population increased substantially since 2009 and over the past few years has remained stable (0.19% in 2009 compared to 0.40% in 2016).

2. National STI Programmes and Initiatives

Programme Title	Contents
FUSION	■ **Programme definition:** FUSION is a national funding programme that supports Research and Innovation as well as providing the necessary support for researchers and technologists to turn their innovative ideas into a market-ready reality. FUSION is composed of two main programmes, the Commercialisation Voucher Programme (CVP) and the Technology Development Programme (TDP). These two programmes are designed in a way to offer the necessary mentoring and financial support for researchers and technologists to take their ideas to the market. The CVP is aimed at improving the development and commercialisation potential of innovative research ideas whereas the TDP supports the actual development of innovative projects proposed by public entities and industry players. ■ **Cooperation Type:** Joint Research ■ **Funding Organisation:** FUSION is supported through the Malta Government funds, and managed by the Malta Council for Science and Technology (MCST). • **Call Opening/Closing Date:** CVP: 2 calls per year - Jan and May TDP: 2 calls per year - March and October • **Participation Qualification:** Eligible entities: Maltese Public and Industrial Entities. Foreign entities can apply as part of the TDP Consortium but will have to self-fund their part of the research. • **Project Duration:** Between 1 to 3 years • **Funding Scale and Funding Scheme:** FUSION operates under De Minimis Aid - a single undertaking cannot receive more than €200,000 in aid over any 3-year period. • **Research Fields:** - ICT-based Innovation / Enabler - Health (focus on e-health, active and healthy ageing) - Resource-efficient buildings - High value-added manufacturing (focus on process and design) - Aquaculture - Tourism product development - Maritime Services - Aviation and aerospace
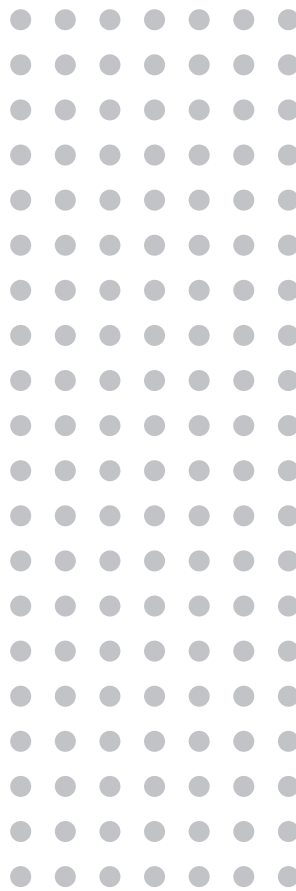
20 NETHERLANDS

NETHERLANDS

Country Outline

- GDP: 958,549 million euros (Eurostat 2022)
- GDP Per capita: 43,800 euros (Eurostat 2022)

Contact Information

- Organisation: Embassy of the Kingdom of the Netherlands
- Name / Position: Mr. Peter Wijlhuizen / Senior Officer for Innovation, Technology and Science
- Phone no. / e-mail: (+82) 2-311-8600 / pw@nost-korea.com

Through their interactive approach to finding innovative solutions to the big challenges facing the world today, the Dutch way of thinking and working has been shaped by centuries of living in the low-lying delta of the Netherlands. Through the ages, the Dutch have joined forces to find ingenious ways to tackle challenges related to water, urbanization, energy, food, health and security. By being inventive, pragmatic and open to new challenges, the Dutch have created a flourishing and resilient country. The Netherlands is a consistently evolving ecosystem of cities, industry, agriculture and nature, all integrated through smart infrastructure. It is a source of knowledge and experience that the Dutch are keen to share with others. Learning from the past to create a better future. Together, seeking sustainable solutions for the most liveable world. The Netherlands is one of the most competitive and innovative countries worldwide as it has ranked the No.5 from the Global Innovation index in 2020. The Netherlands is the world's second-largest agriculture exporter after the United States. The port of Rotterdam is one of the world's largest harbours and it is a gateway to Europe. The Dutch University researchers are among the most productive in the world, and the Netherlands is one of the most wired countries in the world.

1. Policies and Strategies in Science, Technology and Innovation

Science Policy

The Ministry of Education, Culture and Science (Min. OC&W) focuses on scientific research and education. It is responsible for funding basic research and for the public research infrastructure. The policies of the Min. OC&W's are implemented by agencies and research institutes that fall under its remit.

November 2014, the government's new white paper on science was released: "Vision for Science 2025. Choices for the Future." It identifies three challenges that the Netherlands need

to tackle in order to maintain a leading position: increasing international competition, the need for closer ties between sciences on the one hand and society and industry on the other, and the increasing pressure on the Dutch scientist.

Science in the Netherlands is funded from several different sources:
- The private sector funds around half of all research in the Netherlands, mainly its own in-house research, but also research performed by public research institutions (universities and public-private institutions).
- The government funds a little over a third of the total. Some government funding is channelled through intermediary organisations like NWO, KNAW and RVO.
- Other national funding sources: public institutions' own resources and public private funds (Health Funds).
- Foreign funding source, via foreign companies and EU research funding, particularly under Horizon2020.

Innovation Policy

Innovation policy is closely related to science policy. The Ministry of Economic Affairs & Climate Policy (EZK) bears primary responsibility for innovation policy in the Netherlands. It focuses on fostering knowledge development in companies and on collaboration between research institutions and companies.

The core of the policy is the government's plan to make targeted investments in nine leading sectors of the economy. The idea is to tackle problems hampering growth in these sectors. The cooperation between enterprises, scientific institutions, regions and the government will be continued within a new financial framework. The government has chosen nine sectors in which the Netherlands excels as a result of its geography and history: water, agro-food, horticulture, high-tech systems & materials, life sciences, chemicals, energy, logistics and creative industries.

Over the next few years the government plans to tackle administrative problems. This will involve improving professional education, removing obstacles to trade, strengthening the infrastructure, scrapping unnecessary rules and ensuring easier access for knowledge workers. In addition, 1.5 billion euros of research funding will be targeted at the nine leading sectors across the entire government budget. Entrepreneurs, the authorities and research institutions in each sector have drawn up their joint research agendas.

Cooperation between enterprises, knowledge institutes and the government will be important. It will take place in so called 'Topconsortia for Knowledge and Innovation (TKI)' with research initiatives in the chain from basic research to market innovations.

In 2021, the Netherlands spent 19.5 billion euros on R&D. The government invested about 6 billion euro in R&D via direct and indirect funding. Most direct funding goes via intermediary organisations (like NWO and RVO). Indirect funding are tax incentives whereby the Dutch government pays a proportion of the wage costs and other costs (e.g. equipment) associated with research and development. The total R&D expenditures in the Netherlands in 2021

amounted to 2.2 percent of Dutch GDP.

For more detailed information, please visit:
- https://www.government.nl/topics/enterprise-and-innovation/encouraging-innovation
- https://www.government.nl/topics/science/documents/policy-notes/2019/01/28/ curious-and-committed---the-value-of-science
- https://vsnu.nl/files/documenten/Domeinen/Onderzoek/DigitaleSamenleving/VSNU%20 Digital%20Society%20Research%20Agenda.pdf
- https://www.rathenau.nl/en/science-figures

2. National STI Programmes and Initiatives

International Cooperation Programmes/Initiatives

Programme Title	Contents
Horizon Europe	▪ https://ec.europa.eu/info/horizon-europe_en
JTI / EUREKA	▪ https://www.eurekanetwork.org ▪ https://www.eurekanetwork.org/countries/netherlands/eurostars ▪ https://www.eurekanetwork.org/countries/south-korea/clusters
WBSO / RDA	▪ http://english.rvo.nl/subsidies-programmes/wbso-rd-tax-credit-andrda-research-anddevelopment-allowance ▪ Tax incentive for companies and institutes located in the Netherlands for costs related to R&D(e.g. wages and equipment).

3. Joint Activities with Korea

Activities with the RoK in 2023-2024

Programme Title	Contents
Trade Mission	▪ Major topic or agenda: Dutch delegation on Energy Transition (Offshore Wind, Hydrogen, Battery and Horticulture) visited Korea for the Exhibition, Seminar, Company visit and B2B Matchmaking event ▪ Date and Venue: 13-17, March, 2023, Seoul & Metropolitan area ▪ Objective: During the visit of the Dutch trade Minister of Schreinemacher ▪ Target Participants: Dutch and Korean companies & institutes in the field of offshore wind, hydrogen, battery and Horticulture ▪ Detailed Information: https://www.netherlandsandyou.nl/your-country-and-the-netherlands/south-korea/trade-mission

TNO-KoROAD cooperation	▪ Major topic or agenda: Korea-Netherlands cooperation on Autonomous vehicle safety evaluation ▪ Date and Venue: 26. May, 2023, Netherlands Helmond ▪ Objective: LOI was signed between TNO and KoROAD in order to jointly research on standardization of autonomous vehicle safety evaluation. ▪ Target Participants: TNO and KoROAD
No-code/low code Technology Webinar	▪ Major topic or agenda: Webinar on Low-code/no-code solution for machinery ▪ Date and Venue: 12. June, 2023, Webinar ▪ Objective: In order to solve the problem of finding software developer of mechinary companies, a Dutch company has developed a low-code/no-code solution for automation of the machine developing companies. There will be a introduction session of this solution for equipment companies in Korea. ▪ Target Participants: Equipment companies in Korea
Semiconductor Symposium	▪ Major topic or agenda: Semiconductor Symposium ▪ Date and Venue: 31. August, 2023, Suwon Convention Center ▪ Objective: Global trend of Semiconductor industry and technology trend ▪ Target Participants: Semiconductor companies and institutes
Smart City Joint Cooperation Committee Meeting	▪ Major topic or agenda: Joint Cooperation Committee Meeting between the Korean Ministry of Land, Infrastructure and Transport and the Dutch Ministry of Interior Affairs and Kingdom Relations ▪ Date and Venue: In September, 2023, Kintex ▪ Objective: During the World Smart City Expo, the two government will discuss about cooperation opportunity on Smart City subject ▪ Target Participants Ministry of Land, Infrastructure and Transport & Ministry of Interior and Kingdom Relations
Hydrogen Innovation Mission	▪ Major topic or agenda: Hydrogen Delegation visit to Korea ▪ Date and Venue: 13-15, September, 2023, Kintex and Ulsan ▪ Objective: Dutch hydrogen companies and institutes will visit Korea for cooperation. They will attend H2Meet, join the seminar, participate in B2B matchmaking events and site visits. ▪ Target Participants: Hydrogen related companies and institutes
Joint Innovation Committee Meeting and Korea EUREKA Day	▪ Major topic or agenda: Joint Innovation Committee Meeting and Korea EUREKA Day ▪ Date and Venue: October, 2023, Seoul ▪ Objective: Korean Ministry of Trade, Industry and Energy and the Dutch Ministry of Economic Affairs and Climate policy will have a Joint Innovation Committee meeting to discuss about mutual cooperation on Innovation subject. Furthermore there will be some Dutch companies joining the Korea EUREKA Day event. ▪ Target Participants

Organisation Name	Detailed Information
Semiconductor Mission	▪ Major topic or agenda: Semiconductor Mission ▪ Date and Venue: 25-27, October, 2023, COEX ▪ Objective: Dutch Semicon companies will participate in the SEDEX, they will also have a seminar and B2B matchmaking event to meet with Korean companies. ▪ Target Participants: Semicon related companies, universities and institutes

4. Science, Technology and Innovation Partners

| Organisation Name	Detailed Information
Netherlands Enterprise Agency (RVO), https://english.rvo.nl	Netherlands Enterprise Agency (RVO.nl) encourages entrepreneurs in sustainable, agrarian, innovative and international business. It helps with grants (a.o Eurostars and H2020), finding business partners, know-how and compliance with laws and regulations. The aim is to improve opportunities for Dutch entrepreneurs and strengthen their position. Netherlands Enterprise Agency is part of the Ministry of Economic Affairs and Climate Policy and works at the instigation of ministries and the European Union.
Netherlands Organisation for Applied Scientific Research (TNO), www.tno.nl	TNO is an independent research organisation that employs some 3,000 specialists. It focuses on transitions or changes in five social themes: - Industry; Healthy Living; Defence, Safety & Security; Urbanization; Energy.
WUR, https://www.wageningenur.nl	WUR is collaboration between Wageningen University and the DLO foundation. It has a staff of 6,500 and 10,000 students from over 100 countries. The domain of Wageningen UR consists of three related core areas: Food and food production, living environment and health, lifestyle and livelihood.
Maritime Research Institute Netherlands (MARIN), www.marin.nl	MARIN is a research organization founded in 1929 The organization is specialized in offshore technology. As early as 1970, MARIN extended its activities to include nautical research and training. At present, approximately 350 people work at MARIN with turnover of 42 million EURO.

