



MINISTERUL CERCETĂRII,
INOVARII ȘI DIGITALIZĂRII

ue fscdi
Unitatea Executivă pentru
Finanțarea Învățământului Superior,
a Cercetării, Dezvoltării și Inovării



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2014-2020



The National Strategy for Research, Innovation and Smart Specialisation 2022-2027

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ADR	Regional Development Agency
AR	Romanian Academy
BERD	Business expenditure on R&D
BES	Business Enterprise Sector
CERN	Organisation Européenne pour la Recherche Nucléaire
CF	Cohesion Fund
COST	European Cooperation in Science and Technology
CRIC	Romanian Committee for Research Infrastructures
DNSH	"Do no significant harm"
DOAJ	Directory of Open Access Journals
EC	European Commission
EDP	Entrepreneurial Discovery Process
EEN	Enterprise Europe Network
EFSI	European Fund for Strategic Investment
EIC	European Innovation Council
EIC	European Innovation Council
EIP	European Innovation Partnership
EIT	European Institute of Innovation and Technology
ELI -NP	Extreme Light Infrastructure Nuclear Physics
EOSC	European Open Science Cloud
EPO	European Patent Office
ERA	European Research Area
ERC	European Research Council
ERDF	European Regional Development Fund
ERIC	The European Research Infrastructure Consortium
ESA	European Space Agency
ESF+	European Social Fund Plus
ESFRI	The European Strategy Forum on Research Infrastructures ;
ESIF	European Structural and Investment funds
EU	European Union
EURATOM	European Atomic Energy Community
FAIR	Findable, accessible, interoperable, reusable
FTE	Full Time Equivalent
GDP	Gross domestic product
GERD	Gross domestic expenditure on R&D
GOV	Government Sector
HE	Higher Education
HES	Higher Education Sector
INCD	National Research and Development Institute

INS	National Institute of Statistics
IOSIN	Installations and special objectives of national interest
IPR	Intellectual property rights
JPI	Joint Programming Initiative
JTI	Joint Technology Initiative
KIC	Knowledge and Innovation communities
LAP	Lead Agency Procedure (Lead Agency Procedure)
MCID	Ministry of Research, Innovation and Digitalisation
MCID	Ministry of Research, Innovation and Digitization
MSCA	Marie Skłodowska Curie Actions
NCP	National Contact Points
NUTS	Nomenclature of territorial units for statistics
OA	Open access
OECD	The Organisation for Economic Co-operation and Development
OP	Operational programme
OSIM	State Office for Inventions and Trademarks
PN3	National Plan for Research, Development, and Innovation, 2015-2020
PN4	National Plan for Research, Development, and Innovation, 2022 – 2027;
PNCDI III	National Plan for Research, Development, and Innovation, 2015-2020
PNCDI IV	National Plan for Research, Development and Innovation 2022-2027
PNP	Private non-profit
PNRR	Romania's National Recovery and Resilience Plan
POAT	Technical Assistance Operational Programme
POC	Competitiveness Operational
POCIDIF	Smart Growth, Digitalisation and Financial Instruments Operational Programme
PODD	Sustainable Development Operational Programme
POEO	Education and Employment Operational Programme
POIDS	Operational Programme for Inclusion and Social Dignity
POR	Regional Operational Programme
POS	Health Operational Programme
POT	Transport Operational Programme
POTJ	Just Transition Operational Programme
PSF	Policy Support Facility
R&D	Research and development
R&D	Research and development
R&I	Research and innovation
RDI	Research, development, and innovation
RIS3	Regional Innovation Smart Specialisation Strategies
SF	Structural Funds

SNCDI	National Strategy for Research, Development, and Innovation, 2014-2020
SNCISI	National Strategy for Research, Development, Innovation and Smart Specialisation 2022 – 2027
STEAM	Science, technology, engineering, art, and mathematics
TRL	Technology Readiness Level
UEFISCDI	Executive Agency for Financing Higher Education, Research, Development, and Innovation Funding
USPTO	United States Patent and Trademark Office
WIPO	World Intellectual Property Organization

1

Introduction

Introduction

The National Research, Innovation and Smart Specialisation Strategy (SNCISI) has been developed by the Ministry of Research, Innovation and Digitalisation (the Romanian acronym MCID), which holds the role of coordinator of the research-innovation and smart specialisation policy in Romania, of the relevant national funding programmes and legal framework associated with research, development and innovation (RDI), as well as the role of intermediate research body for the Operational Programme for Smart Growth, Digitalisation and Financial Instruments 2022-2027.

Regional Smart Specialisation Strategies (RIS3) are developed by RDAs, which perform the function of planning and programming at regional level (develop, according to the law, the regional development plan, and programmes, as well as fund management plans) and represent the management authorities for the Regional Operational Programmes (ROP) 2022-2027.

SNCISI expresses the firm option to support, recognize and reward the excellence in fundamental and applied research, to stimulate the development of collaboration between the public and private environment, to address economic and societal challenges, to make science, innovation, and innovative entrepreneurship role models of success for the sustainable development of Romania.

Investment in RDI is decisive for the advance in science, for finding solutions to societal challenges, for the development and use of technologies with an impact on the life quality, for increasing productivity and competitiveness and for the creation of sustainable jobs. Oriented towards added value and impact, this investment must as benchmark value the scientific novelty, sustainability of results, the responsibility and openness to the socio-economic environment. The common, transversal priorities of this strategy, regardless of other strategies and programmes, their objectives and funding sources available for implementation (national, PNRR, ESIF etc.) or international (Horizon Europe, EU4Health, Agenda Digital etc.), are:

the human resources humanity for research - in the sense of developing, maintaining, and attracting talents in order to create the critical mass necessary for a scientific sustainability integrated from economic point of view in the Romanian society;

the continuous improvement of the research infrastructure - in order to be prepared for the challenges of the open science, to have the capacity to support experiments at the scientific frontier and provide technology and certification services; to support innovation in the private

sector, partnerships and technology transfer; the concentration of R&D resources and capabilities in functional innovation ecosystems around smart specialisations and industrial transition priorities that support partnerships between research organizations and the private sector, international collaboration and the creation of fast-growing start-ups and enterprises. By adopting the PNRR, the criteria of the "do no significant harm" (DNSH) requirements are met, according to C(2021) 1054 of the European Commission.

SNCISI ensures the balance between the freedom to choose research topics, at the initiative of researchers and the priorities of the strategic agenda, as established by a large, inclusive dialogue with the society. The strategic research agenda is anchored in the need to respond with innovative solutions to the societal and technological challenges. It may include missions of national interest correlated with the European ones, while the smart specialisation priorities will represent fundamental elements for reaching the R&D critical mass, mainly associated with the needs of the business environment.

SNCISI is strongly correlated with the National Strategy for Sustainable Development of Romania 2030, contributing direct to the strategic objective "Strengthening scientific research, modernization of the technological capacity of industry; encouragement of the innovation and the significant growth of the number of employees in and increasing public and private spending on research and development". Furthermore, through the Specific Objective - Connecting research and innovation activities with societal challenges - Strategic Research Agenda, SNCISI supports the contribution of science and research to addressing the challenges of sustainable development, the content of this agenda representing a contextualization of these challenges for Romania.

With these premises and assuming its public role in supporting science, innovation and innovative entrepreneurship, Romania proposes to retain in the national RDI system a critical mass of young talents trained within the Romanian education system, but also to become a home destination to excellent researchers and innovators. The latter, benefiting from an attractive innovation ecosystem that supports entrepreneurs and risk, from facilities and research programmes offering, but also from an exceptional cultural and natural environment, will have a serious option to work and to settle in Romania. The Strategy represents ambition, determination and will, these being assumed by researchers and innovators, as well as by policy makers.

2

Vision 2030

Romania develops, concentrates, and connects excellence in science frontier and societal challenges.

Romania provides a welcoming environment for researchers with experience and international visibility, who can consolidate the scientific performance and support the training of future talents. Career development is supported on specific trajectories, with an emphasis on encouraging the evolution from PhD students to field leaders .

With predictable, performance-based funding, and effective project, strong leadership and management, the research institutes and universities become attractive to researchers.

Research, including basic research, remains the fundament for the development of the innovation and/or ensuring technology transfer.

Centers of excellence, set up through partnerships of research organisations, ensure that the resources (infrastructure, people) are concentrated around research agendas at the scientific frontier, linked to societal challenges and smart specialisation priorities. Research, including research in the social sciences and humanities, is part of an effort to define, understand and address societal challenges specific to Romania or globally. Romania actively participates in addressing global challenges through research, joining European missions and partnerships where it has the potential to contribute with innovative solutions.

THE PROPOSED TARGETS ARE:

- Increase of the number of doctoral graduates as a percentage of tertiary graduates by 10%;
- Increase of the number of researchers per thousand persons employed, i.e., from 2.0 (2022) to 3.2 in 2030;
- The number of researchers working in Romania in 2030 at the level of 'leader' (in the sense of the 'EU framework for research careers'), will increase by 20%;
- The number of articles (indexed Web of Science), will increase, on one hand, due to the increased number of researchers, and, on another hand, due to the improved scientific productivity, from 0.85 articles per researcher to 1 article per researcher (value comparable to that of other countries);
- Increasing the quality of knowledge production:

- Increase the share of articles in the top 10% most cited from 7% to 10% by 2030 (current EU average is 12%) and increase the share of articles in the top 1% most cited from 0.4% to 0.6% by 2030;
- Increase the number of triadic patents by 50% of the number existing in 2021 (triadic or dyadic, USPTO+EPO).

There is a broad mobilisation of businesses towards innovation

Enterprises find in public research organisations determined partners for the development of new products and services, and the innovation entrepreneurship becomes an attractive option. Through the results achieved, enterprises of all sizes contribute to the smart and sustainable economic transformation of Romania.

Transformational factors include opportunities for collaboration between research organisations and the private sector along the whole pathway from idea to market, professionalisation and coordination of technology transfer, incubation and acceleration capacities, and fair co-funding of risk capital available in the market.

THE TARGETS ARE:

- Romania will progress from emerging innovator (2021) to moderate innovator status, (according to the European Innovation Scoreboard);
- The share of companies introducing new innovative products to the market will increase from 2.9% to 6% (EU27 average being 13% in 2018);
- The share of innovative companies collaborating with research organisations will be above 7% (in 2018 only 3.5% of them collaborating with universities and 1.5% with institutes);-
- The number of public-private co-publications per 1 million inhabitants will increase from 24.5 to 50 (compared to the current EU average of 95);
- Employment in the innovative enterprises will increase from 2.6% to 5% (EU average of 11.8% in 2018).

Innovation ecosystems associated with smart specialisations support the advance in global value chains

National smart specialisations support the development of emerging technologies with a cross-cutting impact on local industries, and in particular on regional smart specialisation sectors. National smart specialisation priorities are synergistic with those at regional level.

The transformational element at national level is the investment in broad collaborative projects between research organisations and the private sector, such as innovation and technology centres. These centres will ensure that the critical mass of research and business actors is reached, and they work together to achieve a common research agenda, including through participation in international partnerships. Such projects will be initiated and expanded on the basis of continuous entrepreneurial discovery dialogue, in conjunction with the monitoring of the evolution of the associated ecosystems, and will be designed and funded, preferably in national-regional synergy.

THE TARGETS ARE:

- The growth rate of employment, added value and exports in the ecosystems associated with the smart specialisation fields, beneficiaries of the major projects, will be twice the national average.

Internationalization and European and International collaboration

The national research and innovation system is integrated into the European Research Area and open to international collaboration. Romania has a participation in European programmes at least equal to its share of researchers, and the contribution to international cooperation is in close correlation with its strategic agenda. The national contact points, professionalized and part of the European network supported by the European Commission, ensure that the national participants are well informed and help to identify suitable partners. In this way, the NCP contribute to the increase of the number and quality of the projects submitted in the framework programmes, and act as an important facilitator of internationalization.

The transformational factors are the synergies between Horizon Europe and ERDF, ESF+ and state budget.

THE TARGETS ARE:

- The funds attracted from the Horizon Europe Framework Programme compared to those from Horizon 2020 will double, respectively approx. 500 million euros from HE in the period 2022-2027;
- The annual number of international scientific co-publications per million inhabitants will increase from 284 to 600 (current EU average being 1172);
- Minimum 5% of the national public funding for R&D, will be allocated for joint programmes and for European partnerships, including interregional investments in EU projects;
- Bilateral collaborations are complementary to these interventions and contribute to the development of networking capacity.

Premises for the vision to become reality

The revitalization of research depends decisively on the level of public investments in research and development. Romania, with only 0.17% of GDP allocated for R&D in 2018, ranks last in the European Union; the situation is the same in the case of the percentage of national ESIF funds allocated for innovation.

Romania reaffirms the strategic option to predictably increase R&D public spending to reach 1% of GDP by 2027, under the conditions provided by the applicable legislation.

The accelerated increase in public investments for research and development will allow, among others, the opportunity for a structural convergence of the national RDI system with the other EU RDI, in order to increase visibility, sustainability and impact.

The share for experimental development research in the total national expenditure for R&D, currently at half of the EU average, should double; the share of the R&D expenditures performed by universities (currently at one third of the EU average) should also double.

The increase of the private investment in research, development and innovation is a priority; Romania aims to reach 1% of GDP private R&D investment by 2027.