Netherlands Aerospace Centre (NLR), http://www.nlr.org	NLR is a research organisation founded in 1919 by the Dutch government. It was focused on developing civil aviation, but in 1937, the organization turned into a foundation which conducted scientific research for the national aircraft industry. Now NLR has responded to public concern for sustainable, safe and efficient air transport, carrying out numerous projects with national and international collaborations.
DELTARES, https://www.deltares.nl/en	Deltares is an independent institute for applied research in the field of water and subsurface. It works on smart solutions, innovations and applications for people, environment and society. The main focus is on deltas, coastal regions and river basins. The institute works closely with governments, businesses, research institutes and universities domestically and internationally
Dutch Polymer Institute (DPI), http://www.polymers.nl	DPI is an international collaborative platform for industrially relevant research in the field of polymers. It was established in 1997, and it is widely recognized independent institute that specialises in bringing together industrial needs and academic capabilities in a world-class pre-competitive research programme.

Brainport, http://www.brainport.nl/en	Brainport is an innovative high-tech region, responsible for a quarter of all private investment in R&D in the Netherlands. Brainport generates 37% of all patents registered in the Netherlands each year. Focus areas are renewable energy, safe mobility and smart remote care.
Holst Centre, http://www.holstcentre.com	Holst Centre is an independent open-innovation R&D centre that develops generic technologies for wireless autonomous sensors and flexible electronics. A key feature of Holst Centre is its partnership model with industry and academia based around shared roadmaps and programs. This enables Holst Centre to tune its scientific strategy to industrial needs.
Delft University of Technology (TU Delft), https://www.tudelft.nl	TU Delft is the largest and oldest Dutch public tech university. It is one of the best engineering and technology universities which rank within 20th in the world. TU Delft researchers have developed many new technologies used today. They are very active in research cooperation with knowledge institutes and industries, and also active in startup and technology transfer.
Eindhoven University of Technology (TU/e), https://www.tue.nl/en	TU/e is a research university specializing in engineering science and technology. Their research and knowledge valorisation contribute to solving the major societal issues and boosting prosperity and welfare by focusing on the strategic areas of energy, health and smart mobility; to the development of technological innovation in cooperation with industry; and to progress in engineering sciences through excellence in key research cores and innovation in education. Because of its geographical location, the university closely work with high tech companies like Philips, ASML and DAF. TU/e is one of the most prestigious universities in the world, together with TU Delft.
University of Twente (UT), www.utwente.nl/en	UT is a public research university located in Enschede. Entrepreneurial spirit is one of the core values of the institution and it is committed to make economic and social contributions to the Netherlands. It is one of the top 200 universities in the world which has high competency in nanotechnology, biomedical technology and chemistry.

Science, Technology
and Innovation
of the European Countries
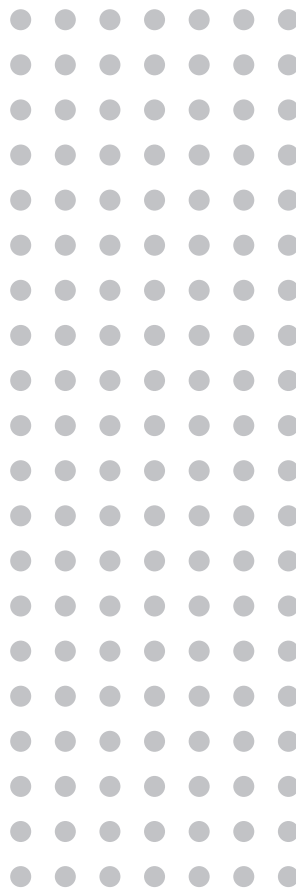
21 POLAND

POLAND

Country Outline

- GDP: 654,594 million euros (Eurostat 2022)
- GDP Per capita: 14,620 euros (Eurostat 2022)

Contact Information

- Organisation: Embassy of Poland
- Name / Position: Mr Karol Peczak / Counsellor
- Phone no. / e-mail: 02 723 9681 (ext. 654) / Karol.Peczak@msz.gov.pl

Poland has a lot of young, qualified scientists and one of the highest Gross Enrolment Ratios (GER) in Europe (51%). Poland continues to allocate more and more funds to science and R&D support. In 2019, its gross domestic expenditure on research and development (GERD/GDP) was 1.32% (1.21% in 2018). Its R&D spending per capita was PLN 789 and was 18.2% higher than a year earlier. The number of R&D businesses grew by 1.5% (Statistics Poland data for 2019).

According to European Commission's data, the most important sectors of Poland's economy in 2018 were wholesale and retail trade, transport, accommodation and food services (26.2%), industry (25.6%), and public administration, defence, education, human health and social work activities (14.0%). Trading with other EU Member States accounts for 80% of Polish exports (28% to Germany, 6% each to the Czech Republic and France). Exports to both Russia and the USA represent 3%. When it comes to imports, 69% is from EU Member States (27% from Germany, 6% from the Netherlands, and 5% from Italy). Imports from China account for 8%, and from Russia for 7%.

1. Policies and Strategies in Science, Technology and Innovation

Rates of growth in innovation among European countries

Every year, the European Commission publishes the European Innovation Scoreboard[1], a ranking to illustrate the rates of growth of all European countries in innovation. In 2020, top positions on the scoreboard were taken by Scandinavian countries. Since 2012, EU's innovation performance has grown on average by 8.9%. Globally, Europe was better than the USA for a second time. This ranking shows that the efficiency of the innovation system within the European Community, and in Poland, is steadily growing year by year. As a result, we are catching up with some more innovative countries, such as Japan.

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1) European Innovation Scoreboard https://ec.europa.eu/docsroom/documents/42981

In the European Innovation Scoreboard 2020, Poland is 24th, ranking only above Hungary, Bulgaria, and Romania. Poland ranks among countries referred to as Moderate Innovators. This is the third leading group of countries after Innovation Leaders, which include Denmark, Finland, Luxembourg, the Netherlands, and Sweden, and Strong Innovators, including Austria, Belgium, Estonia, France, Germany, Ireland, and Portugal. Poland is among EU's 13 Moderate Innovators, which include Croatia, Cyprus, the Czech Republic, Greece, Hungary, Italy, Latvia, Lithuania, Malta, Slovakia, Slovenia, and Spain. The last group, Modest Innovators, includes only two countries, Bulgaria and Romania.

In this report, Poland's performance was the strongest in two areas, Innovation-friendly environment, where we ranked 8th in the EU, and Employment impacts, where we ranked 14th. Moderate Innovators, such as Poland, Malta, Lithuania, and Spain, do well in Innovation-friendly environment, performing above the EU average. These results improved significantly between 2012 and 2019, with the highest performance increase recorded in Poland (by 182%), Finland (by 162.3%), Malta (by 128.6%), Spain (by 127.6%), and Portugal (by 109.2%).

The report praises Poland for its entrepreneurship and top talent, especially in the innovative sectors. And our weakest innovation dimensions are Innovators and Attractive research systems.

National Centre for Research and Development (NCBR)

NCBR is the largest agency to finance R&D projects in Central Europe. Every year, it allocates, on average, PLN 5 billion to support R&D projects. Our applicants can find attractive opportunities in NCBR's competitions. We announce several dozen competitions every year. These are mainly R&D projects, but there are also initiatives to improve the quality of work and science in domestic scientific organisations. NCBR also serves as an intermediary between the worlds of science and business to facilitate innovation. Since its inception in 2007, NCBR has provided to Polish companies and scientific organisations more than PLN 60 billion worth of funding to drive innovation by funding R&D projects.

NCBR acts as the Intermediate Body for two major Operational Programmes, Operational Programme Smart Growth and Operational Programme Knowledge Education Development. Both these programmes are supported from the EU. In addition, NCBR manages a number of initiatives to implement domestic and strategic programmes into R&D. In NCBR, we also run competitions to support national defence and security, through which we finance innovative solutions for the Polish Army and national security agencies, such as the police, border guard, fire service, etc. NCBR is involved in many partnerships with key government institutions in Poland, and with strategic Polish companies. Our applicants can find attractive opportunities in NCBR's competitions. We announce several dozen competitions every year. These are mainly R&D projects.

In the new EU perspective for 2021-2027, the National Centre for Research and Development will serve as National Contact Point for Horizon Europe. Based on the previous, long experience of our National Contact Point experts in implementing Horizon 2020, and in connection with the launch of the new Horizon Europe, NCBR is planning to develop a comprehensive support package for Polish applicants to increase the involvement of Polish entities in Horizon Europe.

International cooperation

International cooperation is a statutory, and important, part of NCBR operations. Strong international position is also one of the key priorities in NCBR's strategy for 2021-2025.

NCBR enters into international partnerships to find global markets for domestic innovation. With this in mind, we participate in 90 international initiatives, implement bilateral collaboration programmes, coordinate a research programme supported from Norway Grants and EEA, carry out multi-lateral and international research programmes (ERA-NET, ERA-NET PLUS, ERA-NET COFUND), cultivate international relations, support Polish entities in "Teaming for Excellence", and represent NCBR during assembly meetings, initiatives and international programmes. We are involved in international programmes and projects across the world, from Nevada to Taiwan and South Africa.

In addition, we enter into and contribute to international relations and agreements, and have signed 10 such agreements. As it initiates and concludes formal bilateral partnership agreements with foreign partners, NCBR takes into consideration the following factors – R&D level of that state, priority target areas, economic benefits, Polish scholars' best experiences from international cooperation, cultural relations, and historical links at state and research unit levels.

To sum up, NCBR's international cooperation rests on three pillars, which create synergies and complement individual measures to contribute to strengthening the international position of the Centre, while also providing support to Polish entities in their international efforts. These pillars are:
- participation in international programmes and initiatives, where NCBR supports international projects involving Polish entities
- actions in Brussels to, e.g., support negotiations and decision-making connected with Horizon Europe
- providing assistance to Polish applicants in preparing project applications, and involvement with Horizon Europe's Programme Committees.

NCBR and the European Green Deal

As it designed its financial perspective for 2021-2027, the European Union took measures against climate change and environmental degradation, recognising these as major threats to Europe and the world. As a result, it developed a new strategy to transform the EU into a modern, resource-efficient, and competitive economy
- which by 2050 will have achieved zero net greenhouse gas emissions,
- which will separate economic growth from resource consumption,
- where no individual or region is left behind.

The European Green Deal is a plan of action for a sustainable EU economy. This can be achieved by transforming climate and environmental challenges into new opportunities across all policy areas, and by making sure that this transformation is fair and socially

inclusive. In its operations, NCBR has responded to today's challenges, initiating a number of projects that embrace the philosophy behind the European Green Deal. In order to make the implementation of these solutions possible and successful, NCBR is announcing projects and starts processing grants on a Pre-Commercial Procurement (PCP) basis. With PCP, economic operators can propose specific solutions, which are often innovative, to meet the requirements defined for the project. Research is conducted simultaneously by several entities working for the Contracting Authority, i.e. NCBR. PCP-based programmes usually have several stages followed by outcome selection and a reduction in the number of contractors.

2. National STI Programmes and Initiatives

NCBR programme opportunities

Programme Title	Contents
Competitions under the Operational Programme Smart Growth "Fast Track"	**Description:** Type of collaboration: Required consortium with a Polish company. Possibility of providing subcontracting services for a business under the project. **Financing institution:** National Centre for Research and Development **Opening/closing dates:** Round 1 from 22 March to no later than 12 April 2021 - only large companies and their consortiums (also including SMEs and research units), Round 2 from 13 April to no later than 4 May 2021 – only SMEs and their consortiums (also including research units). **Thematic area:** no thematic area, project topic must be registered with KIS (NSS). **Competition budget:** Round 1 – PLN 100,000,000 Round 2 – PLN 200,000,000

European Green Deal competitions

Sewage Treatment Facility of the Future	**Description:** Type of collaboration: Required consortium with a Polish company. **Financing institution:** National Centre for Research and Development **Opening/closing dates:** From 23 December 2020 to 12 March 2021 **Thematic area:** The main goal of this project is to develop and present innovative sewage treatment technologies to implement a zero waste strategy. **Competition budget:** PLN 27,000,000

Innovative Biogas Plant	**Description:** Type of collaboration: Required consortium with a Polish company. **Financing institution:** National Centre for Research and Development **Opening/closing dates:** From 23 December 2020 to 19 March 2021 **Thematic area:** The main goal of "Innovative Biogas Plant" is to develop and present an innovative universal biogas plant technology characterised by efficient processing of a diverse stream of organic substrates into biogas, and then cleaned and upgraded into bio-methane. **Competition budget:** PLN 32,500,000
Energy- and Process-Efficient Buildings	**Description:** Type of collaboration: Required consortium with a Polish company. **Financing institution:** National Centre for Research and Development **Opening/closing dates:** From 23 December 2020 to 19 March 2021 **Thematic area:** The main goal of "Energy- and Process-Efficient Buildings" is to develop modular and prefabricated technologies, and climate-neutral technologies, for single- and multi-family housing. **Competition budget:** PLN 37,500,000

Programmes planned for 2021 within the European Green Deal. These programmes will be implemented according to their thematic scope:

- Heat and cold storage (extension of a system based on the development of green methods for heat and cold storage, characterised by low costs of use)
- Electricity storage (extension of power systems for storing electricity)
- School and house ventilation (improving comfort in schools and houses, while reducing the costs of construction and limiting energy consumption)
- House water retention technologies (efficient water management in buildings and improving local water retention)
- CHP plant of the future (extension of the energy system largely based on distributed sources of renewable energy supplied at very low marginal costs but irregularly)
- Heating plant of the future, or RES-based heating system (developing an energy-efficient, affordable, and easy-to-install technology to reduce energy consumption, energy poverty, and smog)

For detailed information on how each programme is progressing, please visit our website (gov.pl/NCBR, gov.pl/innowacje).
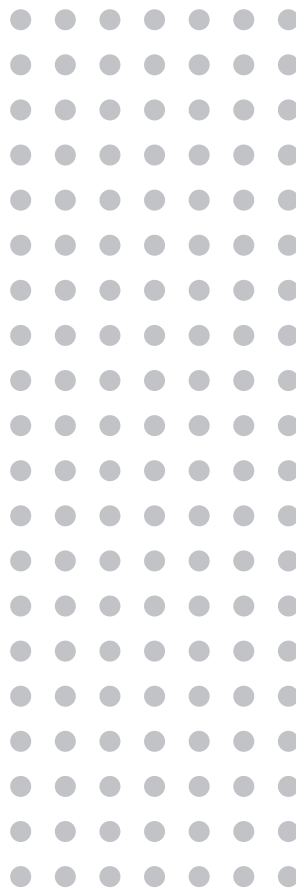
3. Joint Activities with Korea

N/A

4. Science, Technology and Innovation Cooperation Partners

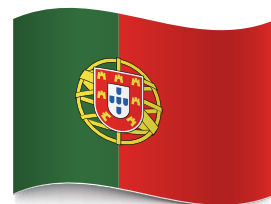| Organisation Name	Detailed Information
War Studies University	- Organisation type: University - Major Research Area : Security & Defence - Major Activities with Korea: bilateral agreement on co-operation with Korea National Defense University - Future Plans: N/A - Contact Information: Mr Jerzy Pietras, Tel. (+48) 22 681 36 51, j.pietras@akademia.mil.pl
Samsung R&D Institute, Poland	- Organisation type: Research Unit - Major Research Areas: digital television, platform convergence, mobile systems, smart solutions and enterprise solutions - Major Activities with Korea: self-evident - Future Plans: N/A - Contact Information: Tel: (+48) 22 377 80 01; office.rd@samsung.com
University of Wrocław	- Organisation type: University - Major Research Area: various - Major Activities with Korea: bilateral agreement on student exchanges with Yeungnam University, Pusan National University and Hankuk University of Foreign Studies - Future Plans: N/A - Contact Information: Ms. Joanna Skotnicka, e-mail: joanna.skotnicka@uwr.edu.pl; Tel. +48 71 375 27 03
Jagiellonian University, Cracow	- Organisation type: University - Major Research Area: various - Major Activities with Korea: bilateral agreement on student exchanges with Keimyung University - Future Plans: N/A - Contact Information: Ms. Adriana Hołub-Palonka, adriana.holub-palonka@uj.edu.pl, Tel. +48 12 663 30 15
Poznań University of Economics and Business	- Organisation type: University - Major Research Area: business and economics - Major Activities with Korea: student exchange with Chonnam National University - Future Plans: N/A - Contact Information: Ms Kyeongseon Kim, Coordinator for European Region Student Exchange, Chonnam National University, e-mail: kyeongy@jnu.ac.kr

Science, Technology
and Innovation
of the European Countries

22 PORTUGAL

PORTUGAL

Country Outline

- GDP: 242,340 million euros (Eurostat 2022)
- GDP Per capita: 19,310 euros (Eurostat 2022)

Contact Information

- Organisation: Embassy of Portugal - Trade Section
- Name / Position: Ms Joana BARROS / Economic and Commercial Counsellor
- Phone no. / e-mail: (+82) 02 766-7960/1 / joana.barros@portugalglobal.pt

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FCT – Foundation for Science and Technology is the Funding Agency for Science and Research in Portugal. FCT supports the scientific community in Portugal through a range of funding schemes, tailored for individual scientists, research teams or R&D centres. Through its funding schemes, FCT supports graduate education, research and development, establishment and access to research infrastructures, networking and international collaborations, conferences and meetings, science communication and interactions with industry. Scientists from all nationalities, and in any research area, may apply to FCT for funding.

1. Policies and Strategies in Science, Technology and Innovation

Estratégia Portugal 2030 (Portugal Strategy 2030) approved by the Resolution of the Council of Ministers no. 28/2020, of 13th November and which served as base for the Portuguese Recovery and Resilience Plan, established as a goal economic recovery and job promotion during the next decade, as well as promoting convergence with EU. To attain this goal, it established four thematic agendas for the next ten years, with correspondent Strategic Goals (SG). Agenda (2) Digitalization, Innovation and Qualification as Major Driver for Development aims to reinforce qualification and competitiveness, harnessing the industrial tissue structural transformation, while addressing the technological challenges associated with digital transition, operationalized through the SG(1) Portugal + Competitive.

The national technology and scientific ecosystem has evolved considerably, not only through diversification but also through promotion of scientific career, on one hand, and increased integration in existing networks for knowledge and science and reinforcing the connection between the R&D institutions, Collaborative Laboratories, public administration and companies, on the other.

The Strategy 2030 will continue the afore mentioned measures, and established new goals until 2030: increase the R&D expense to 3% of GDP; create 25.000 R&D jobs in companies, double the number of technology companies, increase in 25% the number of national patents and increase the ration of high tech exports in our total exports by 9%.

The underlying goal, through this new strategy, is to transfer and apply the results from R&D into the economy/market, while also supporting companies with reduced internal R&D infrastructure (in particular, SMEs) and promoting qualified entrepreneurship in emergent and R&D intensive sectors.

2. National STI Programmes and Initiatives

FCT – Foundation for Science and Technology is the Funding Agency for Science and Research in Portugal. FCT supports the scientific community in Portugal through a range of funding schemes, tailored for individual scientists, research teams or R&D centres. Through its funding schemes, FCT supports graduate education, research and development, establishment and access to research infrastructures, networking and international collaborations, conferences and meetings, science communication and interactions with industry. Scientists from all nationalities, and in any research area, may apply to FCT for funding.

The current Portuguese Roadmap of Research Infrastructures of Strategic Relevance (RNIE in Portuguese) first published by the Foundation for Science and Technology (FCT) to cover the period 2014-2020, is under revision.

It includes a total of 56 RIs in six thematic domains: Energy (4 RIs), Environment (7RIs), Health and Food (20 RIs), Physical Sciences and Engineering (14 RIs), Social and Cultural Innovation (7 RIs) and Digital infrastructures (4 RIs).

Regarding the cooperation between economy/industry and the R&D institutions, the Recovery and Resilience Plan (2021-2026), approved by the European Union, operationalizes the Strategy 2030 and offers further insight on the sectors and respective allocated public budget, as follows:

International Cooperation Programmes/Initiatives

Programme Title	Contents
Programme 1- Investment RE-C05-i01.01: Business Innovation mobilisation Agendas/Alliances (€558m)/ MEASURE C5: Capitalisation and Business Innovation: (https://recuperarportugal.gov.pt/?lang=en; https://www.fct.pt)	Proposals may be promoted by companies, R&D institutions and non-business entities in the research and innovation system, municipal bodies and institutes of higher education. Thematic areas supported: ■ Information and Communication Technologies; ■ Raw Materials and Materials; ■ Manufacturing industries and technologies; ■ Automotive, Aeronautics and Space; ■ Transport, Mobility and Logistics; ■ Health; ■ Tourism; ■ Cultural, Creative and Audio-visual Industries.
Programme 2- i01.02: Business Innovation Green Agendas/Green Alliances (€372 million)/ MEASURE C5: Capitalisation and Business Innovation (https://recuperarportugal.gov.pt/?lang=en; https://www.fct.pt)	Proposals may be promoted by companies, R&D institutions and non-business entities in the research and innovation system, municipal bodies and institutes of higher education. Thematic areas supported: ■ Energy; ■ Agro-food; ■ Forestry; ■ Economy of the Sea; ■ Water and Environment.
Programme 3- i01: Blue Hub, Infrastructure Network for the Blue Economy (87 M€)/ MEASURE C10 – Sea (https://recuperarportugal.gov.pt/?lang=en; https://www.fct.pt)	it will also promote an innovative concept of Blue Hub School. There will be areas reserved for companies, their technological development and their specific intellectual property, but also areas for interaction between companies, between companies and science and knowledge centres, between companies, universities and training centers.
Programme 4 i01: Bio-economy (€145m)/MEASURE C10 – Sea (https://recuperarportugal.gov.pt/?lang=en; https://www.fct.pt)	incorporation of bio-based materials (as an alternative to fossil-based materials) in three sectors of national economic activity. Part of it will be done through around 17 lines of research, development and innovation. Sectors envisaged: textile and clothing, footware and resine.

Other programs (measure 5, PRR):

1) i02: Interface Mission – renewal of the scientific and technological support network and direction towards the manufacturing sector (€186m)

2) i03: Research and innovation agenda for the sustainability of agriculture, food and agro-industry (Agriculture Innovation Agenda 20|30) (€93m)

3. Joint Activities with Korea

Not applicable.

4. Science, Technology and Innovation Cooperation Partners

| Organisation Name	Detailed Information
CEiiA - Centre of Engineering and Product Development (ceiia.com)	Centre of Engineering and Product Development that designs, develops and operates innovative products in the mobility industries, namely Automotive and Urban Mobility, Aeronautics, Ocean and Space. CEiiA is one of the 10 largest R&D investors in Portugal and an international reference in the sustainable mobility area and recognized in the aeronautical world for their skills in structural engineer.
CeNTI – Centre for Nanotechnology and Smart Materials https://www.centi.pt/en	CeNTI – Centre for Nanotechnology and Smart Materials is a private non-profit R&D which results from the cooperation of 3 Universities, 2 Technological Centres and 1 Institute of New Technologies: University of Minho, University of Porto, University of Aveiro, CITEVE – Technological Centre of the Textile and Clothing Industries of Portugal, CTIC – Technological Centre of Leather Industries, and CEIIA – Centre for Excellence and Innovation in the Automotive Industry. CeNTI explores advanced technologies enabling the developing, testing, prototyping and scaling-up of nanotechnology solutions for the market, surface functionalization and *smartization* of materials using printed electronic technologies.
INEGI Instituo de Ciência e Inovação em Engenharia https://www.inegi.pt/en	INEGI – Institute of Science and Innovation in Mechanical and Industrial Engineering is a Research and Technology Organisation (RTO), founded in 1986, focused on research and technology-based innovation activities, technology transfer, consulting and technological services. INEGI integrates and leads LAETA - Associated Laboratory for Energy, Transports and Aerospace, a unit of national dimension, which also includes the Institute of Mechanical Engineering - Instituto Superior Técnico (IDMEC - IST), of the Association for the Development of Aerodynamics Industrial (ADAI) of the University of Coimbra and the Aeronautics and Astronautics Research Group of the University of Beira Interior (AeroG).