Complementary, public investment in R&D will support the consolidation of the innovation in the private sector through a wide range of actions, such as: public-private partnerships, attracting and training talent, intersectoral mobility, enhancing the technological transfer capacity and engaging public research organisation and private sector in addressing societal challenges.

3

**RDI priorities, policies,
and legal framework**

The strategy has been developed in line with European and national policies and strategies and responds to the recommendations of the Policy Support Facility (PSF) expert report. Through the PSF mechanism, the following aspects specific to the national RDI system were evaluated:

The strategy has been developed in line with European and national policies and strategies and responds to the recommendations of the PSF expert report. Through the policy support mechanism (PSF), the following aspects specific to the national RDI system were evaluated:

- The governance of the RDI system - structural changes in the RDI system;
- The evaluation of RDI policies and strategies - evaluation of the funding and how research has a role in political decision-making;
- Internationalization of the national RDI system and integration in the European Research Area;
- Public-private partnerships as key elements for innovation - effectiveness of tools used to improve public-private cooperation;
- The efficiency and impact of ESIF in connection with PNCDI III (2015-2020) – causes for the dysfunction in the commercialization of research results and regarding the weak links between science and the business environment.

SNCISI is strongly correlated with the National Strategy for Sustainable Development of Romania 2030, it is consistent with the national legislation in force for scientific research, technological development, and innovation, it responds to the general priorities of the Government, the favorable condition "*Good governance of the national or regional strategy of smart specialisation*" and the provisions of the PNRR.

The strategy ensures complementarities and synergies with the objectives of the European Research Area for the creation of a common European market for research, innovation and technology, the mobility of researchers and knowledge, investment in research and innovation, increasing interaction between universities, research institutes, the business environment and other actors involved in the innovation process.

SNCISI creates the conditions for the efficient and effective use of national funds, PNRR and cohesion funds dedicated to RDI, over 2022-2027.

4

Context analysis and problem definition

The strategy starts from the difficulties and failures and aims to capitalize on existing opportunities, capabilities (such as the exceptional natural capital, national and the international research infrastructure, developed and hosted by Romania, the islands of scientific excellence, technological capabilities, or human resources, such as IT), to address the challenges of green transition, blue growth, and digitalization. In this way, Romania sets the ambition to become a recognized actor in innovation.

Details regarding the difficulties and challenges faced by the Romanian RDI system are presented in the document *"Analysis of the barriers that prevent the dissemination of innovation, including digitalization"*¹ (Chioncel M, 2020)

¹ Chioncel, M (2020) – Analysis of the factors that obstruct the diffusion of the innovation, <https://www.poc.research.gov.ro/uploads/2021-2027/conditie-favorizanta/analysis-of-the-factors-that-obstruct-the-diffusion-of-innovatio.pdf>

5

General and specific objectives; challenges and directions for action

The National Strategy for Research, Innovation and Intelligent Specialisation is structured around four general objectives:

- OG1. Development of the research, development, and innovation system;
- OG2. Supporting innovation ecosystems associated with smart specialisations;
- OG3. Mobilization towards innovation;
- OG4. Increasing European and international collaboration.

Each general objective corresponds to several specific objectives and directions of action.

OG1. Development of the research, development, and innovation system

OS.1.1. Increasing the number and scientific competencies of researchers in the Romanian R&D ecosystem by training and attracting research talent

Challenges

The share of the number of the R&D personnel in the total employed population is four times lower than the EU average. In this indicator, Romania ranks last in the EU, showing, at the same time, a divergent trend of stagnation in relation to the European growth trend.

There are significant differences compared to the EU average in terms of R&D staff structure by performing sector. Thus, in 2019, of the total R&D staff (full-time equivalent), the business sector represents only 37% (compared to the EU average of 58%), the government sector 39% (compared to 11% in the EU), and universities only 24 % (compared to 30% EU average). Moreover, the number of research norms in universities is mainly associated with the percentage of research within the academic norm, there are very few full-time researchers.

The total number of PhD graduates has decreased significantly over the last decade (from 5,459 in 2010-2011 to 2,043 in 2018-2019), a trend also valid for graduates from technical fields. Although the share of PhD graduates in the total number of researchers is relatively high (56% in 2018), current tuition rates and the capacity of the education and research system to train new researchers do not meet the capacity to increase the number of researchers.

The weak attractiveness of the R&D system for researchers, especially compared to universities and research institutes from abroad, given the chronic underfunding and the low prestige of the universities and institutes, limits the ability to attract, train and maintain high-performing researchers both from Romania and abroad. There is a lack of predictability in funding programmes that would attract foreign researchers, including Romanian researchers from diaspora, although there is experience and successful cases.

Romanian universities and institutes, with exceptions, seem to be closed or hardly accessible for researchers from abroad, contrary to the public advertising in EURAXESS of the vacant research positions, the declarations of internationalization or adoption of ERA objectives. The European Charter for Researchers and the Code of Conduct for the recruitment of Researchers are documents that have been adopted by few public research organisations.

Funding tools for young high-performing researchers have been reduced in recent years, which has led to the international outflow to more attractive RDI destinations, or to migration to other economic sectors, more financially motivating.

In this sense, institutional funding programme would have been necessary to support young high-performing researchers, programmes that would mainly finance research organizations of excellence, which benefit from high-performance research equipment.

Actions

A1. Increasing the number of researchers in the Romanian R&D ecosystem by training and attracting research talent will be achieved through:

- Support provided at various research career stages, including recent PhD graduates, researchers with postdoctoral experience, senior researchers with high performance in their field;
- Grants for young researchers, to aid their integration in R&D organizations, through consolidation institutional research programmes;

- Grants dedicated to young research teams, as well as targeted support for clinical research;
- Increasing the overall performance of researchers by stimulating and sustaining their participation in professional training;
- Increasing the performance in the research activity of doctoral students, an important component of the research system, will be achieved by:
 - Promoting partnerships between universities, National R&D Institutes, Institutes of the Romanian Academy, and private organizations engaged in research within Ph.D. programs. This aims to maximize the utilization of existing resources, including personnel and infrastructure.
 - Support for creating new jobs and retaining existing ones, as a horizontal action, applicable to all forms of financing;
 - Enabling access for doctoral students to training programs abroad, within excellent research groups and laboratories;
 - Encouraging full-time involvement of doctoral students in research activities by ensuring a competitive level of doctoral scholarships;
 - A significant increase in the engagement of doctoral students in research projects. This includes support for both public-public and public-private research collaborations to maintain a high level of training; mechanisms will be established to allow the correlation between the allocation of research positions dedicated to doctoral students in research projects and their enrollment in doctoral schools;
 - Supporting partnerships between research organizations from the public and the private ecosystem, to develop doctoral programs, exploit economic opportunities from the results obtained, and facilitate the transition of graduates from doctoral studies into the job market;
 - Supporting investments in laboratories with cutting-edge technology, both in the private and in the public environment. These investments create an environment conducive to attracting research talent and retaining them within the Romanian research system.

A2. Supporting the mobility and training of doctoral and postdoctoral researchers, including by funding projects that have received the label of excellence and by accessing Marie Skłodowska-Curie COFUND programmes.

A3. Adequacy of the legislative, institutional, and procedural framework regarding the research-innovation system. To achieve this action, the following measures will be taken:

- Encouraging research organizations to adopt the European Charter for Researchers, the Code of Conduct on the Recruitment of Researchers, and the Bonn Declaration on Academic Freedom. These initiatives aim to promote best practices and ethical standards in research and academia.
- Implementing measures to align with the European Commission's recommendations on the valorization of research result, the EU framework for research careers, and promoting gender equality in research. These measures reflect values that are recognized and assumed at national level. Their adoption will not only facilitate the recognition and appropriate positioning of Romanian researchers' international experience but also encourage research institutions to become integration into international personnel flows part of international personnel exchanges.
- Developing regulations for the career progression of technological development engineers by harmonizing relevant legislation. This is essential to ensure that the career path for these professionals is well-defined and aligns with national and international standards.

A4. The development of a " Platform of advanced studies and research", in the form of a virtual network that brings together medium or long-term research projects (i.e., 5-7 years), coordinated by top international researchers. The projects are aimed at creating and developing research groups with international visibility and performance and potential for excellence.

OS.1.2. Ensure the transition to open science and facilitate the consolidation of excellence in scientific research

Challenges

Although the share of open access publications by Romanian researchers is at the level of the international average in the main database (Web of Science and Scopus), further development, correlated to the European ambition, implies, among others, efforts to align financing programmes with European practices.

The level of open access publication of research data is very low, in the conditions of weak stimulation by funding rules, the underdevelopment of dedicated research data infrastructure and the limited knowledge of these practices at the level of research organizations.

Recent investments in the development of digital repositories of research data and scientific publications are still disparate initiatives that require integration into the European Open Science Cloud (EOSC) or relevant disciplinary platforms. Similar coordination is needed for data generated by research infrastructures.

The strategic and functional framework of open science needs policies and operational levers in order to align with the current innovative policies implemented in the European Union, such as the development and acquisition of skills and competences by researchers and staff in academic institutions, the adoption of new evaluation metrics of research and researchers' careers (New Generation Metrics) or the involvement of citizens in science (Citizen Science).

The share of scientific articles among the most cited 10% is 7% in Romania, compared to 12%, the EU average. Among the most cited 10% articles, only 15% of the articles published with Romanian affiliation make explicit reference to the grants which funded the work, compared to the EU average of 50%. According to the European Innovation Scoreboard 2021, Romania has achieved a score of 39.84 in terms of the quantity of highly cited (10% most cited) scientific publications, which falls below the European Union (EU) average of 98.

Actions

A1. The transition to an open science system

This action aims to support: (1) accessibility, reuse of scientific research data and better visibility of scientific production; (2) higher quality results by eliminating duplication, facilitating research replication and combating scientific fraud; (3) transition to storing the knowledge base in digital

repositories; (4) increased transparency of the spending of public funds for research; (5) stronger research collaboration, accelerated innovation and increased competitiveness; (6) openness towards/ active participation of Romanian researchers in the European Research Area (ERA).

The transition to open science and the progress towards excellence in scientific research will be achieved by:

Free access to publications

- obligation to publish in open access journals from the mainstream of knowledge or in platforms with free accession (ex: Open Research Europe); the eligibility of required costs will be guaranteed;
- fair costs for accessing international publications; open access publishing will be guaranteed at national level. This will be achieved by transformative negotiations ("transformative agreements")
- awards will be granted for the Romanian journals indexed in Web of Science, with impact factor or with an absolute influence score above the average of their field and for the adoption of the best practices on open access publishing (such as obtaining DOAJ SEAL accreditation);
- promoting and supporting the existing and new open science initiatives, in particular for the long-term storage of open access publications, having as goal their integration in specific databases and/or EOSC;
- awarding grants for open access publication in journals indexed in Journal Citation Reports, with an impact factor or absolute influence score above the average for their field.
- sustaining the strategic interest in providing access to the scientific literature in the mainstream of knowledge, including through synergy funding mechanisms.

Open access to research data

Open access to research data will be promoted according to the principle of "as open as possible, but as closed as necessary" for research projects that produce scientific data and in line with the principle of responsible management of research data.

- the obligation to draw up management plans associated with research data, in compliance with the FAIR and open data principles, in RDI projects funded by public funds. Research infrastructures will also be supported in the development and implementation of data management plans associated with experiments.
- ensuring the eligibility of costs associated with the management of research data resulted from research activity funded by public money.
- providing grants for the preparation of data underlying the results of scientific research for open access publication/storage.
- promoting and supporting existing and new open science initiatives, in particular for the long-term storage of research data for integration into disciplinary databases and/or EOSC.

Establishing and implementing a national support mechanism for the transition to open science

Under the supervision of the *Open Science Council* of the MCID, this mechanism will provide support for:

- the definition and implementation of open science-specific policies, the coordination of the development and implementation of the recommendations of the *Strategic Document regarding the framework for the development and of open science in Romania*;
- the development of specific open science capabilities;
- the coordination of the expert network at the level of research organisations;
- the coordination of the development of the management capacity for open science at the level of research organizations

A2. Actions to encourage citizen participation.

Complementary to encouraging citizen participation in defining the strategic research agenda, projects that encourage citizen participation at different stages of the research process, such as data collection, will be supported. Various forms of citizen involvement will be piloted, to complement expert assessments from the perspective of the final beneficiaries.

A3. Continue and expand the funding for exploratory research projects and complex frontier research projects.

This action aims to support and promote advanced scientific research and multi-disciplinary, interdisciplinary, and transdisciplinary significant advances at the knowledge frontiers. It also aims to encourage new methods and techniques, including innovative approaches and investigations at the interface between established disciplines.

OS.1.3. The increase of the competitiveness of the research organizations

Challenges

In 2020, Romania has only one university in the top 1000 Shanghai Academic Ranking of World Universities.

The position of Romanian research organizations in the Scimago ranking has deteriorated: if in 2014 Romania was positioned in the first quarter of leaderboard for a number of 20 of fields, in 2019 this number dropped to 17.

The current institutional funding of R&D has a limited competitive character, and is not well-aligned with strategic objectives, performance, and impact.

Project based competition funding has a low share in the public expenditures for R&D, it is not predictable, and does not have the capacity to ensure the continuity of research activities, in this way contributing to the exodus of R&D/academic personnel to other sectors or countries.

The number of SCI (Science Citation Index) articles per full-time equivalent researcher is 0.85 in Romania, compared to the EU average of 1.00.

The number of articles cited in patents is very low, particularly in triadic or dyadic ones, which reflects the low impact of basic and applied research on new technologies.

In Romania, there is a large number of public research organizations with a small number of researchers, which generates high administrative costs, lack of critical mass and low competitiveness in international competitions; all of these are reflected by a modest presence in the international rankings.

Actions

A1. Creation of a system for evaluating the performance of all public R&D units/institutions, in order to ensure the comparability of indicators and their achievements.

All public R&D units and institutions will periodically undergo external evaluation of their performance, in accordance with a series of indicators specific to each entity, as the basis of institutional funding. The assessment will provide recommendations for institutional development and will assign each entity to a performance class. Competitive institutional funding facilitates institutional development and the path to excellence. Moving an entity from one class to another will be possible as a result of external evaluation.

A2. Competitive institutional funding for R&D.

A3. Creation of Centers of Excellence by sustaining partnerships between research organizations (public-public), around a common research agenda/thematic focus.

The centers will have medium-long term funding, spanning from five to seven years. They will aim to ensure a balance between the development or expansion of existing research infrastructures and conducting actual research aligned with a strategic agenda focused on scientific frontiers and addressing societal challenges.

A4. The NUCLEU Programme funding will be continued, expanded, and adapted as part of the National Research Development and Innovation Plan (PNCDI IV).

According to the current legislation, the Nucleu Programme is specifically designated for National Research and Development Institutes. Its primary objective is to establish and reinforce the knowledge foundation and early-stage components for future projects.

A5. Development of research performance funding fund for public and private CD organisations.

OS.1 .4. Modernisation and efficient use of RDI infrastructure by facilitating open access and ensuring the sustainability

Challenges

Challenges related to the access and efficient use of existing research infrastructures

Research infrastructures are insufficiently oriented towards the provision of scientific and technological services.

Access policies for public research infrastructures are rarely developed and transparent.

There is no systematic reporting on the use of research infrastructures for scientific, technological and certification services; it is not possible to estimate the degree of use of infrastructures, especially by users outside the host institutions: public institutions and private organisations at home and abroad, the business environment.

Challenges related to the sustainability of the research infrastructure ecosystem

Investment in research infrastructures (new and upgraded) must be maintained at a certain share of the total research expenditure. As a reference, the average share of spending on instruments and equipment in total R&D expenditure was 8.9% in EU during 2013-2018, while in Romania the annual shares were between 6 and 15%, with an average value of 8%.

Current policies to ensure the sustainability of existing infrastructures are limited to the list of installations and special objectives of national interest (IOSIN).

The infrastructure roadmap developed in the previous period was not based on an analysis of the needs of potential users.

Large investments in infrastructures (e.g., ELI-NP) have not been followed by integrated developments ensuring spill-over effects in the context of territorial development and smart specialisation.

The current concentration of research infrastructures does not reflect the need for cohesion, even if it is related to the regional distribution of research organisations.

Actions

A1. The upgrading and efficient use of RDI infrastructure to facilitate open access and ensure its sustainability with multiplier and spillover effect of knowledge and RDI results in the economy will be achieved mainly through the following types of measures:

- consolidate the design and implementation capacity of access policies to research infrastructures that received public funds and ensure the transparency of these policies. Tools will be developed to facilitate and financially support access to research infrastructures (and related scientific data) financed by public money. Support for access will be provided to researchers, academics, students and doctoral students for research activities and educational purposes.
- support the orientation towards research and technological services offered by the research infrastructures, through:
 - support the management capacity associated to supply of services (scientific, technological) by the research infrastructures;
 - establish national consortia between similar or complementary infrastructures, able to offer integrated service packages;
 - support national participation in European collaboration/coordination mechanisms, ERIC type;
 - further development of the <https://eertis.eu> platform and its internationalization, to facilitate access to services and ensure transparency of information about existing infrastructures, equipment and the services offered;
 - co-financing of the costs for scientific and technological services performed for public or private beneficiaries (especially start-ups and innovative SMEs), through experiment voucher schemes. The ERRIS platform will be developed with specific functionalities for the implementation of an integrated system for monitoring and reporting the degree of use of the research infrastructures and of the research results obtained through the use of the infrastructures.
- accreditation of testing laboratories, ensuring testing and certification capacities in areas of strategic interest, a balanced geographical distribution, and their sustainability.
- develop, implement, monitor, evaluate and update the national *Roadmap* of research infrastructures, which will include:

- the list of Romania's participation in international infrastructures/European research infrastructure consortia (ERIC), updated based on the analysis of previous results and the strategic opportunity (at national and/or regional level), including from the perspective of international cooperation activities. Excellence research projects related to the valorisation of ESFRI Roadmap infrastructures hosted by Romania will be supported, including the European Research Infrastructure Consortia (ERIC) in which Romania participates.
 - List of Romania's participation in ESFRI Roadmap, updated on the basis of dedicated consultations, aiming at capitalizing on ERDF – Horizon Europe synergies.
- update, based on evaluation, the list of *Installations and specific objectives of national interest* (IOSIN); the cost for their operationalisation will be integrated in the institutional funding of the host organizations. This list will be based on the use and demand of these infrastructures, the associated research programmes, and policies for access and management of research data.
- compiling a list of proposals for new eligible public investments, based on the needs of the research-innovation community, industry, and public actors, needs that are not covered by existing infrastructure. A research programme of excellence associated with the use of ESFRI infrastructures hosted by Romania and participation in international research infrastructures, in accordance with existing agreements.
- Strengthening achievements in the field of advanced technologies through proactive measures and investments in research directions with high potential for practical application. These directions aim to develop products with high added value that can be assimilated by the domestic industry, which is still undergoing restructuring and/or formation in sectors of national and European interest.

OS.1.5. Connecting research and innovation activities with societal challenges - Strategic Research Agenda

Challenges

Although part of the research is implicitly addressing societal challenges, a mechanism to connect to these challenges has been lacking. This has been primarily due to the lack of systematic dialogue with society (public institutions, civil society, citizens in a broad sense) regarding the specific national challenges and the local impact associated with global challenges. Secondly, it is influenced by the almost complete absence of a "top-down" mechanism for defining concrete challenges that can be addressed through research and innovation. Among the consequences, socio-economic and humanistic research has been largely overlooked as a potential contributor to addressing societal challenges.

Actions

A1. Connecting research and innovation activities with major societal challenges (demographic changes, climate change, welfare and social inclusion, health, food security, green energy, technological changes, etc.) will be achieved mainly through the following measures:

- Provide funding to projects that target societal challenges (the basis for open project calls and a reference for participation in international initiatives).
- Support solutions to clearly identified problems, with the involvement and co-financing from various public and/or private institutions, through dedicated calls.

A2. Support the dialogue through national missions, to which research programmes with clearly defined objectives can be subsumed, and to which strategies of the research organizations or competence centers can converge. These can be correlated with European missions.

Presentation of the content of the Strategic Research Agenda

In 2021, an extensive consultation process took place to identify the Strategic Research Agenda priorities, involving 150 representatives of key stakeholders in panels and 2353 online

respondents. The result of this consultation consists of six domains addressing societal challenges, each associated with several impact areas with detailed descriptions:

- Digitalization, industry, and space;
- Climate, energy, and mobility;
- Food, bioeconomy, natural resources, biodiversity, agriculture, and the environment;
- Health;
- Culture, creativity, and inclusive society;
- Civil security for society.

By focusing on societal impact, the Strategic Research Agenda is distinct and sometimes complementary to smart specialisations (as described in the dedicated chapter of this strategy). Moreover, the Agenda does address the fundamental research, for which funding should primarily be based on scientific excellence criteria.

Programmatically, the Strategic Research Agenda describes expected impact areas without limiting the research field that can address them. At the same time, although some impact areas can be primarily addressed through other instruments than RDI (e.g., human resource development, investments, new fiscal policies, etc.), the goal of the Agenda is to exclusively define the contribution of research, development, and innovation to achieving these impacts.

The societal challenges priorities included in the Strategic Research Agenda are:

Domain: Digitalisation, industry and space

IMPACT: Open Strategic Autonomy in Digital and Emerging Technologies with a Human-Centric Focus

AI with human-level performance, scalable and secure; The involvement of the human factor in the analysis and validation of the results generated by the automatic systems; Collaborative robotics for an agile and resilient economy, in support of society; Next generation computing (edge, neuromorphic, bioinspired, nano, quantum, photonic, HPC); Additive manufacturing (3D printing); Advanced materials, nanomaterials; New materials for strategic sectors, resilient to extreme operating environment conditions; Sensors and biosensors; Biotechnologies with industrial or environmental applications; Mentally and physically non-invasive technologies in industry, health, education, communications and housing; Increased safety and intuitiveness in human-machine interaction; Deep immersion to enable extensive experience in human interaction with advanced technologies and ecosystems.

IMPACT: An Attractive, Secure, Dynamic, Data- Agile, Regional and Global Economy

Increased cyber security; Integration of clean digital technologies; Smart data for smart communities; Safe, ethical, and human-centered data management; Digitally assisted open innovation ecosystems; Lifetime traceability of social services, industrial and food products; Creating, accessing and operating in open data ecosystems; Product customization through data-driven manufacturing ecosystems; Language technologies for the Romanian language.

IMPACT: Clean industry, circular economy, and guaranteed supply of raw materials

Greening of highly polluting economic sectors; Decarbonization of production processes; Development of cost-effective green manufacturing technologies; Industrial value chains based on local resources, including on opportunity niches generated by climate change; Curtailment and diversification of supply chains including the use of 4R solutions; New business models in the circular

economy; Product life cycle management; Products/technologies with time of high validity life and high recycling rate; Servitization of business models and systems; Advanced recycling of end-of-life materials; Sourcing raw materials from natural residues; Non-polluting industrial processes for obtaining raw materials from various sources; New energy efficient economic processes; Sustainability of critical material supply; Transparent and consolidated value chains.

IMPACT: Strategic autonomy in the development, deployment and use of global space infrastructures, services, applications, and data

Enhancing the quality of life and safety of citizens through space technologies; New materials and advanced technologies applicable to the space domain; Space technologies for optimising the activity of the institutions and public authorities; New advanced equipment and materials for future space missions; Contributing with niche technological advantages to the development of autonomous EU space systems and infrastructures; National capabilities for space robotics; National capabilities for satellite positioning and navigation (EGNOS/Galileo, PRS); Development of complex mechanical systems for space applications; Access to space through satellite platforms; Autonomous access to space.

Domain: Climate, energy and mobility

IMPACT: Transition of the energy sector towards climate neutrality and resilience

Development of environmentally friendly technologies in obtaining new energy storage solutions; New methods and technologies for producing energy from renewable resources with a low carbon footprint and their large-scale implementation; The development of efficient technologies for the production of hydrogen from abundant, renewable sources; Innovative methods and technologies for reducing the carbon footprint in energy production systems; The development of cross-sectoral energy efficiency solutions;

Use of offshore wind and wave energy; Alternatives for the production of clean electricity using nuclear technologies; Climate services for the energy sector; Capture and storage of greenhouse gases.

IMPACT: Accessibility, supply, and efficient use of energy

Integration of renewable energy sources in heating and cooling systems; Modernization of network of energy transport and distribution; Development of solutions for thermic insulation and storage of the thermal energy; Ensuring the necessary raw materials for the expansion of clean energy technologies; Increasing energy storage capacity (Power-to-X Technologies); Rationing energy consumption; Energetically sustainable human communities; Energy-efficient and interactive buildings connected to the grid; Efficient and advantageous solutions for assuming the role of prosumers for buildings; Digitalisation of the energy system; Promotion and utilization of decarbonized energy vectors; Urban space architecture oriented towards creating energetically autonomous micro spaces.

IMPACT: Towards a neutral, climate-resilient and environment friendly mobility

Decarbonisation of the transport sector through the use of electrification and other energy vectors with low carbon footprint (hydrogen, fuels from renewable sources, etc.); Development of production systems and supply networks for alternative fuels; applications for hydrogen-based energy storage for transport; Recyclability of materials used in transport systems; Development of zero emission technologies for mobility; Methods for storing energy on board vehicles; Electrification and use of the railway in freight transport; Changing travelling behavior; Increasing the capacity of cities to implement climate neutral mobility systems; Climate services for the transport sector.

IMPACT: Systems for smart mobility

Connected, automated and cooperative mobility; *Big Data* and artificial intelligence for smart mobility; Smart transport systems to increase the safety and resilience of the transport infrastructure; Open data platforms for mobility; Promoting mobility as a service; Optimization of multimodal and modular transport systems, including with the help of artificial intelligence; Use of drones for food and/or convenience delivery services.

IMPACT: Behavioral Transformations to

Reducing the impact of human activities, including food waste, on greenhouse gas emissions; Mitigating climate and water crises through change and diversification of dietary

Reduce Climate Footprint

habits; Sustainable methods of living in harmony with the environment and supporting ecosystems; Understanding and promoting the effects of climate change at the national level; Developing education regarding the human impact on the environment.

Field: Food, Bioeconomy, Natural Resources, Biodiversity, Agriculture, and Environment

IMPACT: Increasing the relevance of forests in reducing pollution

Compensation for massive deforestation and degraded and desertified soils; Reduction of wood consumption; The gradual removal of forests from the forestry circuit; Sustainable forest management in the context of climate change.