INESC-TEC Instituto de Engenharia de Sistemas e Computadores https://www.inesctec.pt/pt	INESC TEC is a private non-profit research association, Present in 6 sites in the cities of Porto, Braga and Vila Real, INESC TEC incorporates 13 R&D Centres, structured in four thematic domains - Computer Science, Industrial and Systems Engineering, Networked Intelligent Systems, and Power and Energy.
Instituto Superior Técnico (Lisboa) https://tecnico.ulisboa.pt/en	University devoted to the fields of Architecture, Engineering, Science and Technology. Técnico offers Bachelor, Master and PhD programmes, lifelong training and develops Research, Development and Innovation (RD&I) activities.
TMOB-HUB – Transportation and Mobility Research Hub http://www.tmob-hub.pt	The Transportation and Mobility Research Hub (TMob-Hub), associates the competences of individual researchers, R&D units and interface institutes of the School of Engineering of University of Minho. The TMob-Hub covers the five main transportation modes, including Railways, Metro, Roadways, Airways and Maritime and Inland Waterways, as well as their interaction. It also strongly cooperates with the main national transportation actors and multiple international partners.
Universidade da Beira Interior https://www.ubi.pt/en/page/office_for_innovation_and_development	UBI hosts five faculties – Arts and Letters, Sciences, Health Sciences, Social and Human Sciences, Engineering. It is associated with Parkurbis - Science & Technology Park of Covilhã (10th best incubator of enterprises in Europe) aims to foster for the development of new technology-based activities, by ensuring a dynamic interconnection between the University of Beira Interior (UBI) and the companies.
Universidade de Aveiro https://www.ua.pt/en	The UA is therefore made up of organisational units within the university sub-system (16 departments) and the polytechnic sub-system (four schools). At the University of Aveiro, there are 20 Research Units, five of them with Associate Laboratory status, covering most of knowledge areas. Aveiro is considered a digital cluster and a territory of innovation and over the past 3 years, through Aveiro Tech City initiative.
Universidade de Braga https://www.uminho.pt/EN/uminho/University-Bodies/Unidades-Organicas-Ensino-Investigacao/Pages/Escola-de-Engenharia.aspx	The School of Engineering focus its activities on the traditional areas of Engineering, as well as on emerging and unique areas with a strong research component.

Universidade de Coimbra https://www.uc.pt/ucbusiness	UC Business is the Technology Transfer Division (TTO) of the University of Coimbra responsible for joint projects with different business structures (start-ups, spin-offs, SMEs, large companies and associations), framed in the multiple areas of knowledge of the University of Coimbra.
Universidade do Porto https://www.up.pt/portal/en/feud	FEUP is one of the most prestigious Portuguese teaching and research institutions in engineering and related areas. Its reputation is justified by the wide range of high-quality training offered at various levels of education. The Faculty's modern complex – which opened in 2000 on Campus 2 (Asprela) – is an incubator of innovation and knowledge, fostered by the work carried out in the research centres based there, in close contact with the business world and community.
CBQF (Centro de Biotecnologia e Química Fina – Centre of Biotechnology and Fine Chemistry) https://www.cbqf.esb.ucp.pt/en/cbqf	The CBQF (Centro de Biotecnologia e Química Fina – Centre of Biotechnology and Fine Chemistry) is a Research Centre created in 1992 within the Faculty of Biotechnology of the Catholic University of Portugal (ESB). It is interested in collaborating with Korea in the agrifood sector.
University of Evora https://www.uevora.pt/en	University of Evora is one of the oldest Universities in Portugal (established in 1559) and one of the most innovative, with 108 patent applications (40 internationals, 68 nationals), 15+ Spin-offs and close collaboration with the Alentejo Science and Technology Park (named PACT). It is currently the leader of the cross-border Project led by University of Evora, named University Innovation Center - Andalucía, Alentejo and Algarve (CIU3A), and which includes one University of Spain and two Portuguese. CiU3A is an innovation centre involving the universities of Evora, the Algarve and Seville, specializing in Industry 4.0, Logistics, Materials and Sustainability.
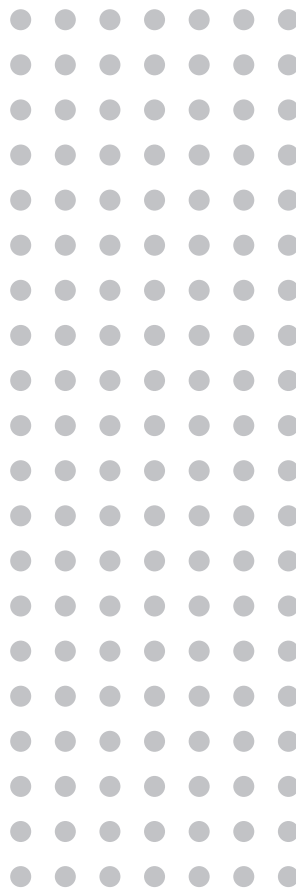
23 ROMANIA

ROMANIA

Country Outline

- GDP: 284,173 million euros (Eurostat 2022)
- GDP Per capita: 10,040 euros (Eurostat 2022)
- Areas of marked S&T specialisations: Energy, Environment and Climate change, Advanced Materials

Contact Information

- Organisation: Embassy of Romania
- Name / Position: Mr Cătălin PETRU / Minister Counsellor
- Phone no. / e-mail: (+82) 7974924 / Seoul.economic@mae.ro

The quality of research facilities is high in Romania. Romania has now top-level research infrastructure and is considered more than competitive by the highest Western standards. This could support the implementation of successful and complex Horizon Europe projects. There is an excellent available infrastructure, not only in universities, but also at national level. Romania is hosting a European research infrastructure with global impact – the ELI Extreme Light Infrastructure and other 10 research facilities of European interest in engineering, energy, socio-economic sciences, physics, environmental, marine and Earth sciences, material sciences, chemistry and nanotechnologies, as well as life sciences.

1. Policies and Strategies in Science, Technology and Innovation

In 2022, Romania adopted the National Strategy for Research, Innovation and Smart Specialization 2022-2027 (SNCISI). The strategy expresses the firm option to acknowledge and support excellence, reward achievements, stimulate the development of collaboration between the public and private sectors, address economic and societal challenges, to make science, innovation and entrepreneurship successful models for the sustainable development of Romania amid a local, national and international context.

The National Strategy for Research, Innovation and Smart Specialization is structured around four general objectives:

- ➢ Development of the research, development and innovation system
  - Research, including basic research, is the foundation for developing innovation and/or ensuring technology transfer.

- Centers of excellence, established through partnerships of research organizations, ensure the concentration of resources (facilities, people) around research agendas at the scientific frontier, connected to societal challenges or smart specializations.
- Benefiting from predictable funding awarded based on achievements/excellence and competitions for high-performing projects, leadership and management, research institutes and universities become relevant to researchers.

➢ Supporting innovation ecosystems associated with smart specializations

- Smart specialization priorities at national level are synergistic to the smart specializations in the regions. National Smart Specializations support the development of emerging technologies with a cross-cutting impact on local industries and especially regional smart specialization sectors. The transformational element at national level is the investment in large collaborative projects between research organizations and the private sector, such as innovation and technology centers.

➢ Mobilization towards innovation

- Public investment in R&D will support driving innovation in the private sector through a wide range of public-private partnerships, talent attraction and training, cross-sectoral mobility, developing the technology transfer capacity of public research organizations and engaging businesses in addressing societal challenges.
- Businesses regard public research organizations as determined partners for the development of new products and services, thus innovation entrepreneurship becoming an attractive option. Through the achieved results, enterprises, regardless of size, contribute to the intelligent and sustainable economic transformation of Romania.

➢ Increasing European and international collaboration

- Romania actively participates in addressing global challenges through research, aligning itself with European missions and partnerships where it has the potential to contribute with innovative solutions. The national research and innovation system is integrated into the European Research Area, being open to international collaboration. Romania's participation in European programs is at least equal to the weight of its researchers, and the contribution in international cooperation is in close correlation with its strategic agenda.

SNCSI is implemented by the Ministry of Research, Innovation and Digitalization through the National Plan for Research, Development and Innovation (PNCDI) which includes 10 specific programs as financing instruments for RDI projects.

For 2022-2030 the PNCDI budget is up to 60 billion Lei and is provided from amounts from the state budget, external non-refundable funds and contributions from project partners.

2. National STI Programmes and Initiatives

International Cooperation Programmes/Initiatives

Programme Title	Contents
Extreme Light Infrastructure – Nuclear Physics (ELI-NP) (http://www.eli-np.ro)	■ ELI-NP hosts a new European laboratory to consistently investigate a very broad range of science domains, from new fields of fundamental physics, new nuclear physics and astrophysics topics, to applications in material science, life sciences and nuclear materials management. ■ The project is co-financed by the European Regional Development Fund. ELI-NP is one of the three pillars of ELI - THE EXTREME LIGHT INFRASTRUCTURE, along with the facilities dedicated to the study of secondary sources (Dolni Brezany, near Prague) and to second pulses (Szeged).
DANUBIUS – International Centre for Advanced Studies for River-Delta-Sea Systems (http://www.danube-delta-blacksea.eu/index.html)	■ It is coordinated by the National Institute of Research and Development for Biological Sciences (www.dbioro.eu) and the National Research and Development Institute for Marine Geology and Geoecology (www.geoecomar.ro). This is a Romanian initiative for a Pan European R&D infrastructure in the field of integrated management of rivers-deltas-seas focused on the Danube-Black Sea macro system with a hub in Danube Delta, at Murighiol, Tulcea County, with nodes as leading facilities and research centers dealing with processes, research methodologies and offering access to other parts to the Danube – Black Sea macro system. ■ The mission of Danubius is to provide science-based innovative solutions for major actual environmental-related problems and set the framework for sustainable development of Danube – Danube Delta – Black Sea system, as best practice for large river – delta – sea systems worldwide. ■ In 2013 DANUBIUS was unanimously elected as a flagship Project within the European Union Strategy on the Danube Region Priority Axis 7 (SUERD).
Engage in the Romanian Research Infrastructure System (www.erris.gov.ro)	■ ERRIS (Engage in the Romanian Research Infrastructure System) is a platform developed and hosted by the Executive Agency for Higher Education, Research, Development and Innovation Funding (UEFISCDI), within the framework of the "Improving the efficiency of the electronic data monitoring of R&D activities" European funded project. ■ ERRIS is the first Romanian online platform which connects the research infrastructure owners with potential clients (researchers and company representatives).

| Cluj Innovation City (http://www. clujinnovationcity.com)	■ Cluj Innovation City is the major project for our community and the region. Cluj Innovation City is bringing together t local authorities, the universities and the business community to foster the development of the city, region and country. Cluj Innovation City represents a collaboration ecosystem and synchronized urban development project based on education, innovation and entrepreneurship, with the main goal to create a sustainable community in years to come. ■ Cluj-Napoca has built a solid reputation in recent years as the most important development center in Romania, second only to Bucharest. Cluj is already the national 'number one' in IT services exports. The local municipality offers diverse assets, including the leading university and academic establishment within the country, a leading medical community and Romania's foremost IT industry. These assets have turned Cluj-Napoca into a strong regional economic development pole. ■ Based on the local assets, the close collaboration with the leading universities, and the rich entrepreneurship environment, Cluj Innovation City is becoming a significant Eastern European Innovation Hub. Start-ups can rely on local highly skilled human capital. Companies can also develop more competitive advantages by collaborating with applied research centers owned by universities. The current academic environment is already becoming more industry-oriented. Current discoveries by local scientists in artificial blood and brain research confirm their international competitiveness and pedigree, and will furthermore contribute to the EU competitiveness with results in medical and agricultural field.

3. Joint Activities with Korea

Joint activities are currently being undertaken at university level, researchers are free to engage in research activities in the preferred fields independent of the central government or subordinated structures. Such actions take place especially in the fields of bio-technology, waste management, energy, involving exchanges of experts between Romania and Korea.