IMPACT: Agriculture's contribution to climate neutrality and resilience

Implementation of agricultural systems that contribute to climate neutrality and biodiversity; Reducing the carbon footprint through innovative agricultural technologies; Conservation and restoration of natural resources used in agriculture (soil, water, biodiversity); Reduction of greenhouse gas emissions generated by animal husbandry; Estimation of emissions/absorptions from land use, forestry, and agriculture; Climate services for the agricultural sector.

IMPACT: Biodiversity recovery, conservation and sustainable restoration of ecosystems and ecosystem services

Conservation and restoration of affected ecosystems and those at risk; Conservation of species, connectivity of habitats and safeguarding ecosystems integrity; Ensuring the efficiency of production systems favorable to biodiversity (low input, ecological); Increasing biodiversity in agri-food systems; Management of genetic resources (animals, plants) in order to maintain biodiversity; Management of insufficiently exploited natural resources (spontaneous flora, old crops, microorganisms); Changing people's attitude

towards nature and ecology; Control of invasive species; Ensuring coexistence between local communities and fauna; Evaluation and valorization of ecosystem services with nature conservation; Preventing and combating eutrophication; Restoring wetlands as complex carbon storage areas providing ecosystem services; Development and provision of knowledge resources regarding the management of protected natural areas; Public awareness and citizen involvement in science.

IMPACT: Circular bioeconomy

Reducing the consumption of plastic packaging and microplastic pollution; Integrated exploitation, in cascade, of natural resources; Valorization of by-products and waste from the agri-food and non-food industrial sector; Combating environmental pollution with heavy and/or radioactive metals; Climate- resilient agricultural and livestock production systems; Sustainable assurance of plant health and modernization of the phytosanitary sector; Reducing the environmental footprint of activities in the bioeconomic sector; Reducing nutrient losses along the food chain; Prevention and combating offshore and onshore oil pollution; Superior utilization of vegetable residues - circular bioeconomy; Management of water and aquatic resources considering quality water as a hard-to-renewable resource; Superior utilization of natural resources.

IMPACT: Water resource management and sustainable development of fisheries and aquaculture

Integrated management of water resources; Ensure access to drinking water resources; Development of aquaculture and sustainable fishing; development of aquaculture in recirculating systems, with the development of the complex roles of microorganisms; Aquaponics development; Sustainable development of irrigation systems; Climate services for the water resources management sector.

IMPACT: Food and nutritional security

Reduction of chemical synthesis inputs in the bioeconomy; Safety and traceability of products in the food chain; Reducing the phenomenon of food fraud; Resilient and sustainable agri-food system to ensure food and nutritional security; Prevention of infectious agents that pass from one species to another and can cross environmental barriers; Foods with superior nutritional characteristics for healthy/ personalized diets; Reduction of poor eating behaviors; Ensuring protein independence, diversifying protein sources and increasing the efficiency of their use; Precision nutrition

along the food chain; Development and support of urban and peri-urban agriculture; Development of the agro-food industry in the rural area.

IMPACT: Sustainable, balanced, and inclusive development of urban, rural and coastal areas

Integrated solutions for smart cities; Reduction, recycling and recovery of municipal waste; Development of green infrastructure in the urban environment; Sustainable and smart rural development; Smart lifestyle, friendly to nature and adaptable to changes; Efficiency of energy use and integration of renewable resources in the built environment; Agroecology for sustainable, balanced and inclusive development; Reducing the impact of extreme events on the built environment in rural, coastal and urban areas using dedicated climate services. Sustainable development by integrating digitization and artificial intelligence in the built environment; The development of high-performance agriculture to the detriment of subsistence.

IMPACT: Innovative governance models that foster sustainability and resilience

Solutions for involving society and multiple stakeholders in policy decision-making; Innovative models of governance through modeling and forecasting; Increasing the resilience of critical infrastructure, through monitoring, modeling, alarming and control; New business and consumption models, through innovation and digitization for sustainability and resilience; Decision support tools for SMEs in the agri-food sector; Supporting the integration of enterprises in global value chains, including through clusters; Assessing the extent to which current policies promote sustainability and resilience; Modeling the programming of local and regional development by operating at the territory scale.

Field: Health

IMPACT: A healthy life in a rapidly changing society

Proactive, predictive, personalized and participatory prevention (P4) in health; Prevention and rapid detection of emerging infectious diseases with pandemic potential; Knowing the causes of illness and the factors that influence health; Identifying the underlying mechanisms of mental disorders; Increasing the chances of a healthy life for children; Adopting a healthy lifestyle through education and modifying behavioral risk factors; Healthy and active aging.

IMPACT: Living and working in a health-promoting environment

Ensuring optimal performance at work, in an ergonomic and stress-free context; Understanding the effects of telecommuting on productivity, monotony and employee health; Understanding the benefits of reorganizing the work schedule and reducing monotony at work; Identifying new ways to promote health and safety at work; Understanding and reducing the impact of air, water, soil and noise pollution; Understanding the impact of climate change on health and developing climate services dedicated to public health; Reduction of diseases among vulnerable populations due to favorable living environment; Access to adapted health services for those living/working in hazardous environments; Awareness of the importance of periodic health testing and new population health screening solutions; Understanding the effects of moral stress at work on health; Identifying the health risks associated with emerging professions.

IMPACT: Managing disease and reducing its burden

Prevention, early detection, treatment and maintenance of quality of life in cancer; Reducing the burden of cardio- and cerebrovascular diseases and their long-term implications; Surveillance of communicable diseases with high national incidence and nosocomial diseases; Prevention, early detection, treatment and maintenance of quality of life in chronic non-communicable diseases, including early prediction with the help of biomarkers; Promoting mental health, preventing and reducing the impact of neurodegenerative pathology, accompanied by cognitive decline; Reducing the burden of disease for the chronically ill and those on long-term treatment; Understanding the pathogenic mechanisms of diseases; Management of large volumes of diversified, quality clinical and biological data (with "data sharing"); Interoperability and standardization in the use of new technologies/methodologies.

IMPACT: Access to innovative, sustainable and high-quality healthcare

Increasing the quality of medical services, through personalized medicine; Patient-centered medical system; Access to regenerative medicine services; Digital transformation of health and healthcare services; Ensuring access to health services for vulnerable people and those with special needs; Evaluating health costs and adopting an efficient financing system; Innovative solutions to improve health system resilience, including adaptation to climate change and extreme weather events; Validating and supporting the introduction of new therapeutic approaches into health services.

IMPACT: New tools, technologies, and digital solutions for a healthy society

New preventive health monitoring technologies; Development of medical bioengineering applications; Development of telemedicine; The use of artificial intelligence in medicine; Precision medicine; Personalized medicine; Regenerative medicine; Effective use of medical and molecular data in the system Romanian medical; Assistive technologies for people with vulnerabilities or special requirements; Increasing interoperability and economies of scale in the healthcare system.

IMPACT: Developing an innovative, sustainable, and competitive healthcare industry

Research, development and innovation will aim at: Ensuring a strategic autonomy in the field of essential medicines and local production of vaccines; Cost-effective solutions for the biomedical industry, integrating emerging technologies such as nanotechnologies, customized prostheses, bioinformatics, sensors and wearables; Development of medical technologies for active life; The ability to fight microorganisms with multiple drug resistance; Solutions for spa and medical recovery services; Solutions for the functional food and personalized nutrition services industry; Solutions for the development of medical tourism in Romania.

Field: Culture, creativity, and inclusive society

IMPACT: Consolidated democratic governance

Increasing the transparency of public institutions and public administration in general; Increasing the understanding of governance, including at the level of vulnerable groups; Digital citizenship - the competent use of new technologies in the context of democratic citizenship; New approaches to generate and collect data on community issues; Development of functional mechanisms and tools for involvement, consultation of citizens; Improving participatory mechanisms by adopting some characteristics specific to games ("gamification"); Increasing civic participation in decision-making, with a focus on vulnerable communities;

Development of functional governance systems at the level of public services and processes; Reducing extremist attitude and radicalization directed against minorities; Knowledge of the contribution of national minorities to the development of Romanian society; Promotion of science in society; Promoting the role of science in the foundation of public policies; The development of a political class motivated by convictions.

IMPACT: Development of cultural heritage, arts, and cultural and creative sectors

New forms of education through culture; New transdisciplinary, integrative/holistic approaches to support the sustainable management of cultural heritage, the creation of new cultural products and tools for cultural management and entrepreneurship; Reducing the gap between artistic creativity and the socio-economic environment; Stimulating the development of language skills both in the mother tongue and in foreign languages; Increasing the understanding of common values for the mix: culture, heritage, tourism, economic development; Developing the sense of European identity and belonging; Maintaining cultural diversity; Development of art, design and intangible national heritage; Reducing the illicit traffic of cultural goods and risk management in cases of force majeure; The development of solutions regarding the integration of populations that do not keep up with the pace of technological changes; Recognition and development of heritage in transition; Realizing the connection between technical and artistic innovation, respectively social innovation.

IMPACT: Social and economic resilience

Eradication of learning poverty, the major cause of underdevelopment of human capital; Identifying and creating effective tools in the development of disadvantaged young people; Creating a resilient society by combating the phenomena of "fake news" and pseudoscience; Basing decisions for solving transdisciplinary societal problems; Evaluation of the perspectives of social protection systems through the lens of demographic decline; Assessment of the long-term impact of fiscal policies and macroprudential analysis of systemic risks associated with climate change; Economic and social adaptation to the phenomena associated with globalization; Increasing economic and social resilience to random exogenous, disruptive; Adaptation of educational standards to the accelerated dynamics of the labor market; Understanding the impact of migration and labor mobility on economic and social

resilience; Cultivating national identity and values in a European and universal context; Meritocratic system in the public sector.

IMPACT: Inclusive growth and reducing vulnerabilities

Increasing the quality of education and lifelong learning opportunities; Reducing poverty: Reducing social polarization (with all associated reasons: standard of living, education, health); Combating discrimination; Increasing equality of opportunity and treatment, including the gender dimension; Social integration of vulnerable people and children with special needs; Exploring / understanding the factors that contribute to citizens' well-being, such as social relationships, lifestyle, resilience under stress, physical and emotional health, work-life balance, connecting with nature, spirituality; Increasing employment, ensuring decent jobs for all; Access to culture and science; Development of tools and availability of evidence collection in relation to the implementation of public policies; New ways of developing entrepreneurial culture.

Domain: Civil security for society

IMPACT: Reducing losses caused by natural, accidental, and man-made calamities

Increasing community resilience through information, education and engagement; Risk management associated with technological disasters; Preparation for multi-hazard events under conditions of accelerated climate change; Limiting the impact of extreme weather phenomena (storms, blizzards, tornadoes, extreme temperatures), by developing specific climate services; Reducing the impact of strong earthquakes, through correctly informed decisions, based on science; Reducing CBRNE (chemical, biological, radiological, nuclear and explosive) threats; Development of the flood risk management system; Prevention of laboratory accidents

generating major biological risks; Combating the effects of drought periods and reducing desertification; Prevention and limitation of forest fires.

IMPACT: Facilitating the mobility of passengers and the legal transport of goods, as well as the prevention of illicit trade, piracy, and other criminal acts

Reducing the incidence of major road accidents; Limitation of illegal waste traffic; Early detection and stopping of human trafficking; Reducing the risk of a terrorist attack on passengers and in public spaces; Reduction of illegal traffic (including transit) of goods and raw materials; Limiting migrant smuggling and illegal immigration; Changing perceptions of immigration; Increasing the safety of modular transport; Optimizing road traffic.

IMPACT: Managing crime and terrorism more effectively and improving the resilience and autonomy of physical and digital infrastructures

Reducing corruption in the public sector; Combating organized crime networks; Urban regeneration solutions to increase citizens' safety; Increasing the degree of trust of the population in law enforcement; Combating discrimination in law enforcement; Adapting society to the new hybrid security challenges; Evaluation of the impact of the use of artificial intelligence in collective security maintenance systems.

IMPACT: Increasing cyber security and maintaining a safer online environment

Developing cyber security culture at individual and institutional level; Identifying inciting content from the online environment; Preparing for asymmetric cyber threats; Innovative models for attracting and training specialists in the field of cyber security; Development of cyber security standards in the public sector; Combating cyberbullying; Accountability of suppliers of digital products from the perspective of cyber security; Increasing the population's confidence in the security of data exchanges via the Internet; Reducing the impact of computer attacks on critical infrastructures; New methods to reduce online fraud.

OG2. Supporting innovation ecosystems associated with smart specialisations

Smart specialisations are priorities aimed at building competitive advantage by developing and matching research and innovation strengths with business needs to address emerging opportunities and market developments in a coherent way, while avoiding duplication and fragmentation of efforts.

Smart specialisations are identified through a process of entrepreneurial discovery, a process that, starting from evidence, involves the iterative dialogue of actors from the business environment, research, public institutions, and civil society. The European Commission encourages the development of national / regional research and innovation strategies for smart specialisation as a means of directing the use of public funds towards strategic, integrated investments to harness the potential for smart growth and the knowledge economy in all Union territories.

The Smart Specialisation Strategies for the period 2022-2027 operationalize Policy Objective 1 (OP1) "A more competitive and smarter Europe, by promoting an innovative and intelligent economic transformation and regional ICT connectivity" of the cohesion policy, being part of the enabling condition for accessing FESI. Regulation (EU) no. 1060/2021 establishing common provisions (Article 73) states that in the case of OP1, only the operations corresponding to the specific objectives (i) the development and increase of research and innovation capacities and the adoption of advanced technologies are compatible with the smart specialisation strategies and (iv) the development of skills for smart specialisation, industrial transition, and entrepreneurship.

Romania has decided that it will have synergistic smart specialisation strategies at the level of each development region and at the national level. The strategies promote the following principles:

- cooperation and partnership between actors, intra and intersectoral, to ensure the consolidation and development of research and innovation capacities;
- encouraging research-development-innovation activities that respond to market requirements and societal challenges;
- promoting innovation in all forms – product, process, service innovation, etc.;

- national-regional synergy;
- inclusive and multilevel governance, recognizing the need to create and support a cohesive national-regional system (strategy, implementation tools and entities involved, with concrete and distinct responsibilities).

Challenges

During the period 2014-2020, Romania had the lowest share of RDI funds allocated from ESIF, compared to the countries in the region.

The delayed design of the Roadmap on Research Infrastructures led to non-correlation with the launch of competitions dedicated to them.

The lack of predictability of project competitions did not allow a credible correlation with the needs of the business environment.

The synergies with European and national funds were not operationalized, which also had an effect on the teaming/twinning programmes.

A significant share of the funds was allocated for the procurement of research equipment, without a close correlation with the financing of related activities. There was also a noticeable gap in supporting human resources in research and in developing the provision of scientific and technological services. This misalignment had an impact on the overall sustainability of the initiatives.

Efforts to attract researchers from abroad have been associated with research projects that were relatively limited in scope. These projects were often insufficient in their ability to attract leading researchers as project leaders and to strengthen research teams.

Although there is good practice in organizing open project competitions for national research funds (open calls having oversubscription rates of over 400%), in some cases the project pipeline method was used (obtained through the participatory process of their generation). Although building a pipeline of projects is desirable from the perspective of granting long-term funding, they must not replace open competitions and generate discrimination in the research ecosystem. The decoupling of competitions led to a considerably smaller number of applications and, implicitly, to an even smaller number of eligible projects.

At the national level in the POC 2014-2020 programme, there were two instruments dedicated to the partnership between research organizations and the private sector, namely Partnerships for knowledge transfer and Innovative technological projects, which had a total of 81 contracted projects. The national fields of smart specialisation were also supported by sub-programmes financed from PNCDI III (i.e. Complex R&D projects in partnership, Innovation Vouchers), experience that can be extended in the future to ESIF funds.

In an environment characterized by chronic underfunding of research, particularly in experimental development, public research organizations have a limited pool of researchers. Their efforts are fragmented across numerous short-term projects burdened with bureaucratic complexities. The scant resources are inadequately focused on strategic agendas, and even less so on collaborative initiatives with the business sector. These conditions do not provide a foundation for smart specialisation within this context.

According to the Regional Innovation Scoreboard 2021, all development regions in Romania are included in the category of "emerging innovators". Almost two-thirds of the R&D expenditure and half of the research infrastructures are concentrated in Bucharest – Ilfov. Disparities between regions persist, including differences in the proportion of the population with higher education, scientific output, intellectual assets, employment in medium and high-tech sectors, and knowledge-intensive services. Moreover, there is a declining trend in innovation performance across all regions, which is mirrored in substantial regional disparities in research and innovation.

Romania has 414 enterprises in the field of advanced technologies. Their degree of clustering is high (9th position out of 27 EU countries in 2019), but the supply of specialists is low (23rd/27th place), the number of patents is very small (although 21% of the existing ones are associated with advanced technologies), the survival rate of start-ups is low (position 25/27), and the introduction of new products and services to market is relatively modest (18/27). (Source: EC, Data Dashboard). This underlines that there is untapped potential in terms of advanced technologies.

National-regional correlation

At the national level, the Smart Specialisation component is part of SNCISI and has the role of establishing:

- National *smart specialisation priorities* target sectors or areas that have the potential to generate significant economic and societal impacts, and for which the national collaboration is crucial. These areas are intended to

complement, rather than duplicate, the smart specialisation priorities at the regional level.

- The *directions of actions* supporting national intelligent specialisations, as well as possible synergies with regional funds;
- *Areas of interregional thematic convergence*, basis for joint calls for projects between regions.

At the regional level, the role of each RIS3 is to establish:

- *The vision of regional development* through the lens of smart specialisation;
- *The objectives and directions of action* in view of supporting the diffusion of innovation in regional ecosystems, the mobilization of partnerships between research organizations and the private environment in the area of applied research and experimental development, as well as RDI international inter-regional collaboration;
- *Regional areas of smart specialisation* able to promote economic competitiveness and social development, as well as the double transition (ecological and digital);
- *Mechanisms to facilitate the continuous dialogue* with local actors. relevant for smart specialisation areas, with the aim to support the identification of common goals, and advancing joint initiatives and projects.

The **national-regional correlation mechanism**, respectively **SNCISI** and **RIS3**, is based on the following principles:

At the level of objectives

SNCISI presents a 2030 vision for the national whole, a vision that has associated a series of measurable targets, to the achievement of which all RDI and intelligent specialisation programmes, implemented at national or regional level, including those in international collaboration, contribute. RIS3 strategies have specific targets and compete to achieve national targets according to specific regional objectives.

At the level of funding sources

Smart specialisation is supported at the national level especially through the POCIDIF programme, and at the regional level through the regional operational programmes (POR). SNCIS and RIS3 represent the strategic milestones for the development and implementation of these programmes.

Both at the regional and national level, innovation actors will be encouraged to access funds from other national programmes (PNCDI IV, PNRR, OP Health, POEO 2022-2027, POTJ) and international (Horizon Europe Programme, Interregional and Cross-border Cooperation Programmes, Erasmus+, Invest EU, Innovation Fund - Ministry of Energy, etc.).

Regarding the identification of smart specialisation areas

Three levels are considered:

- *The regional level*, the result of entrepreneurial discovery processes carried out at regional level, basis for regional programmes;
- *The national level*, focused on technologies with a transformative impact, identified through the entrepreneurial discovery process at the national level. This level targets the national programmes supporting smart specialisation (especially POCIDIF);
- *The interregional level*, which includes thematic convergences between certain regions. This level is not identified through dedicated entrepreneurial discovery process, but through the analysis of established domains at regional level, with convergence validation from the ADRs. The interregional level it mainly represents the basis of synergy of funds between regions.

Regarding the updating of the smart specialisation priorities

This is achieved in 2025 and 2027 by:

- Evaluation of the existing fields, both at the regional (by ADRs) and national level (by MCID);

- Entrepreneurial discovery process at the regional level, which also capitalizes on the guidelines and methodologies developed by the DG Joint Research Center (JRC) and DG Regio, European Commission, approved by OM MLPDA no. 3630/18.08.2020;
- Entrepreneurial discovery processes at the national level. It will be focused on frontier technological fields, and will follow the methodology developed within the SIPOCA 592 project;
- Dialogue/Decision of the ADRs facilitated within the CCSI regarding the updating of the inter-regional convergence areas.

Areas of smart specialisation at the national level

National areas of smart specialisation are a key component of SNCSI; component of the European cohesion policy, the smart specialisation aims to stimulate economic growth and job creation.

Smart specialisations at the national level primarily (but not exclusively) target technologically intensive fields (technologies of the future) for which the national dimension of collaboration is important, and which have the potential to produce spillover effects in the economy and society.

The result of the entrepreneurial discovery process at the national level, including the consultation on the multi-criteria evaluation of proposals for smart specialisation fields, is embodied in the following areas and sub-areas of smart specialisation.

1. Bioeconomy

1.1 Technologies for the blue economy

It includes innovative technologies for increasing sustainability and superior exploitation of marine resources- minerals, non-conventional energy, biological.

1.2 Breeding of seeds and breeds

Creation of cultivars/varieties/hybrids/ideotypes of plants and animal breeds better adapted to new challenges in agriculture and forestry, such as climate change, existing biotic and abiotic stressors, the need for healthy food and in increasing volumes and a healthy environment. It also includes the production of genetically improved forest saplings resistant to drought, disease and pests, adapted to extreme conditions and used in ecological reconstruction.

1.3 Technologies for organic agriculture, agroecology, and forestry

Organic farming is a sustainable agricultural production system that supports the health of the soil, ecosystems and people. It relies on ecological processes, biodiversity and cycles adapted to local conditions rather than using inputs with adverse effects. Advanced technologies at the ecosystem complex level contribute to the development of the forestry, hunting, agroforestry and agro-ecological sectors.

1.4 Agriculture 4.0

Agriculture 4.0 represents the new agricultural revolution, integrating precision agriculture, robotics, applications of IoT, big data, blockchain, artificial intelligence and plant imaging technologies. This technological progress will lead to the implementation of specific processes that are more efficient, safe and environmentally friendly and to a better utilization of available resources.

1.5 Safe and sustainable food for a healthy diet

It includes the development of sustainable foods based on healthy dietary concepts, in line with the nutritional/sensory needs of the consumers, with quality standards related to local lifestyles. It pursues the balance between demand and resources, through (1) the development of compositionally reformulated foods to combat nutritional diseases/obesity, (2) the utilization of indigenous/organic raw materials, and (3) the development of systems of authenticity and food safety. Part of this approach, *foodomics* allows the connectivity between food, diet, individual health, by applying "*omics*" approaches such as genomics, transcriptomics, proteomics and metabolomics, epigenomics, lipidomics, interactomics, metallomics and/or diseasomic

2. Digital economy and space technologies

2.1 Microelectronic devices and systems for smart products

It includes devices and integrated circuits, including based on quantum effects, smart sensors, lab-on-a-chip and microsystems. The field is focused on innovative solutions in the design, implementation, testing and characterization of integrated circuits, devices and microelectronic systems intended for the development of smart products.

2.2 Networks of the future, communications, the Internet of Things

It includes applications based on intelligent sensor networks, the Internet of Things and associated forms of distributed computing ("fog" or "edge"), as well as their integration with geospatial technologies, in diverse areas such as: prevention and rapid response to natural disasters, the smart city, vehicle-to-vehicle communication, patient monitoring, etc.

2.3 Technologies for the space economy

The space economy involves innovative technologies in mechanics, mechatronics, robotics, electronics, communications, IT, biology and medicine, materials, radio applications, THz, IR, UV to X and gamma, etc. and has a key role in national security, disaster management, environmental protection, communications resilience, air, sea and land traffic, etc. This also includes robotic operating technologies for the next generation of space exploration vehicles.

2.4 XR Technologies

It includes complex applications of immersive technologies, such as virtual reality, augmented reality, brain-computer interface ("Brain-Machine Interface" - BMI) for the fields: cultural, educational, industrial, therapeutic, and medical, services (entertainment, retail, etc.)

2.5 Artificial Intelligence Systems

It includes artificial intelligence techniques and their applications such as language processing, computer vision, prediction of the evolution of phenomena, recommendation systems, etc. Particular attention will be paid to reliable artificial intelligence systems, defined as technically robust systems, safe, transparent, able to explain the decisions taken and which ensure non-discrimination, diversity, equity, contributing to social well-being.

2.6 Cyber Security

Cybersecurity aims to protect computer systems and networks and manage risks, in the context of growing expanse of vulnerabilities, as a result of rapid digitization and the importance of data as the fundamental resource in the economy and research. Innovation in cyber security includes solutions for automating vulnerability profiling and attack addressing, protecting data flows, identity management, attack recovery and user education.

2.7 Technologies for traceability

This encompasses the utilization of disruptive technologies like blockchain, artificial intelligence, the Internet of Things, and collaborative platforms. These technologies enable the tracking of various products, ensuring authenticity, transparency, and efficiency in value chains.

2.8 Robots and cognitive agents

Cognitive robotics aims to endow robots with artificial intelligence, enabling them to learn and respond to diverse real-world situations. The functions of an intelligent robot include, for example: artificial vision, automatic speech recognition, automatic speech synthesis, anticipation and planning, autonomous movement, human morpho- functional imitation, learning ability, ability to explore on its own.

3. Energy and mobility

3.1 Green mobility

This covers electric and hybrid vehicles, including those utilizing hydrogen, for various modes of transportation. It also includes components related to propulsion systems and their supplementary elements, energy storage systems, and energy management for these vehicles. Moreover, it addresses the integration of such vehicles into smart cities, as well as solutions for interoperability and intermodality in transportation.

3.2 Modern energy generation technologies with low or zero emissions

This encompasses energy conversion technologies and systems from renewable energy sources (hydraulic, wind, solar, biomass, geothermal), energy recovery of hydrogen, use of nuclear energy, low-emission energy recovery of coal and natural gas.

3.3 Digitalisation in energy

Digital solutions for the monitoring and control of energy systems, integrated between the levels of the sector (production, transport, distribution, use) will facilitate the implementation of measures to increase energy efficiency, increase the flexibility of the system, prioritize the consumption of clean energy, and optimize the consumption of users. Digitization allows the implementation of Smart Grids-type functions at the level of electricity transport and distribution, but also at the level of users.