Also, there is a direct cooperation with Korean researchers within the EUREKA Initiative. Thus between 2015-2023, through the National Plan of Research, Development and Innovation, Romania allocated from the State budget, grants for 4 joint EUREKA projects.
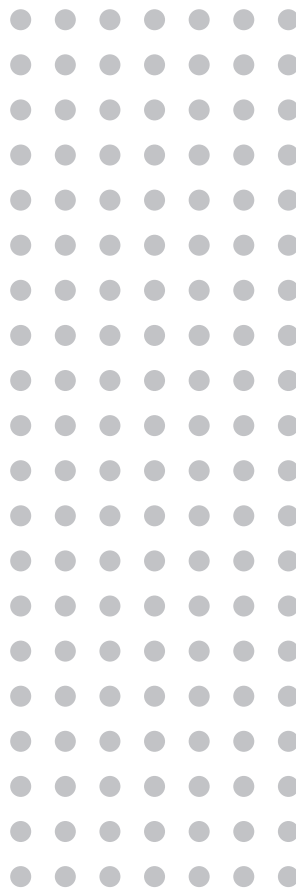
4. Science, Technology and Innovation Cooperation Partners

Organisation Name	Detailed Information
Ministry of Research, Innovation and Digitalization (MCID) (http://www.mcid.gov.ro)	▪ The RDI policies are implemented by the Romanian Government through the MCID ▪ Contact Information: Phone no. +40-21-319.23.26 / e-mail: viorel.vulturescu@mcid.gov.ro
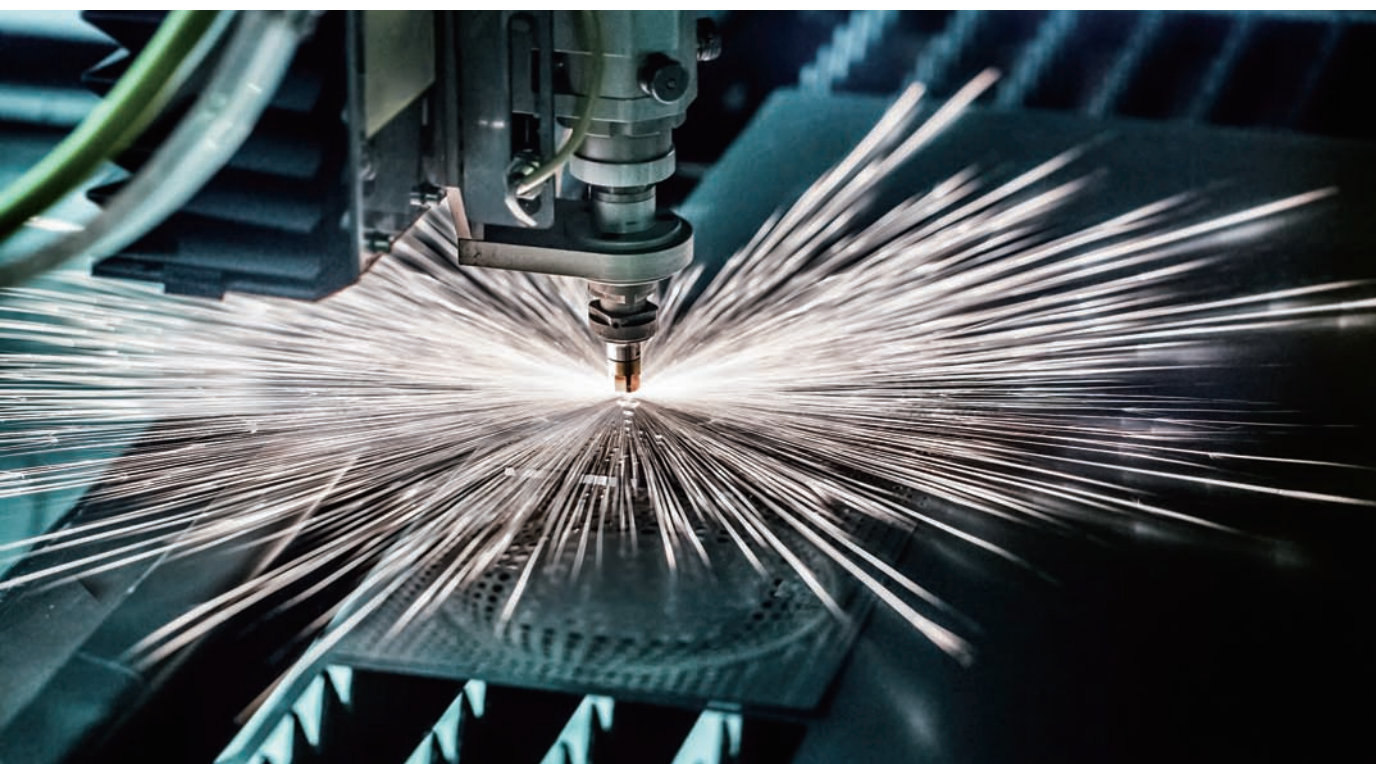
24 SLOVAKIA

SLOVAKIA

Country Outline

- GDP: 109,645 million euros (Eurostat 2022)
- GDP Per capita: 16,340 euros (Eurostat 2022)
- Areas of marked S&T specialisations: Materials and nanotechnology, Biomedicine and Biotechnology, Environment and agriculture, Sustainable energy

Contact Information

- Organisation: Embassy of the Slovak republic
- Name / Position: Mr. Michal Bordean / Head of Economic and Commercial Affairs
- Phone no. / e-mail: (+82) 2-794-3981 / michal.bordean@mzv.sk

While Slovakia has become for RoK in the past decade a country with one of the most intensive foreign investments in the whole Europe, as well as top 4th export destination in EU, cooperation in S&T has only started recently. So far, the cooperation between Korea and Slovakia in the field of S&T has been developing mainly through various mobility programmes, minor individual projects and multilateral research platforms. Based on the Agreement on S&T cooperation between the governments of both countries that entered into force in 2014, the first Joint Committee took place in October 2016. Launching of the Joint Committee has created new windows of opportunity for Korean and Slovak researchers, students and science related capacities to participate in diverse and appealing S&T projects in years to come. Moreover, during the summit of V4+RoK in December 2015, two new MoUs were signed to boost S&T cooperation. One is related to platform V4 and RoK and the other MoU was signed between the Slovak Academy of Science and Korean Institute of Material Science. In 2018 another two MoUs were signed: (i) Slovak Academy of Science and National Research Foundation of Korean; (ii) Slovak Innovation and Energy Agency and Korea Institute of Energy Technology Evaluation and Planning; to foster the cooperation. 2021 is expected to be a year the second round of the Joint Committee will take place.

As for many developed economies, science and innovation has become one of the focal points of Slovakia for sustainable economic development, employment and future growth. However some challenges still remain, such as the gap in R&D expenditure compared to the rest of EU (1% of GDP), as well as an issue to get more private companies involved in the research and innovation process. The aim is to increase private funds in R&D and achieve ratio at least 2:1 between private and public funds, while the total expenditure in R&D is planned to double in the near future.

1. Policies and Strategies in Science, Technology and Innovation

The main science and innovation objectives of the Slovak Republic are defined in **"Research and Innovation Strategy for Smart Specialisation (RIS3)"**, which was approved by the Slovak Government on 13 November 2013 and respectively in its Implementation plan. It has identified seven thematic areas of scientific research as follows:

In the area of research and development priorities:

1. **Material Sciences and Nanotechnology** (e.g., lightweight structural materials and composites, organic materials, steel and special materials, etc.)
2. **Information and Communication Technologies** (e.g., technological process management systems, processing of large databases, cloud solutions, etc.)
3. **Biomedicine and Biotechnology** (e.g., diagnostics and therapeutic approaches for cancer, heart disease, blood vessels and brain, pharmacological and industrial biotechnologies, etc.)

In the field of technology priorities:

4. **Industrial Technologies** (e.g., automation control, robotics, technology for cutting and forming, logistic technologies, processing of polymers, wood, etc.)
5. **Sustainable Power Engineering and Energy** (e.g., reduction of energy intensity, emission reduction program ALEGRO, smart grid technology, safety of nuclear plants, etc.)
6. **Agriculture and Environment** (focus on advanced technologies and practices in agriculture and food production, better utilisation of the forests, etc.)

In the field of social priorities:

7. **Selected areas of social sciences** (e.g., The ageing population and quality of life, Multiethnicity, social inclusion and poverty problems, Employment of young people in the changing conditions, etc.)

The key authority for the implementation of RIS3 is the Government Council for Science, Technology and Innovation with two independent agencies appointed for implementation: Research Agency and Technological Agency.

The main tools of funding of research and development under current legislation Slovak Research and Development Agency (SRDA) – the main agency for distribution of public finances for research and development on the competitive basis in Slovakia. SRDA is responsible for research and development promotion in all research fields, including international research cooperation. In the 2021-2027 period there are planned expenditure on operations and programmes of SRDA in total sum of EUR 300 million, which is supposed to be increased in the later part of the period. (http://www.apvv.sk).

Incentives for research and development are provided to entrepreneurs. In the 2015-2020 period the total amount of R & D incentives provided from the National budget was 51 million EUR. Solely in 2019 funds allocated to the business sector (including funds from the European

Structural Funds) ammounted to 0,45% of GDP and are expected to slowly grow in upcoming years. It is an essential tool for promoting and stimulation of R&D in business sector.

Grants under the of Ministry of Education, Science, Research and Sport of the Slovak Republic to legal persons and individuals and Grants for scientific and technical services in the following period have planned budget of 10 million EUR from the National budget.

Businesses also have the opportunity to apply for funds provided by the Research and development agency or the Research Agency based on currently open calls ammounting to 30 mil. EUR, or 250 mil. EUR respectively.

The main executive and self-governing scientific institution in Slovakia is Slovak Academy of Sciences which comprises of 23 research institutes and 69 organisations. (www.sav.sk)

As an example of excellent R&D work can serve R&D projects with worldwide potential like:
- *Tachyum* with development centers in Bratislava and Santa Clara (USA) develops a high-performance, universal processor chip for data processing, artificial intelligence (AI) and supercomputers (HPC);
- *MultiplexDX*, which develops highly accurate diagnostic tests for effective and personalized treatment of breast cancer and has launched the first Slovak PCR test for COVID-19;
- *Sensoneo*, which develops an intelligent solution for waste management (combining advanced sensors with cloud software and transport management) for cities and transport companies;
- *AeroMobil*, a flying car

2. National STI Programmes and Initiatives

Most of the scientific programmes and international S&T cooperation projects that Slovakia offers or takes part in are co-financed by EU funds, therefore the details and application can be found on official web pages of European Commission or through the major R&I programme of EU - Horizon 2020. Among the programmes that can be chosen are e.g., EURECA, EIT, COST, EUROSTARS, etc.

On the level of national programmes there are regularly mobility initiatives available, such as SASPRO (http://www.saspro.sav.sk). Please check more for current mobility initiatives at www.sav.sk.

3. Joint Activities with Korea

The main joint activity between RoK and SR for 2021 is the second round of the Joint Committee for S&T cooperation. Apart from joint research projects mentioned below, other activities include mainly individual scholarships/mobility initiatives/exchange programmes.

| Programme Title	Contents
Intergovernmental Joint committee meeting	■ Activity: Joint Committee meeting (2nd round) based on a bilateral Agreement on Scientific and Technological Cooperation between the Government of Republic of Korea and the Slovak Republic ■ Major topic or agenda: Joint call for mobility projects and research and development projects ■ Target Participants: Government officials and selected universities and research institutes ■ Relevant Information: Cooperation in the field of S&T, promotion of mobility of experts and scientists

4. Science, Technology and Innovation Cooperation Partners

Organisation Name	Detailed Information
University of Zilina www.uniza.sk	■ Organization type: University ■ Major Research Area/Product: Transportation, construction, new materials, mechanical engineering, smart buildings, renewable energy sources ■ Contact Information: http://vyskumnecentrum.sk/kontakty ■ Others: Cooperation with Yeungjin College (Daegu), Korea University (Seoul), Keimyung College University (Daegu)
Slovak Technical University Bratislava www.stuba.sk	■ Organisation type: University ■ Major Research Area/Product: Architecture, civil engineering, geodesy, cartography, chemical technologies, food processing, machinery, electrical engineering, electronics, informatics, ICT, applied physics, mathematics, economics and social science ■ Contact Information: public@stuba.sk ■ Cooperation with Seoul National University and Sun Moon University (Asan)
Technical University of Kosice www.tuke.sk	■ Organisation type: University ■ Major Research Area/Product: Mining, ecology, metallurgy, geotechnology, mechanical, electrical and civil engineering, economics, ICT, aeronautics ■ Major Activities with Korea: Cooperation with Yeungjin College (Daegu) and Sun Moon University (Asan) - MoU ■ Contact Information: Science, Research and Doctoral Study (tuke.sk) ■ Others: Preparation of exchange of students in the field of electrical and mechanical engineering