3.4 Energy storage

Energy storage plays a pivotal role in facilitating the integration of renewable energy sources. Several key factors are driving the advancement of energy storage technologies in this field, including endeavors to reduce carbon emissions across economic sectors, the digital transformation of energy systems, and the move toward decentralization, where end consumers actively participate as "prosumers." Storage systems can be chemical, with gravitational potential, with electric potential, at high temperature, with latent heat and of kinetic type.

4. Advanced manufacturing

4.1 Manufacturing technologies for the aeronautical industry

This includes new manufacturing technologies that meet the requirements for the aerospace industry in the context of the "Green Deal" and "Circular Aviation". The technologies aim at both the introduction of new generation materials (poly/multi- functional) and performance over the entire production-use-recycling cycle.

4.2 Digitization and automatization of manufacturing

This encompasses industrial applications of the Internet of Things, industrial robots equipped with artificial intelligence, including autonomous intelligent robots for logistics.

4.3 Advanced Manufacturing Technologies

It includes additive manufacturing technologies, with organic or inorganic materials, and other precision manufacturing technologies, such as: laser technological processing (welding, sintering, coating), machine tools with micron tolerance, etc.

5. Advanced functional materials

5.1 Optoelectronics

This domain encompasses electronic devices that are capable of detecting, generating, and controlling electromagnetic radiation across the ultraviolet, visible, and infrared spectrum. This includes technologies like photonic crystals and photonic integrated circuits. Optoelectronics serves as a bridge between optics, electronics, sensors, communications, lab-on-chip systems, and quantum technologies, finding applications in various fields such as biology, medicine, the pharmaceutical industry, chemistry, material science, and the semiconductor industry.

5.2 Smart composite materials

Smart composite materials exhibit responsiveness to various external stimuli, including mechanical stress, magnetic and electric fields, light, temperature, pH, humidity, and chemical components. They have applications in various sectors: in construction (they are used in building materials with self-repairing, self-cleaning, photoactive, and chromoactive properties, as well as those integrated with built-in sensors), in the textile industry (textiles with antibacterial, self-adaptive properties), electronics/communications, actuators/sensors, medical devices (artificial muscles, smart dressings).

5.3 Recyclable materials and technologies for material recycling

The field aims at the design and development of materials that lead - in the context of their use in the economy - to the implementation of efficient recycling processes and technologies, with low energy consumption and limited pollution. Thus, the aim is also to reduce the dependence on critical raw materials, through the development of alternative green and sustainable solutions in the medium and long term.

5.4 Materials for electronic, electrical, photonic, magnetic and sensor applications

The field includes materials, including bio-inspired, for electrical and electronic components, smart sensors (including biochemical, chemical, and electrochemical), micro- and nanoelectronics devices, photonic components and systems, quantum devices, energy recovery devices, as well as technologies for their integration into applications in engineering, telecommunications, information technology, space and security, quantum technologies, biochemistry, medicine.

5.5 Biocompatible materials

The research aims at the design, modeling, fabrication and characterization of advanced, intelligent, highly functional materials and developments in surface engineering, for bioinspired and biomimetic applications in the medical sector such as: implantable devices, regenerative/personalized/precision medicine, controlled release systems, diagnostics (including bio-imaging), theranostic platforms, biosensors, bio(nano)technologies, solutions in immunology and cosmetics.

5.6 Materials for energy

It includes materials for photovoltaic panels, batteries, fuel cells, superconducting materials, superhydrophobic coatings, thermal insulation materials and other innovative materials with increased functionality in the field of energy production, storage, and transport.

6. Environment and eco-technologies

6.1 Technologies for environmental management, monitoring, and depollution

It includes technologies for monitoring the environment (including through sensor networks and satellite data), as well as those designed to improve the quality of air, water, soil, and complex biological systems and to enable rapid and effective management of contamination situations.

6.2 Technologies for the circular economy

It includes technologies for waste management (such as those for optimized collection and selection, water filtration, biological reprocessing, waste-to-energy recovery, pyrolysis, etc.) and the set of solutions that contribute to reducing waste and increasing the degree of recycling in the value chains associated with electronic products, batteries, packaging, plastic materials, textile products, constructions, food, etc.

7. Health - prevention, diagnosis, and advanced treatment

7.1 Precision surgery

The research area includes surgical robots and solutions of artificial intelligence, imaging, augmented and/or virtual reality with a role in precision interventions in plastic surgery, urology, gynecology, orthopedics, neurology, thoracic surgery, ENT, bariatric, rectal and colon surgery, multiple oncologies, oral-maxillo-facial surgery.

7.2 New generation diagnostic-therapeutic nuclear technologies

It includes the development of technologies for proton therapy – high-energy beams for treating tumors; systemic therapy with radionuclides - radiopharmaceuticals: biomolecules with specific targeting capacity (peptides, antibodies, nanostructures) and therapeutic radioisotopes; Single Photon Emission Computed Tomography (SPECT); Positron Emission Tomography coupled with Computed Tomography (PET-CT) for early diagnosis, therapy monitoring and follow-up; hybrid imaging: PET-CT, PET-MRI and SPECT-CT.

7.3 Longevity medicine

The field aims to extend life and its quality by increasing the body's immunological defense capacity with the help of senolytic products, nutraceuticals, etc.; through cellular and molecular medicine; by quantifying stress and its enduring repercussions, by devising patient-centric and eco-friendly, smart solutions.

7.4 Early diagnosis

It includes functional tests and analyses, imaging, biomarkers, sensors (wearable or implanted), rapid pathogen detection and analysis systems for early identification and screening of diseases such as dementia, cancer, or emerging infectious diseases (with viruses, bacteria and fungi).

7.5 Technologies for autonomous living

The research area includes smart technologies for active and healthy aging and autonomous living of people with disabilities / impairments (physical, cognitive, perceptual), illness or trauma, in all relevant aspects - domestic life, social interactions, mobility, leisure. Technologies

include devices, sensors (and wearables) for monitoring activity, physiological or environmental parameters, robots (companion, collaborative, exoskeleton), artificial intelligence algorithms.

7.6 eHealth

eHealth encompasses the utilization of information and communication technology to enhance the prevention, diagnosis, treatment, monitoring, and overall management of health issues, as well as lifestyle habits that impact one's health. On a technical level, eHealth encompasses various components, such as information networks, data transmission, electronic health records, pharmaceutical services, communication networks between patients, providers, and healthcare institutions, and supportive systems, including those relying on wearable monitoring devices.

7.7 Personalized medicine and genomics

Personalized medicine is a healthcare approach that involves analyzing the unique characteristics of individuals, including their phenotypes (observable traits) and genotypes (genetic makeup), in order to tailor medical treatments to their specific needs. This can include customizing therapeutic strategies to match an individual's characteristics or identifying their susceptibility to certain diseases. Personalized medicine may also extend to individualized nutrition recommendations. It encompasses a range of technologies, including molecular profiling, medical imaging, the use of big data, and ongoing genomics research to better understand and apply this approach...

7.8 Technologies for wearable systems

Wearable technology comprises smart electronic devices that are designed to be worn in close proximity to or on the surface of the skin. These devices have the capability to detect, analyze, and transmit information, often to the cloud, pertaining to bodily signals like vital signs, or environmental data. In some instances, they provide immediate biofeedback to the user. The applications of wearable technology span various fields, including healthcare and fitness, as well as environmental monitoring and the entertainment industry.

OS 2.1. Supporting and encouraging involvement in smart specialisation projects and capitalizing on results

Actions

The support for the development of smart specialisation areas at the national level will be achieved, mainly, through the following actions:

A1. Encouraging the creation of partnerships between research organizations and the private environment to support smart specialisation areas through the development of **Innovation and Technology Centers**. These centers should be coordinated by leaders with scientific and/or business experience. The centers mainly cover RDI activities (including attracting top researchers from abroad), technological infrastructure, human resource development and industry liaison capabilities. In the preparatory phase, it is crucial to formulate a well-defined R&I agenda, an action plan for technology transfer, and devise a strategy for collaboration with industry and end users. This planning should be a collaborative effort between research organizations and businesses. In the partnership associated with innovation and technology centers, the participation of large companies is also supported. These projects should have the goal of conceiving, constructing, and testing prototype models for new or significantly enhanced products, technologies, methods, systems, or services. This support should span the entire journey from the inception of an idea to its successful introduction to the market.

A2. Supporting mobilization for participation in RIS3 partnerships developed at national level and making interregional investments in EU projects through:

- *The development and operationalization of a group of managers of smart specialisation fields* at national level, with the role of monitoring the implementation of interventions and the evolution of ecosystems. They will also facilitate the dialogue with decision-makers.
- The *Smart Specialisation Portal* will be created. This will be an online communication tool, which will serve as a central hub for providing detailed information on national and regional smart specialisation areas. The portal will include information on ongoing projects, results achieved (through inter-operation with the national R&D Registers), communities associated with these initiatives, competition schedules, and entrepreneurial discovery events.
- *Administrative Capacity Strengthening*: Enhance the administrative capacity of the national and/or regional innovation ecosystems by providing training, facilitating the exchange of experiences, and sharing best practices. This training and knowledge exchange should focus on smart specialisation, industrial transition, and entrepreneurship. It aims to equip stakeholders with the skills and knowledge necessary to effectively drive smart specialisation strategies forward.

- *Support for Collaboration Between Research and Private Sector:* Encourage collaboration between research organizations and the private sector through RDI collaborative projects that address areas of smart specialisation. At the regional level, competitions will be launched, targeting specific areas of regional specialisation, with the goal of localizing project results within the respective region. Similarly, at the national level, competitions should be designed to target national areas of smart specialisation.
- *SME Access to Scientific and Technological Experiment Services:* Promote access for small and medium-sized enterprises (SMEs) to scientific and technological experimentation services. This can be facilitated through vouchers that allow SMEs to access these services.

OS 2.2 Support smart specialisation at the level of regions

Action

A1. Increase funding for the specific areas and niches of smart specialisation to unlock the economic potential and enhance regional competitiveness. This funding should be geared towards leveraging the outcomes of scientific research, aligning them with business and economic goals, and ensuring they contribute to sustainable development objectives.

Promoting collaboration between research organizations and the private sector is crucial for nurturing the local and regional innovation ecosystem, as well as for achieving a critical mass. One approach to foster such collaboration consists in the creation of smart specialisation parks.

The Smart Specialisation Strategies of the regions, RIS3, 2022-2027 aim to define interdisciplinary innovation directions that lead to obtaining strongly differentiated products and services, based on local resources. These strategies focus on achieving economic transformation through innovation, capitalizing on sectors and economic activities with innovation potential and drawing on the outcomes of research and development efforts. Simultaneously, they consider unique resources, global challenges, European industrial competitiveness, global trends, and the regional, national, and European context.

These strategies are structured and informed by the findings of socio-economic analyses, comparative advantages of each region, as well as their strengths and opportunities. They aim to provide a coherent and well-articulated response to regional challenges and shortcomings.

The ultimate goal is to establish a strategic vision that not only fosters the smart economic development of each region but also enhances their adaptability to address contemporary societal challenges, facilitating the transition to a knowledge-based economy.

RIS3 initiatives adopt a bottom-up approach, which involves active participation from a wide array of actors within the regional innovation ecosystem. This collaborative engagement takes the form of an inclusive Entrepreneurial Discovery Process (EDP), with the aim of establishing the areas in which focus the investments related to the Specific Objectives (i) the development and increase of research and innovation capacities and the adoption of advanced technologies and (iv) the development of skills for smart specialisation, industrial transition and entrepreneurship within *Policy Objective 1 of the Cohesion Policy "A more competitive and smarter Europe" for the period 2021-2027*.

The complete documents of the regional RISs can be found on the web pages of the ADRs.

North-East Region

The region development **vision** on the horizon of 2027 **states**: "The North-East Region creates, transfers and transposes systematically, sustainably, and socially beneficial innovation in the following Key Areas -Food & Wood Industry, Textiles, Health, Tourism, ICT, Energy and Environment.

The strategy is designed to intervene in the following directions:

P1: The development of human resources for RDI transition, by promoting partnerships for the development/updating of the educational curriculum and synchronizing the training offer with the current technological level in the *Smart priority areas*. It also entails facilitating internships for students across various academic levels, from pupils to doctoral candidates, within industry. Additionally, extracurricular activities that encourage creativity and an innovative mindset will be developed. Pedagogical skills in regional pre-university and university education will be improved, and teaching staff will be introduced to new trends and technologies relevant to smart fields.

P2: Increasing the capacity of companies to innovate and exploit the regional potential for digitization, by developing the capacity of the entrepreneurial innovation ecosystem for the creation, maturation, and internationalization of *start-ups / spin-offs* in areas of smart specialisation. Furthermore, support will be provided for the technological and sustainable development of innovative companies. This includes investments in new technologies, digital transformation, and circular economy solutions.

P3. Increasing the capacity, performance and attractiveness of the regional research and development ecosystem, by strengthening the research-innovation capacity at the regional level, in response to the needs identified in the EDP, promoting collaboration between RDI organizations and the business environment, developing the regional technology transfer capacity.

P4: Increasing the capacity for collaboration and internationalization by providing support for the creation and consolidation of business networks and clusters, promoting RDI interregional and international cooperation. And attracting foreign direct investments.

P5: The development of the administrative capacity at the regional level of the actors involved in the elaboration, implementation, monitoring, evaluation and review of the North-East RIS3 and the development of skills and expertise within entities involved in the Entrepreneurial Discovery Process (EDP).

The areas and niches with potential for smart specialisation, identified through the entrepreneurial discovery process are:

- **Agri-food & Wood Industry.** The identified niches are: Smart-farming, Use of agricultural products for non-food purposes, Impact of agriculture on the environment, Biosecurity and food safety and the Sector forestry and wood industry;
- **Energy.** The identified niches are alternative energy sources, energetic efficiency;
- **Environment.** The identified niches are Water (innovative solutions), Air (innovative solutions) and Economy circular;
- **Textiles.** The identified niches are: High-tech processes and applications in textiles, Technical and functional textiles and Digital fashion;
- **ICT.** The identified niches are: Industrial modernization, Cybersecurity, Traceability and big data, Smart-city and smart-village, Development of new hardware & software products;
- **Health.** The identified niches are: Medical and pharmaceutical biotechnologies, Precision medicine, Preventive medicine, e-Health, Biosecurity (veterinary medicine – human medicine);

- **Tourism.** The identified niches are: IT&C solutions, Marketing and creative promotion, Tourism for a healthy lifestyle, Eco-tourism, Business tourism, Cultural tourism.

South-East Region

Vision: "The South-East Region is aligned with the development trends at the national level and supports the improvement of the capacities and abilities of representatives of the academic, public and private environment and civil society to develop and implement integrated actions of smart specialisation, using an approach based on knowledge."

The strategy is designed to intervene in the following directions:

OS1 - Consolidation of research and innovation capacities. This action focuses on strengthening research and innovation capabilities within the academic, public, and private sectors. Its overarching goal is to support organizations engaged in RDI activities.

OS2 - Increasing the competitiveness of fields with potential for smart specialisation, through the digitization of processes and the use of IT systems. It addresses the transversal strategic priority "Digital transformation by supporting the implementation of information and communication technology (ICT) in smart specialisation areas."

OS3 - Developing human resources skills for smart specialisation, industrial transition, and entrepreneurship. It addresses the transversal strategic priority "Supporting the activity of organizations performing RDI activities."

OS4 - Adoption of advanced technologies (KET) in areas of smart specialisation. It addresses the transversal strategic priority "Consolidate the application of Key Enabling Technologies (KET) in smart specialisation areas."

The areas with potential for smart specialisation, identified through the entrepreneurial discovery process, are structured on three pillars of regional development as follows:

- **Pillar I. Innovation in traditional industries** (Engineering and naval transport, the Garment Industry). The goal is to enhance the international competitiveness of these industries while contributing to regional economic development. It aims to revitalize and modernize traditional sectors by infusing them with innovation;

- **Pillar II. Sustainable development through innovation** (Agri-food and biotechnologies, Aquaculture, fishing, and Tourism). Its objective is to support sustainable development in key regional fields, with the aim of improving the standard of living for all the citizens of the region;
- **Pillar III. Smart society and regional economy through digital transformation** (ICT). Its objective is to support the economic and social development of the region by applying new technologies in key competitive fields.

Bucharest – Ilfov region

Vision: “The Bucharest-Ilfov region will maintain an upward trajectory in terms of innovation performance, with the goal of achieving a level of innovation that is at least 70% of the European Union (EU) average.”

The strategy has the following objectives:

- **Consolidation of the regional RDI capacity**, through the creation and development of R&D, technology transfer infrastructures, and innovative clusters; Support the process of generating, exploiting, and disseminating knowledge;
- **Support for a competitive regional economy**, by providing support for the creation of new innovative enterprises and improving the performance of the existing ones;
- **Digital transformation of the economy and society** by supporting the adoption of digital technologies in enterprises and local public authorities;
- **Strengthening the cooperation and competences of actors in the regional R&D ecosystem** by improving the skills and abilities of human resources involved in smart specialisation areas, industrial transition, digitalisation and entrepreneurship; support for a collaborative regional innovation ecosystem.

The entrepreneurial discovery process has identified specific areas and niches with significant potential for smart specialisation in the region. These areas and niches include:

- **Information and Communication Technology (ICT):** Cybersecurity IT solutions; Digital monitoring and control products and services for the environment and agriculture; Systems, applications, and platforms in the field of medicine and human well-being; Creation and development of proprietary digital products and applications of the future; Transforming the economy through digitization and leveraging the potential of new technologies, including artificial intelligence, cloud computing, blockchain, and more;
- **Cultural and creative industries:** Creative solutions and products (including digital) for stimulating human sensations and senses, with applications in health, education, social integration, and audio-visual media; The development of new formats and interactive technologies to preserve and promote cultural diversity for cultural preservation and tourism development; New approaches in spatial arrangement, design, advertising and artistic creation;
- **Intelligent systems and components:** New manufacturing systems and technologies, robotic and automated equipment and components; Sensors, components, micro-opto- electro-mechanical systems (MOEMS) and nano-opto-electro-mechanical systems (NOEMS); Products that include advanced manufacturing processes and electronic, optoelectronic, mechatronic and cybermechatronic systems with applications in various fields (including: health, culture, automotive, environment, construction, agriculture, storage);
- **Advanced materials:** Smart, connected, and ecological packaging and labels; Materials intended for the prevention, diagnosis and treatment of medical conditions; Innovative and/or circular materials with applications in various fields;
- **New foods and Food safety:** Foods and ingredients that are safe, functional or with a special nutritional purpose; Technologies and innovative production methods of food products;
- **Health:** Biotechnology, generic tools, and medical technologies (detection, diagnosis and monitoring; innovative therapeutic approaches and

interventions, etc.); It's health; Development of innovative prophylactic and therapeutic products (vaccines, therapeutic serums, probiotics, food supplements, etc.).

South Region – Muntenia

Vision: “The South-Muntenia region innovates and consolidates its economic competitiveness domestically and internationally, by developing the regional innovation ecosystem, the skills for the green and digital transition to a circular economy and improving the framework conditions for smart specialisation.’

The objectives and measures identified are:

- **Priority 1. Improve the framework conditions for smart specialisation**, by implementing the following measures: Consolidate the administrative capacity of actors involved in the design, implementation, monitoring, evaluation and revision of smart specialisation strategies and the Entrepreneurial Discovery Mechanism (MDA); Support the enhancement of the skills of Quadruple Helix actors (business, academic and research environment, public sector and civil society) involved in the entrepreneurial discovery process; Periodic implementation of the entrepreneurial discovery mechanism at regional level; Develop the monitoring and evaluation systems for Smart Specialisation Strategy.
- **Priority 2. Strengthen the human capital for the transition to the knowledge-based economy**, through various measures, including Development of the school curriculum and professional training to prioritize creativity and adaptability to emerging technological trends; Educational programmes designed to stimulate entrepreneurship skills and competencies, innovation and digitalization of education; Development and consolidation of the dual education system.
- **Priority 3: Foster the growth and maturity of the regional innovation ecosystem** through various measures, including: Enhancing the capacity of the entrepreneurial ecosystem to rapidly create and develop start-ups and spin-offs in areas of smart specialisation; Support the sustainable development of the business environment by promoting innovation, technological modernization, and digitization; Strengthen the collaboration between the innovation research system and the business environment, to

enhance their capacity for innovation; Develop the regional capacity for technology transfer, enabling the effective transfer of knowledge and technology from research institutions to businesses; Implement financial instruments to improve access to financing for the regional innovation ecosystem; Enhance the efficiency of public services through digitization and interoperability, making them more accessible and user-friendly; Support the development and operationalisation of clusters, competitiveness poles, and business networks to foster collaboration and innovation among businesses. Promote interregional and international cooperation to facilitate knowledge exchange, collaboration, and the sharing of best practices.

The areas and niches with potential for smart specialisation which were identified through the entrepreneurial discovery process are:

- **Manufacturing of machines, components, and production equipment.** The identified niches are smart and safe, electric cars, components and equipment for the automotive industry;
- **Agriculture and Food Industry.** The identified niches are precision agriculture, functional foods - new healthy and nutritionally enriched food products;
- **Tourism and Cultural Identity** - The identified niches are innovation services in the tourism industry, innovative solutions for the valorization of cultural heritage, integrated cultural tourism, spa/bathing, as well as opportunities for active tourism;
- **Bioeconomy: the development of the circular economy** - The identified niches are Biotechnologies in agriculture, Industrial Biotechnologies, Biotechnologies oriented towards environmental protection, pollution reduction and waste recovery;
- **Smart cities that offer innovative services to citizens** - The identified niches are: Environmental technologies for smart and green towns (energy efficiency, renewable energies), Smart public services, Smart housing;

- **High-tech Industry and Research** - The identified niches are: Advanced production methods and technologies, Advanced materials, Innovation in the aerospace industry, Innovation in the nuclear industry;
- **ICT** - The identified niches are Industry 4.0, Cyber Security, Digitization, *Big data* (Fintech and GIS), New ICT products and services;
- **Health** - The identified niches are Biotechnologies and medical and pharmaceutical Bio nanotechnologies, Biosecurity, Intelligent medicine, Preventive/personalized medicine.

South-West Oltenia Region

The Vision: “The South-West Oltenia Region will accelerate the processes of economic transformation, by supporting investments in research and innovation for sustainable and inclusive growth.”

The general objective is to ensure the optimal framework for the development and the implementation of innovative actions and activities at the region level. This involves creating preconditions to guarantee their long-term viability, with the aim of fostering sustainable development within the region.

- **Priority 1: Support for strengthening research-innovation capacity at the regional level** by promoting collaboration between RDI organizations and the business environment supporting research and innovation structures;
- **Priority 2: Development of the technology transfer capacity and streamlining *know-how transfer***, by promoting technology and *know-how transfer*, developing support infrastructure for technology transfer;
- **Priority 3: Enhance the competitiveness of the business environment and support the industrial transition** through research-innovation activities and investments in enterprises, required for the validation of an innovative concept in SMEs, and for increasing the SMEs competitiveness;
- **Priority 4: Support for digitalisation - digital economy** (funding investments related to the adoption of digital technologies and tools in companies, supporting investments in ICT technologies, IoT, automation, robotics,

artificial intelligence, industry 4.0, advanced production methods, etc.), digitalisation for the benefit of citizens;

- **Priority 5: Consolidation of the innovation ecosystem**, through the development of human resources, (training, internships, mentoring for researchers etc.), promoting interregional and international cooperation in the R&D field.

The areas and the niches which were identified through the entrepreneurial discovery process as having potential for **smart specialisation**, are:

- **Transport systems.** The identified niches are: Vehicles and components for vehicles; Vehicles and technologies for rail transport;
- **Industrial Engineering and Materials.** The identified niches are: Systems, installations, equipment, machines/ equipment for construction and other industries; Systems, processes, installations, equipment, for environmental technologies/environmental protection; Systems, equipment, technologies for the agri-food, aeronautical, sanitary sector; Advanced materials, composites; Recovered materials, materials from bioresources;
- **Agri-food.** The identified niches are: Safe, healthy, nutritionally optimized (functional) foods; New varieties (including hybrids) resistant to the effects of climate change; Organic farming; Food quality control; Biofertilizers, biocatalysts; Use of agricultural products for non-food purposes; Conservation and protection of nature;
- **Health and wellness - healthy lifestyle.** The identified niches are: Personalized drug therapies; Active aging and healthy lifestyle, SPA treatments; Solutions and systems to combat the spread of infections; Prevention, diagnosis, and treatment of non-communicable and rare diseases (including genetic diseases); Active aging and healthy lifestyle;
- **ICT and Digitization.** The identified niches are: Smart city, smart village; Innovative products in the IT field, with an emphasis on the fields of environment, energy, heritage, tourism; Digitalisation of the economy;

- Creative industries. The identified niches are: Cultural and creative activities, creative solution and products.

At the RIS SV Oltenia level, the Green Economy and the Circular Economy have been identified as transversal fields, their developments conditioning the proper functioning of the proposed intelligent specialisation sectors.

Western Region

The vision on the horizon 2030 "The Western Region becomes a national benchmark in innovation, research, and development, by creating an innovative regional ecosystem, capable of generating knowledge, efficiently leveraging local resources and assets, and providing strong support for sustainable economic growth."

The objectives and measures identified:

The main objective is to narrow the productivity and competitiveness gap between the West Region's economy and the EU. This will be achieved by (1) developing a regional ecosystem that stimulates and supports RDI activity, (2) capitalizing on the competitive advantages of sectors with the most potential for growth in the region, (3) enhancing the added value of production and services within these sectors.

The strategy outlines a combination of support measures to promote Research, Development, and Innovation and enhance the competitiveness of small and medium-sized enterprises. Additionally, it aims to facilitate the transition to higher value-added activities, ultimately fostering sustainable economic growth.

- **AP 1: Strengthening the regional RDI capacity:** creation of a Regional Innovation Agency, development of R&D infrastructure in all areas with potential, Activation of existing infrastructure; enhancing services for the market; skill enhancement for staff and implementation of a business model for infrastructure management; Creation of robust networks comprising innovation and technology transfer entities to assist companies through the entire process of innovation, from research to production; Support for collaboration between the business sector and RDI organizations; formation of partnerships and networks/consortia; Strengthening, diversifying, and upgrading the skills and capabilities of the workforce; Development of four

competence centers catering to students and pupils; Development of R&D infrastructure in areas with potential.