SAV Slovak Academy of Science (SAS) www.sav.sk	■ Organisation type: National Science Institute ■ Major Research Area/Product: 23 research institutes http://www.sav.sk/?lang=en&doc=activity-offers-results-products ■ Major Activities with Korea: Various partnership programmes, such as: • ALICE experiment at the CERN LHC: A study of strong interacting matter properties at high energy densities • K2 Mobility - Sustainable Vehicle Technology ■ JRP Program V4 (SAS) – Korea ■ The Korea Institute of Materials Science (KIMS) and Slovak Academy of Science (SAS) MoU, National Research Foundation of Korea (NRF) and Slovak Academy of Science (SAS) MoU ■ Contact Information: SAS - Office of Slovak Academy of Sciences (sav.sk)
Ministry of Education, Science, Research and Sport of the Slovak Republic www.minedu.sk	■ Organisation type: Ministry ■ Major Research Area/Product: The main ministry overlooking implementation of major policies and programmes in S&T ■ Major Activities with Korea: MoU between Ministry Education, Science, Research and Sport of the Slovak Republic and Ministry of Education of the Republic of Korea ■ Others- National Scholarship Programme ■ Contact Information: sekretariat.svt@minedu.sk
Ministry of Economy of the Slovak Republic www.mhsr.sk	■ Organisation type: Ministry ■ Major Research Area/Product: The main ministry responsible for strategy for creating and implementing innovations and regional investment aid to: industrial production, technology centre, their combination and business services centre ■ Major Activities with Korea: Knowledge Sharing Programme (KSP) V4 & Korea ■ Contact Information: minister@mhsr.sk, tomas.kakula@mhsr.sk
Slovak Innovation and Energy Agency www.siea.sk	■ Organisation type: Agency ■ Major Research Area/Product: implementing measures supported by EU funds and state resources which are focused on energy demand decrease, introduction of low carbon technologies, competitiveness growth, innovative solutions and smart specialization of economy. ■ Major Activities with Korea: Knowledge Sharing Programme (KSP) V4 & Korea, MoU with Korea Institute of Energy Technology Evaluation and Planning ■ Contact Information: sekretariat@siea.gov.sk, artur.bobovnicky@siea.gov.sk
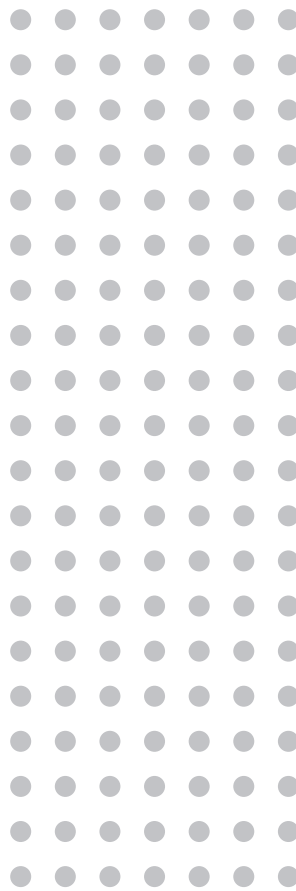
25 SLOVENIA

1. Policies and Strategies in Science, Technology and Innovation

2. National STI Programmes and Initiatives

3. Joint Activities with Korea

4. Science, Technology and Innovation Cooperation Partners

SLOVENIA

Country Outline

- GDP: 57,037 million euros (Eurostat 2022)
- GDP Per capita: 21,860 euros (Eurostat 2022)
- Areas of marked S&T specialisations: See Smart Specialization Strategy - S5

Contact Information

- Organisation: Ministry of Higher Education, Science and Innovation
- Name / Position: Ms Tanja Vertelj / Head of Science Division,
  Mr Domen Petelin / Deputy Head of Mission / Embassy of Slovenia
- Phone no. / e-mail: +82 (0)2 7979971 / tanja.vertelj@gov.si, Domen.Petelin@gov.si

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Research and innovation has always had an important place in Slovenia, with a clear recognition that it is key for our social development and equality. Slovenia has a long tradition in science, technology and innovation, which stems from the time it was considered to be the development powerhouse of former Yugoslavia. Slovenia has a very strong R&I base in terms of capacity with above average number of researchers both in EU and OECD terms. The R&I ecosystem covers all fields of research and is in its innovation and technology segments connected to the automotive industry, pharmaceutics, nanomaterials, IT and robotics, and recently artificial intelligence (AI). The strength of the system derives from a relatively highly educated population with tertiary educational attainment at 49.2% in 2021 (above EU and OECD average) and the highest share of population with doctoral or equivalent education (3.8%) among OECD countries (2018 data).

1. Policies and Strategies in Science, Technology and Innovation

Key actors

Policy and executive: The Ministry of Higher Education, Science and Innovation is the primarily responsible policy authority in the field of R&I policy in Slovenia.

Advisory bodies: Development Council of the Republic of Slovenia is the government's expert advisory body for scientific research and innovation. It is composed of ministers, responsible for policy areas directly connected with R&I (science, innovation, economy, finance, development, digitalization, energy, environment, agriculture) and representatives of the key stakeholders in R&I (Academy of Sciences and Arts, Chamber of Commerce, Rectors' Conference, Coordination of Independent Research Institutes (KOsRIS), trade unions, students, researchers, researchers from abroad, strategic R&I partnerships, …).

Research funding: The Slovenian Research and Innovation Agency (ARIS) is the principal Research Funding Organization (RFO). As an independent public funding organisation, it performs tasks relating to the Resolution on the Slovenian Scientific Research and Innovation Strategy 2030 (ReZrIS30) and co-creation of the European Research Area (ERA).

Research performing organizations (RPOs): Slovenia has 4 public universities, 3 private universities, 19 national research organizations and more than 600 R&I industry units. Together they represent the principal landscape of the RPOs in Slovenia.

Centres of excellence: Centres of Excellence (CoE) are defined as high quality multidisciplinary teams of researchers from academia and business. Eight CoE were established and cover a wide variety of scientific fields and societal challenges, among them health (CO BIK), space (CO SPACE), chemistry and biology (CIPKEBIP), low-carbon technologies (CO NOT), biotechnology (ENFIST), polymers and pharmaceutics (POLIMAT). With support from Horizon 2020, The InnoRennew Centre of Excellence was established in 2017 and is dedicated to carrying out cutting-edge scientific research on the use of renewable materials, to innovative and interdisciplinary research on wood and its applications, and to the transfer of knowledge and results to the economy and society. The Centre for the Technologies of Gene and Cell Therapy was approved for support from Horizon Europe in 2022 and represents a Centre of that will set new milestone in the Slovenian healthcare system.

Strategic development and innovation partnerships (SRIPs): SRIPs are an effective instrument for connecting actors in the fields of research, development and innovation, thus contributing to the development and added value of the economy, Currently, Slovenia has 9 running SRIPs in fields of Smart Cities and Communities, Smart Buildings and Home including Wood Chain, Circular Economy, Sustainable Food Production, Sustainable Tourism, Factories of the Future, Health – Medicine, Mobility and Materials as end Products.

Key documents

Resolution on the Slovenian Scientific Research and Innovation Strategy 2030 (ReZrIS30)

ReZrIS30 is **the principal strategic document in the field of R&I** in Slovenia. It sets several ambitious objectives and provides concrete measures to achieve them by 2030. The objectives are outlined within five (5) distinct policy objectives that form the foundations of a modern research and innovation ecosystem:

    (1) Effective governance of the scientific R&I system;
    (2) Enhanced investment in R&I;
    (3) Researchers' career development and excellent science;
    (4) Excellent and internationally competitive Research Infrastructure;
    (5) Accelerated cooperation between science and industry, knowledge transfer and innovation.

A number of horizontal objectives also form a part of the strategic priorities and include (1) Openness and participation in the international space, (2) Open Science to improve research quality, efficiency, and responsiveness, (3) Socially responsible science (ethics and integrity in

research and among researchers), and (4) Ensuring Gender Equality in Research and Innovation. One of the key novelties of the ReZrIS30 is that it sets a very ambitious target in terms of financing R&I in Slovenia with an objective to increase public investment in R&I to 1.25 % of GDP by 2030, with public investment at 1 % of GDP by 2027, and total investment in R&I to reach 3.5 % of GDP by 2030.

[Government funding of science (2020-2024)]
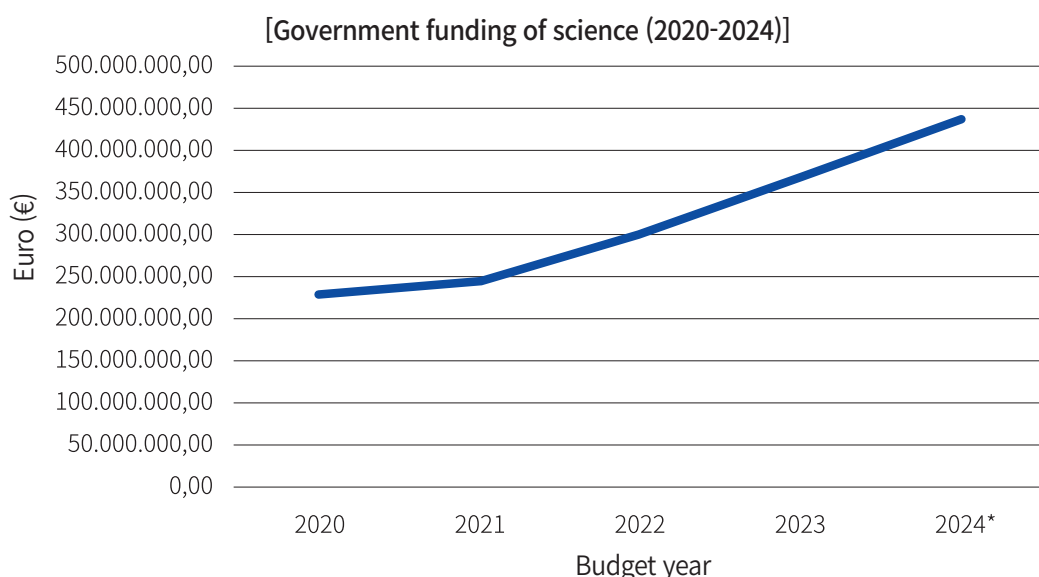
* Estimates for 2023 and 2024 are based on the provisions of the Act on Scientific Research and Innovation and do not yet present the adopted level of funding by the Government.

Act on Scientific Research and Innovation

The act increases the public financial investment by the Government and regulates funding in a way that allows financial stability and autonomous development of scientific research activities and their providers. The new act provides public research organisations with a higher degree of autonomy, including the transfer of state funds managed by public research institutes and the possibility to set up a company in order to transfer knowledge more quickly and efficiently. The law also introduces elements of results-based funding through contractually defined KPIs that influence the European Innovation Scoreboard (EIS), greater incentives to reward researchers, both in terms of financial incentives for international cooperation and cooperation with industry. The act creates the conditions for Slovenia to become an internationally attractive destination for research, with a focus on the return to Slovenia of Slovenian researchers working abroad.

Research Infrastructure Roadmap 2030 (NRRI 2030)

The NRRI 2030 is consistent with the purpose and objectives of ReZrIS30, which identifies a modern, competitive and accessible research infrastructure (RI) as one of the key tools for excellent science and career development. Without RIs, there is no quality research and break-through discoveries, nor the desired development of science in Slovenia.

Strategy for the Internationalisation of Higher Education and Science in the Republic of Slovenia 2030

The purpose of the strategy is to ensure an attractive research environment both in the national and international context. The Internationalisation Strategy for the first time addresses two key areas (science and higher education) of the knowledge triangle together in a single strategic document. The strategy focuses on key aspects of strengthening international cooperation in higher education and scientific research.

Action plan for Open Science

The Action Plan for Open Science is the basic implementation document to support compliance with provisions on Open Science. These are determined in ReZrIS30 and elaborated in more detail in the Scientific Research and Innovation Activities Act and the recently adopted governmental Decree on the Implementation of Scientific Research Work in Accordance with the Principles of Open Science. All these acts stipulate Open Science as an integral aspect of scientific research work.

2. National STI Programmes and Initiatives

International Cooperation Programmes/Initiatives

Programme Title	Contents
Hosting agreements between research organisations and third-country researches (https://www.aris-rs.si/sl/medn/gostovanje/predstavitev.asp)	■ Programme name: Hosting agreements between research organisations and third-country researches ■ Cooperation Type: researchers' mobility ■ Funding Organisation: Slovenian research organizations ■ Call Opening/Closing Date: n/a ■ Participation Qualification: researchers ■ Project Duration: in agreement with the hosting organization ■ Funding Scale and Funding Scheme: in agreement with the hosting organization ■ Research Fields: all research fields ■ Matching fund from Korean government: No ■ Others: A Slovenian research organisation is eligible to conclude an agreement under these Rules if it is registered in the ARIS database of research and development performers. In the notification, the research organisation indicates the title or purpose of the research activity or field of research for which it is hosting the third-country researcher and the start and end dates or the expected duration of the research activity for which the agreement is concluded.

3. Joint Activities with Korea

Activities with the RoK in 2023-2024

Programme Title	Contents
Agreement on scientific and technological cooperation between the Government of the Republic of Slovenia and the Government of the Republic of Korea	■ Joint activities with Korea are undertaken on the basis of the Agreement on scientific and technological cooperation between the Government of the Republic of Slovenia and the Government of the Republic of Korea, signed in Seoul on May 30, 1994. ■ Target Participants: researchers, research performing organisations. ■ Detailed Information: http://www.pisrs.si/Pis.web/pregledPredpisa?id=ZAKO659
Protocol between the Ministry of Education, Science and Research with National Research Foundation of Korea (NRF)	■ On this basis of the agreement the protocol between the Ministry of Education, Science and Research to cooperate with National Research Foundation of Korea (NRF) was signed. Last decision document was approved in July 2013 where both sides agreed to jointly fund the five research projects. Slovenia is interested to launch a common call for the coming period. ■ Objective: build researcher-to-researcher partnerships and develop common research project ideas. ■ Target Participants: researchers, research performing organisations. ■ Detailed Information: last published call http://www.arrs.si/sl/medn/dvostr/drzave/Koreja/rezultati/arhiv.asp

4. Science, Technology and Innovation Cooperation Partners

Organisation Name	Detailed Information
Jožef Stefan Institute – JSI (https://www.ijs.si/ijsw/JSI)	■ Organisation type: **Public research institute** ■ Major research areas/products: JSI is the leading Slovenian scientific research institute, covering a broad spectrum of basic and applied research, specializing in natural sciences, life sciences and engineering, more specifically production and control technologies, communication and computer technologies, knowledge technologies, biotechnologies, new materials, environmental technologies, nanotechnologies, and nuclear engineering. **Products**: Videolectures.net, Reactor Infrastructure Centre (RIC) - TRIGA facility, International Research Centre on Artificial Intelligence (IRCAI) ■ Current cooperation status with Korea: n/a ■ Contact point: info@ijs.si

National Institute of Chemistry – KI (https://www.ki.si/en)	■ Organisation type: **Public research institute** ■ Major research areas/products: The KI is a scientifically excellent, established and breakthrough research institution. They perform cutting-edge research, enriching the global treasury of knowledge by solving the most pressing challenges facing society including: health, sustainable energy, climate change, circular economy and safe food. Research areas include analytical chemistry, polymer chemistry and technology, inorganic chemistry and technology, materials chemistry, molecular biology and nanobiotechnology, synthetic biology and immunology, catalysis and chemical reaction engineering. **Products**: Slovenian NMR Centre, chemical analyses, GMP (service according to Good Manufacturing Practice), biological and biochemical research, chemical technology and engineering and materials for industry partners. ■ Current cooperation status with Korea: n/a ■ Contact point: glavna.pisarna@ki.si
Research Centre of the Slovenian Academy of Sciences and Arts - ZRC SAZU (https://www.zrc-sazu.si/en)	■ Organisation type: **Public research institute** ■ Major research areas/products: ZRC SAZU established itself in the national public space as the leading scientific-research institute, working primarily in the humanities, social sciences, and selected disciplines within the natural sciences. Research areas include anthropological and spatial studies, Slovenian language, geography, archaeology, cultural history, cultural and memory studies, ethnomusicology, philosophy, Slovenian ethnology, karst research, biology, palaeontology, migration, history. **Products**: Karts Research Institute. ■ Current cooperation status with Korea: n/a ■ Contact point: zrc@zrc-sazu.si
Slovenian national building and civil engineering institute – ZAG (https://www.zag.si/en)	■ Organisation type: **Public research institute** ■ Major research areas/products: ZAG is the leading Slovenian institute in the field of building and civil engineering. The organization is widely recognized both in Slovenia and in other countries by means of its experts, top-class equipment and multi-disciplinary work, including life cycle analyses of different construction materials. Research areas include materials, building physics, research of fire-safe sustainable built environment, structures, geotechnics and infrastructure, metrology. Products: Provides access to different research equipment (e.g. Laboratory line for kneading and granulation of polymer composites). ■ Current cooperation status with Korea: n/a ■ Contact point: info@zag.si

University of Ljubljana - UL (https://www.uni-lj.si/ university)	▪ Organisation type: **Public university** ▪ Major research areas/products: UL is the oldest and largest higher education and scientific research institution in Slovenia, founded in 1919. It has approximately 40,000 undergraduate and postgraduate students and approximately 6,000 staff. With its 23 faculties and three arts academies it covers all research fields and areas. It is the central and largest research institution in Slovenia with 30 percent of all registered researchers. ▪ Current cooperation status with Korea: n/a ▪ Contact point: rektorat@uni-lj.si
University of Maribor - UM (https://www.um.si/en/ home-page)	▪ Organisation type: **Public university** ▪ Major research areas/products: UM was established in 1975. With its 17 Faculties, it is the second largest and second oldest university in Slovenia. It has a strong ambition to become a research university. Interdisciplinarity is highly valued, as its faculties cover the natural sciences, mathematics, engineering, medicine, biotechnology, social sciences, humanities, and other sciences. ▪ Current cooperation status with Korea: n/a ▪ Contact point: rektor@um.si
University of Primorska – UP (https://www.upr.si/en)	▪ Organisation type: **Public university** ▪ Major research areas/products: The UP is a medium-sized, internationally engaged university with 5,745 students (19.5% come from 39 countries. The UP has 480 researchers and higher education teachers (12.3% come from abroad). Research areas include intercultural studies, history and heritage, linguistic and literary studies, geography, management, educational sciences, mathematics, computer science and informatics, biodiversity science and informatics, Mediterranean agriculture and the environment, sustainable use of wood, health and prevention, tourism, psychology, political science, sociology, communication, ethics and cultural studies in management, finance and economy. ▪ Current cooperation status with Korea: n/a ▪ Contact point: info@upr.si
University of Nova Gorica – UNG (https://www.ung.si/en)	▪ Organisation type: **Public-private university** ▪ Major research areas/products: UNG is an independent, research oriented and student friendly university, where knowledge is created in a harmonious relationship between students and researchers. Research areas include environmental and life sciences, organic matter physics, materials, quantum optics, astrophysics and cosmology, atmospheric research, information technologies and applied mathematics, wine research, humanities, cognitive science of language. ▪ Current cooperation status with Korea: n/a ▪ Contact point: info@ung.si

26 SPAIN

1. Policies and Strategies in Science, Technology and Innovation

2. National STI Programmes and Initiatives

3. Joint Activities with Korea

SPAIN

Country Outline

- GDP: 1,346,377 million euros (Eurostat 2022)
- GDP Per capita: 24,910 euros (Eurostat 2022)
- Areas of marked S&T specialisations: Bio including Health, Green technology including Energy, Smart city, Mobility, Information and Communication Technologies including Artificial Intelligence and 5/6G, semiconductors, Materials, Smart Manufacturing, Aerospace

Contact Information

- Organisation: Spanish Office for Science and Technology to South Korea
- Name / Position: Dr. Jordi Espluga Bach / Director
- Phone no. / e-mail: +82(0)7041170888 / jordi.espluga@cdti.es

1. Policies and Strategies in Science, Technology and Innovation

The activities in Spain in the scope of Research & Development (R&D) follow the direction of latest Master Plan for Science and Technology, which sets the priorities for the coming years, with the objectives of improving resource efficiency while maximizing outcome and visibility, including the following,

- Bring talent in research
- Enhance industrial leadership, and capacity building
- Increase private investment, and the technology capabilities of the industry
- Answer to societal challenges
- Promote an open R&D model, and more inclusive into society
- Coordination of the R&D policies, at international, national and regional scope

The main funding agencies in charge of the management and funding of the Master Plan are the "Agencia Estatal de Investigación" (AEI) and the "Centro para el Desarrollo Tecnológico y la Innovación" (CDTI), both under the Ministry of Science and Innovation. The main actions of the Ministry are found around these four pillars,

1. Personnel, talent promotion and employment: Human resources, Mobility, Incorporate talent in research
2. Enhance the research and technology system: Knowledge, Infrastructures and equipment, Encourage participation of research institutes
3. Industrial Leadership: Foster Industrial research & Experimental development, Promotion of horizontal technologies, Industry 4.0

4. Promote research and development targeting Societal challenges including Health technologies, Promote a Digital society and inclusiveness

2. National STI Programmes and Initiatives

Spain has aligned its research and development policies within the strategic plan for science and technology ("Plan de Recuperación, Transformación y Resiliencia") including national and strategic projects for economic recovery and transformation ("Proyectos Estratégicos para la Recuperación y Transformación Económica or PERTE). The PERTE are projects of a strategic nature with a great driving force for economic growth, employment generation and competitiveness pull for the economy, characterized by a high component of public-private collaboration across to the different public bodies. The PERTE focuses on 12 strategic areas: 1. Electric & connected vehicle; 2. Health; 3. Renewable energy, green hydrogen, and storage; 4. Agrifood; 5. Spanish as a language; 6. Circular economy; 7. Naval; 8. Aerospace; 9. Water; 10. Semiconductors; 11. Social economy; 12. Decarbonization of the industry.

The second pillar is in regard of the digitalization of the economy, the 2025 Digital Agenda ("Agenda Digital 2025) around 10 major pillars: 1. Reduce the digital gap; 2. 5G technologies; 3. Knowledge building in digital technologies;4. Cybersecurity; 5. e-Government; 6. Digitalization of companies, including e-commerce; 7. Digitalization of the industry; 8. Contents; 9. Big data and artificial intelligence; and 10. Digital rights.

The State Secretariat for Research under the Ministry of Science and Innovation is responsible for the planning of research and development, including the supervision of international relations. The funding programs are largely managed by the funding agencies of CDTI and AEI.

3. Joint Activities with Korea

The bilateral Committee in Science and Technology between Korea and Spain identified the following areas for collaboration: Marine biology, Agrofood, Geology and Mining, clean Energy including renewable, Hydrogen and Energy Storage Systems (ESS), Environment, Smart cities, Health and aging society, Nanotechnologies, Astrophysics, and Mobility.

Following the agreements with Korea, the collaboration is centred around industrial leadership and societal challenges, implemented mainly through multilateral programs like the Horizon Europe and EUREKA, as well as of Bilateral scope subject to joint calls for proposals in Mobility, Smart Manufacturing, Energy, and Information & Communications Technologies. There are also initiatives in view of Mobility of researchers funded under the Marie Sklodowska Curie Actions (MSCA).

In this line, the joint activities are planned under the agreements with the Korean Ministries MSIT and MOTIE, covering various forms of joint research collaboration between Spain and Korea.

List of Joint R&D Programmes of Activities with the RoK

Programme Title	Contents
KSSP	■ Cooperation Type: Large-scale joint applied research, top-down ■ Funding Organization: CDTI and KIAT ■ Call for proposals KSSP SPAIN-KOREA: ■ Deadline for submission of projects: April 21, 2023 ■ Participation Qualification: Minimum of one Large of Medium size company, and one SME. Research institutes and universities are encouraged to participate ■ Project Duration: From 12 to 36 months ■ Funding Scale and Funding Scheme: Grants ■ Research Fields: Smart manufacturing & Mobility ■ Matching fund from Korean government: Yes
EUREKA	■ Cooperation Type: Joint applied research, bottom-up ■ Funding Organization: CDTI and KIAT ■ Call for proposals EUREKA SPAIN-KOREA: ■ Deadline for submission of projects: April 28 & September 22, 2023 ■ Participation Qualification: Minimum of one company. Research institutes and universities are encouraged to participate ■ Project Duration: From 12 to 36 months ■ Funding Scale and Funding Scheme: Loans with a grant portion ■ Research Fields: Horizontal ■ Matching fund from Korean government: Yes
KSEI	■ Cooperation Type: Joint applied research ■ Funding Organization: CDTI and KETEP ■ Call for proposals KSEI SPAIN-KOREA: ■ Deadline for submission of projects: May 19, 2023 ■ Participation Qualification: Minimum of one company. Research institutes and universities are encouraged to participate ■ Project Duration: From 12 to 36 months ■ Funding Scale and scheme: Loans with a grant portion ■ Research Fields: Energy (Renewables, Green hydrogen, Smart grid including energy storage) ■ Matching fund from Korean government: Yes
KRESIP	■ Cooperation Type: Joint applied research ■ Funding Organization: CDTI and IITP ■ Call for proposals KRESIP SPAIN-KOREA: ■ Deadline for submission of projects: 2024 ■ Participation Qualification: Minimum of one company. Research institutes and universities are encouraged to participate ■ Project Duration: From 12 to 36 months ■ Funding Scale and scheme: Loans & grants ■ Research Fields: ICT (Artificial Intelligence, Cybersecurity) ■ Matching fund from Korean government: Yes
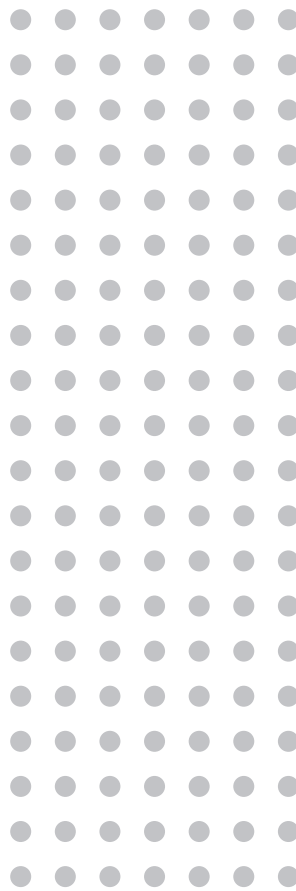
27 SWEDEN

SWEDEN

Country Outline

- GDP: 563,030 million euros (Eurostat 2022)
- GDP Per capita: 46,280 euros (Eurostat 2022)
- Areas of marked S&T specialisations: Life Science, Sustainable Urban Management, Aerospace, Energy and ICT, Mining, Minerals and Steel, Forest Products and Biomass

Contact Information

- Organisation: Embassy of Sweden
- Name / Position: Mr. Lars Hammarström / Science and Innovation Counsellor
- Phone no. / e-mail: (+82) 2 3703 3700 / lars.hammarstrom@gov.se

Sweden is an innovation leader. The country has consistently ranked No 1 in the European Innovation Scoreboard since 2010, and No 2 and 3 in WIPO's Global Innovation Index since 2013. The indicators show that Sweden especially stands out in international scientific co-publications, PCT patent applications and license and patent revenues from abroad. Sweden invests heavily on R&D, promotes cross-sectoral collaboration and is open to international influences.

1. Policies and Strategies in Science, Technology and Innovation

Innovative Country

Sweden, the country of the Nobel Prize, has ranked the top in the European Innovation Scoreboard every year since the measures started in 2010. And in the Global Innovation Index Sweden has ranked number 2 or 3 every year since 2013. Its innovative climate, strong global connections and talents helped its capital city Stockholm to be the second in number of unicorns per capita after Silicon Valley. Also, Sweden's R&D expenditure as percentage of GDP is 3.53% (World Bank 2020), third highest and recorded the top among the EU Member States.

Innovation Policy

The Swedish research and innovation policy will be geared towards Excellence, Internationalisation and Innovation. For that purpose, a new research and innovation bill will be presented.

The Swedish business community is a hotbed for prosperity and innovation, and nowadays also a world leader in sustainability and green transition. The government is an active partner in that work. Free economy and free enterprise are the basis of prosperity in Sweden.

Research Policy & Funding

Sweden aims to be one of the world's foremost research and innovation countries and a leading knowledge nation, where high-quality research, higher education and innovation lead to society's development and welfare, the competitiveness of the business world and respond to the societal challenges in Sweden and globally.

Universities and colleges contribute strongly to the development of society and the competitiveness of business. Science and research must be free from political control. The rules for highly qualified foreign researchers and doctoral students are improved to strengthen Sweden's competitiveness as a research nation.

The country's R&D expenditure as % of GDP was 3.53% (World Bank 2020) and about 70% of this R&D spending comes from the industry. The Swedish Parliament grants R&D funds and the Ministry of Education and Research is responsible for overall coordination of research policy in the government offices.

There are four main research funding agencies in Sweden. The *Swedish Research Council* (VR) is the largest civil recipient of the R&D fund in Sweden and provides around SEK 7.4 billion (730 million USD) in funding for basic research in all areas of research each year. The *Swedish Research Council for Environment, Agricultural Sciences and Spatial Planning* (Formas) supports basic and needs-driven research in the fields of environment, land-based industries and spatial planning. Formas distributes about 1.7 billion SEK (176 million USD) annually. The *Swedish Research Council for Health, Working Life and Welfare* (Forte) supports and initiates basic and needs-driven research in the fields of the labour market, work organization, work and health, public health, welfare, and social relations. The organization distributes 800 million SEK (78 million USD) each year. The *Swedish Innovation Agency* (Vinnova) contribute to sustainable growth by improving conditions for innovation by funding innovation projects and research needed to develop new solutions. Vinnova distributes 3 billion SEK (293 million USD) annually.

Research Institutes of Sweden (RISE), is a single holding entity and a group of public research institutes that receives government funding. The overall objective of RISE is to support sustainable development of Sweden and help the country to gain more international competitiveness. RISE budget is 3.6 billion SEK (351 million USD) annually and is expected to serve as a knowledge partner for businesses, an intermediary between academia and industry, and a nexus for participation in EU R&D projects.

Four research funding foundations were established by the government in the mid-1990s. These include the *Swedish Foundation for Strategic Research* (SSF), the *Foundation for Strategic Environmental Research* (MISTRA), the *Knowledge Foundation* (KK) and the *Swedish Foundation for International Cooperation in Research and Higher Education* (STINT). Annually, about 180 million USD is contributed for basic research by these foundations. Support from other public research foundations is also important contributions to research. For example, the *Bank of Sweden Tercentenary Foundation* (RJ), foundation is a public fund and supports research in *Humanities* and *Social Sciences.*

Private financiers are also important and provide significant contributions to research in Sweden. Notably, the Wallenberg Foundations distributes 253 million USD worth of grants every year. Sweden's second biggest research-oriented foundation based on assets, is *Torsten Söderbergs Stiftelse*, that provide grants of 8 million USD each year. The third largest private research foundation is *Jan Wallanders and Tom Hedelius Stiftelse*.

2. National STI Programmes and Initiatives

Programme Title	Contents
Korea-Sweden STI Joint Research Programme (Vetenskapsrådet/ Swedish Research Council) www.vr.se/inenglish	▪ The Swedish Research Council (Vetenskapsrådet, VR) has an ongoing bilateral collaboration with the National Research Foundation of Korea (NRF). A typical project lasts two years with up to 50,000 USD per year provided by each side. ▪ The next joint call between VR and NRF will take place in 2024. ▪ Previous calls have focused on the exchange for use of national research infrastructure and on research on Covid-19. Research topics addressed were within life-, medical-, natural- and engineering sciences. ▪ Contact person: marie.hillerby.johansson@vr.se
Research project grant (Vetenskapsrådet/ Swedish Research Council) www.vr.se/inenglish	▪ Research project grants are annual calls within medicine and health, natural and engineering sciences, humanities and social sciences, educational sciences, development research and artistic research. The calls within the different topic areas open in spring every year. ▪ The purpose of the project grants is to give researchers the freedom to formulate by themselves the research concept, method, and implementation, and to solve a specific research task within a limited period (usually between 1-4 years). ▪ The main applicant must be employed by a Swedish administrating organisation but is allowed to include up to six participating researchers from any country in the world in the project application. ▪ Contact person: lena.renner@vr.se

Korea-Sweden Research Cooperation (STINT) www.stint.se/en/ scholarships_and_ grants/ korea-sweden	■ STINT, the Swedish Foundation for International Cooperation in Research and Higher Education, supports research projects between Korean and Swedish universities in cooperation with National Research Foundation of Korea (NRF) for up to 3 years. ■ STINT invests up to SEK 750 000 per project (about USD 78 000) and NRF invests a corresponding amount to the Korean side. Since 2008 STINT has supported 66 projects together with NRF (and KOSEF before NRF was founded). The call is open to all fields of science. ■ The cooperation type is mobility and calls are open to all fields of science. Calls usually open approximately in June/July and close in September/October for the next year program. ■ Contact person: mattias.lowhagen@stint.se
EUREKA and Eurostars Korea-Sweden Collaboration (Vinnova) www.vinnova.se/en	■ A Memorandum of Understanding was signed between the Korea Institute for Advancement of Technology (KIAT) and the Swedish Governmental Agency for Innovation Systems (VINNOVA) during EUREKA Innovation Week 2018 and was renewed in 2021. ■ Both countries will focus on areas of mutual interest and consider utilizing existing channels, such as EUREKA meetings to identify, discuss, plan, implement and monitor collaborative activities. These include but are not limited to partner search, matchmaking, identifying joint R&D projects, drafting of promotional calls, etc. ■ Open call for Staff exchange for applied AI, automation, and data sharing 2023. Close September 5. ■ Contact person: kim.silvasti@vinnova.se

3. Joint Activities with Korea

Activities with the RoK in 2023-2024

Programme Title	Contents
Korea-Sweden R2B-Forum	■ Major topic or agenda: Korea-Sweden Research to Business (R2B) Forum is a meeting place for Korean and Swedish research-based startups at universities, and investors, companies, and agencies. ■ Date and Venue: 19-20 April 2023 at Yonsei University, The Commons. 2024 is expected to take place in Sweden. ■ Objective: The R2B forum aims to provide opportunities for cooperation through technology commercialization networking, and to share technology commercialization policies and innovation cases between the two countries. ■ Target Participants: Startups at Universities, Research Institutes, and SMEs; tech-scouting Corporates, VC Companies and Research Funding Agencies. ■ Detailed Information: www.r2bforum.com
Nobel Memorial Program	■ Major topic or agenda: Symposia on Nobel Prize awards during a week of additional seminars, workshops, and roundtables. ■ Date and Venue: 22 November 2023, Seoul National University and Korea University ■ Objective: The Sweden-Korea Nobel Memorial Program celebrate human endeavours in science, discovery, and curiosity since 2020. ■ Target Participants: The symposia on 22 November are open to the public. Some additional events in the program may be for experts and specialists by invitation. ■ Detailed Information: www.nobelmemorialprogram.kr

4. Science, Technology and Innovation Cooperation Partners

Organisation Name	Detailed Information
RISE www.ri.se/en	Research Institutes of Sweden AB (RISE) is owned by the Swedish government and work in collaboration with and on behalf of the private and public sectors and academia. RISE 3.000 researchers develop services, products, technologies, processes and materials that contribute to a sustainable future and a competitive Swedish business community. RISE mobilise resources and create improved conditions to increase the pace of innovation by gathering a number of research institutes and over a hundred test beds and demonstration environments under the umbrella of a single innovation partner.

Chalmers University of Technology www.chalmers.se/en	Chalmers University of Technology is a full-scale technological university with scientific depth and interdisciplinary breadth situated in Gothenburg, Sweden. At Chalmers, both curiosity-driven fundamental research and applied research to solve concrete societal challenges are natural. Founded in 1829, Chalmers is consistently ranked World top 100 for Engineering. Recently, nine researchers from Sweden (two Chalmers) and nine from South Korea received a total of 7.3 million USD for research collaboration of the highest international standards.
Royal Institute of Technology www.kth.se/en	KTH Royal Institute of Technology in Stockholm is the largest and the oldest technical university in Sweden. No less than one-third of Sweden's technical research and engineering education capacity at university level is provided by KTH. KTH and KAIST have had collaborative agreements such as reciprocal two-year postdoc positions and six-month guest research positions in the field of medical engineering.
Linköping University www.liu.se/en	Linköping University is a research-based university with excellence in education. The university is a multi-faculty university in which research and education are equally important. Linköping University has been an innovator since the establishment in the late 1960s creating new study programmes and new ways to tackle research problems. Linköping University's current research collaboration with Korea includes material science and biotechnology.
Lund University www.lunduniversity. lu.se	Lund University (LU) was established in 1666, and is consistently ranked as one of the top 100 universities in the world. LU provides education and research in engineering, science, law, social sciences, economics and management, medicine, humanities, theology, fine art, music and drama. LU has research collaboration with many Korean counterparts in fields such as Biomedical Engineering, Automatic Control and Nanoscience.
Karolinska Institutet www.ki.se/en/startpage	Karolinska Institutet (KI) is one of the world's leading medical universities. KI accounts for over 40 % of the medical academic research conducted in Sweden and offers the country's broadest range of education in medicine and health sciences. KI has a wide range of research collaboration with Korean counterparts, including cancer therapy.
Uppsala University www.uu.se/en	Established in 1477, Uppsala University is Sweden's oldest university. Uppsala University has been placed as one of the 100 best universities in the world during the last number of years with only a few exceptions. Concrete research collaboration with Korea includes cardiovascular diseases, stroke and neurodegenerative diseases like Alzheimer's.

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2023~2024
Science, Technology and Innovation in Europe
and Joint Activities with South Korea

**Delegation of the European Union
to the Republic of Korea
주한 유럽연합 대표부**

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