- **AP 2: Increasing the competitiveness of enterprises through innovation:** increasing the innovation capacity within enterprises (product, service, process, organizational, *business model*), by developing mechanisms that stimulate the companies' demand for innovation; support the cooperation between SMEs at the associative level; support the creation and the growth of innovative start-ups/spin-offs; support for the development of clusters;
- **AP 3: Supporting the digitalisation of the economy and society:** support the digitalisation in enterprises active in the regional smart specialisation sectors; deploy *smart* solutions for the development of local communities;
- **AP 4: Increasing the competitiveness of smart specialisation sectors:** customized investments and support packages aimed to increase the competitiveness and productivity of SMEs, considering the unique characteristics of each sector; supporting and developing business support service structures in the RIS3 fields.

The areas and niches with potential for smart specialisation identified through the entrepreneurial discovery process are:

- **Agriculture and Food Industry.** The identified niches are: biotechnologies and improvement of agricultural products and development of animal husbandry, biosecurity and certification of varieties, processing of local and other value-added products, production of biofuel from plants.
- **Energy efficiency and sustainable buildings.** The identified niches are: smart buildings, new models and technologies for modular buildings, smart energy networks;
- **Manufacturing/processing industry.** The identified niches are: advanced and technical materials, industrial design and production, new production technologies and customized production, *3D printing*;
- **ICT and Automotive industry.** The identified niches are: IoT, automation / robotization, artificial intelligence, *big data*, virtual reality, autonomous cars,

intelligent transport systems, communication equipment manufacturing, system design, customization and programming;

- **Cultural and creative industries.** The identified niches are: artistic design and creation, support infrastructures for creative communities;
- **Tourism, Health and Quality of Life.** The identified niches are: *wellness* and medical tourism, innovative treatments for degenerative diseases, emerging technologies in medical IT, e-health.

Center Region

The vision: “The region consolidates and capitalizes on its innovation potential, adopts changes of the technological and industrial paradigm; smartly and sustainably promotes the regional specificity”.

The objectives and measures identified by RIS3 are:

- **Objective 1. Support the knowledge creation and the innovation** in the regional excellence sectors. Although the region is a modest innovator, with declining innovation performance over time, some territorial nuclei of innovators are identified at regional level. The action tries to consolidate the existing nuclei and support the creation of new ones;
- **Objective 2. Industrial modernization of regional excellence sectors:** the region has a high degree of industrialization. While the region has a substantial industrial base, there's room for improvement, particularly in terms of robotization and digitization among local SMEs, which currently lag behind the EU average.
- **Objective 3. Integration in regional, European and global knowledge flows** - The number of RDI and technological transfer structures increases and benefits from enhanced visibility;
- **Objective 4. Innovation for sustainable communities** - there is an important natural capital, as 35% of the surface of the Central Region is covered by forests, with high potential to produce energy from biomass and solar sources.

- **Objective 5. Support the digitalisation of the economy and society** - There is growth in the Business Process Outsourcing (BPO) sector. Digital literacy among the population remains low, with less than one-third of individuals aged 16 to 74 in the Central Region possessing basic digital skills. The challenge is to improve digital literacy and leverage technology for economic and societal advancement.

Horizontal priorities and actions

- **Horizontal priority 1. Increasing the capacity of the regional ecosystem to support smart specialisation in a sustainable manner.** It involves support for RDI infrastructures of RDI organizations and companies, as well as the development of science and technology parks, technology transfer structures with enhanced capacity to provide specific services, of innovative clusters and other innovation-oriented partnerships structures with increased capacity to generate innovation;
- **Horizontal priority 2. Supporting the technological and digital advance in the economy and society.** The focus is on supporting technology transfer within companies, facilitating the transformation of ideas into market-ready innovations, fostering the industrial modernization of SMEs, and promoting digitalization in the economy and society.
- **Horizontal priority 3. The creation of stronger and more innovative local communities.** This priority aims to create stronger and more innovative local communities by promoting the development of innovative start-ups, fostering proximity within value chains, driving sustainable economic growth in the region, and advancing the digitalisation of communities.
- **Horizontal priority 4. Facilitating international cooperation for innovation and economic growth.** This priority seeks to facilitate international cooperation by creating synergies with European programmes that support innovation, integrating into knowledge and innovation networks, encouraging participation in international value chains, facilitating the global expansion of regional companies, and enhancing the capacity of regional organizations to engage in international projects.

- **Horizontal priority 5. Education and training for smart specialisation.** This priority focuses on enhancing the regional education system's ability to respond to evolving skills needs within sectors of excellence. It promotes skill improvement (*upskilling*) and the acquisition of new skills (*re-skilling*) through formal and non-formal lifelong learning initiatives.

The **areas and related niches**, which were identified through the entrepreneurial discovery process as having **potential for smart specialisation**, are:

- **Automotive industry and mechatronics.** Potential niches: Mechatronics, Industry 4.0, electric mobility;
- **The Food Sector.** Potential niches: ecological agriculture, the improvement of short chains through digitization and social innovation, the creation of new products, Bioeconomy;
- **The aeronautical industry,** Potential niches: Robotics for aeronautics, New technologies used in Aerospace and in other fields, New composite materials (e.g., supercapacitors), Inclusion of nano- technologies in aviation components;
- **Forestry, Wood Processing and Furniture Industry.** Potential niches: Industrial Advanced Technologies, Bioeconomy;
- **IT and Cultural and Creative Industries.** Potential niches: video games;
- **Light industry.** Potential niches: medical textiles, automotive textiles, textiles for industrial constructions;
- **Health sector.** Potential niches: Balneology/preventive and recuperative medicine, Nutritional medicine, Personalized medicine, Telemedicine, Regenerative medicine;
- **Sustainable built environment.** Potential niches: Sustainable communities, Circular economy, New Building Materials;
- **Tourism.** Potential niches: integration of digital technologies, use of Augmented Reality and Virtual Reality technologies, innovative tourist products and services.

Additionally, RIS 3 Center Region recognizes the potential for synergy and capitalizes on it through cross-sector themes that address shared requirements across various sectors, fostering the innovation process. The cross-sector thematic areas formulated within the entrepreneurial discovery process are the following: Sustainable Economy, with the fields Collaborative Economy, Circular Economy, Local Value Chains, Medical Technologies, Preventive and Recuperative Medicine, Industrial Modernization, with the fields Modernization of production processes through new technologies, New product development, New prototyping and testing technologies, Digitization, Energy and the built environment.

North-West Region

Vision: *"The north- West Region will evolve from the status of emerging innovator to a competitive technological economy. This transformation will be achieved through the adoption of cutting-edge digital solutions, sustainable practices, fostering collaboration, and supporting innovators and innovation."*

The strategic objectives are designed to bridge the gap between the vision and the practical steps outlined in the action plan.

- **Strategic Objective 1: Structural Transformation of the Economy.** Promote innovation and technological adoption in response to key societal and economic challenges. Embrace sustainability and the principles of the circular economy to drive economic transformation.
- **Strategic Objective 2: Developing the Regional Innovation Ecosystem.** Strengthen the regional innovation ecosystem, fostering collaboration and knowledge exchange. Establish connections with national, European, and global innovation networks.
- **Strategic Objective 3: Enhancing Research Capacity.** Develop research capacity to boost the region's innovation potential. Effectively capitalize on research outcomes to drive innovation.
- **Strategic Objective 4: Leveraging Digitization.** Maximize the benefits of digitalisation in both the public and the private sector. Promote the adoption of digital solutions and technologies to enhance competitiveness and efficiency.

These strategic objectives contribute to the achievement of the region's vision, facilitating a shift towards a competitive and technologically advanced economy. It will be achieved using the following instruments.

- Specific instrument 1. The development and growth of research and innovation, as well as the adoption of advanced technologies:
 - Investments in research and innovation, but also in entrepreneurial universities;
 - Pilot lines, early product validation, technology transfer;
 - Ready to use digital technologies;
 - Development of *Living Labs* and *Test beds concepts*;
- Specific instrument 2. Leveraging the advantages of digitalisation, for the benefit of citizens, companies and research organizations and public authorities:
 - ICT adoption in SMEs through all 3 types of interactions: *business2business*, *business2consumer* and *consumer2consumer* (B2B; B2C; C2C)
 - development of e-government tools;
 - development of *e-inclusion*, *e-health*, *e-learning*, *e-skilling tools*;
- Specific instrument 3. Intensification of sustainable growth and competitiveness of SMEs, such as and job creation in SMEs, including through productive investments:
 - support the development of new companies, start-ups/scale-ups;
 - development of support processes for industrial clusters;
 - improving the entrepreneurial discovery process;
 - facilitate access to financing and advanced services for businesses;
- Specific instrument 4. Developing skills for smart specialisation, industrial transition and entrepreneurship

- Development of innovation management on SMEs;
- training, retraining for smart specialisation areas;
- the integration of education and training institutions into the innovation ecosystem.

The areas with potential for smart specialisation identified through the entrepreneurial discovery process are structured on three pillars, as follows:

- **Pillar I – Innovation for health and well-being**, with the fields: Health; Agri-food; Cosmetics and food supplements;
- **Pillar II – Development of emerging sectors**, with the fields of: Advanced production technologies and New materials;
- **Pillar III – Digital transformation: Regional digital agenda**, with the field Information and Telecommunications Technology.

For each of the 6 fields, specialisation niches have been identified and are presented in the RIS3 NV strategy.

OG 3. Mobilization towards innovation

OS.3.1. Encouraging and facilitating collaboration between research organizations and the private sector to participate in innovation projects and capitalize on the outcomes

Challenges

In the 2014-2020 cycle, there were few funding instruments dedicated to the partnerships between businesses and research organizations, and those that did exist were underfunded and lacking predictability. This situation has resulted in a widening gap between the RDI activities conducted by the public sector and the demands of the private sector. As a result, the opportunities for sustained collaboration have diminished, including the possibility to achieve the critical mass required for common interests and objectives.

In the European Innovation Scoreboard 2021, Romania occupies the lowest position regarding the number of innovative SMEs that collaborate with others as well as the number of SMEs that introduce product or business process innovations.

The share of innovative enterprises in total SMEs is very low; the share of SMEs introducing innovative products and/or processes is currently 4.6%, compared to the current EU average of 35.6%.

There are no records regarding technology transfer between multinational companies active in Romania (which are also the main innovators) and SMEs/ Start-ups.

The number of public-private co-publications per 1 million inhabitants is 4 times lower than the EU average, a ratio correlated with the gap in the number of researchers.

Actions

Supporting and encouraging public research organizations and the private sector to collaborate in innovation projects and the capitalization on the results will be achieved, mainly, through the following types of actions.

A1. Support the collaborative projects between research organizations and the private sector. Support for collaborative projects that involve both research organizations and the private sector. These projects have the objective of designing, building, and testing prototype models for new or substantially improved products, technologies, methods, systems, or services, and span across the entire process from the initial concept to bringing these innovations to the market.

A2. Support enterprises to launch new products, services on the market, including: (1) Preparing the launch of a minimum viable product (MVP) with the aim of market validation; support for (2) *the go to market stage* and (3) continuous development.

A3. Support R&D initiatives, coming from the public/private environment, that aim to explore and validate ideas with commercial potential, particularly at the pre-spin-off stage.

A4. Supporting SMEs, by financing projects with a high degree of innovation, with the potential to achieve concrete results, with a real impact on the market, by offering innovation vouchers allocated for the purchase of services from public and private knowledge providers.

A5. International Patenting Support vouchers for SMEs. This action entails granting international patenting vouchers to SMEs interested in patenting the outcomes of their R&D activities.

A6. Solving Business-Defined Problems: Support is provided to research organizations or consortia, which may include both research organizations and businesses, for projects that address specific challenges or problems defined by businesses.

A7. Supporting SMEs to develop their own RDI capacities, including through access to programmes that promote intersectoral and international researcher mobility.

A8. Open innovation mechanism. Development of an open innovation mechanism, which involves a staged selection process, designed to address innovation needs identified by the public sector. Projects with a strong practical focus, such as transferring innovations to economic operators, and experimental and demonstrative projects, are supported through this mechanism.

OS 3.2. Development of technological and knowledge transfer at the national level to increase the visibility of results and their impact in the economic environment

Technology transfer is the mechanism through which research outcomes generated by knowledge producers are introduced into the economic sector circuit. The effectiveness of technology transfer is assessed by various indicators, such as the number of license agreements, partnerships, creation of *spin-off/ spin-out companies*, consulting services; technology feasibility studies; providing technical expertise; transfer of new technologies developed in universities/institutes, intellectual property management support services, licensing contracts with industry; innovation audits.

Challenges

The technology transfer (TT) system is poorly developed; this is also reflected by the low visibility and impact of the results in the economic sector.

The absence of training programmes aligned with international best practices has resulted in a deficiency of professional technology transfer experts. This knowledge gap hinders the development and growth of this field. Furthermore, public investments in transfer centers have predominantly been focused on infrastructure acquisition, while relatively less attention has been given to the advancement of competencies among professionals in this field and in the associated support services

The lack of a unitary executive management of the technology transfer system affects its performance by fragmenting institutional procedures and the path of research results from idea to market.

The lack of a culture of collaboration and trust affects the transfer of research results to the *business environment*.

Actions

The development of technological and knowledge transfer at the national level, with the goal of enhancing the visibility of results and their impact on the economic environment, will primarily be realized through the following types of actions:

A1. Unified Process for Technology Transfer. Establish a unified process for the development, management, and monitoring of technology transfer activities at the national level within the relevant public authority. This includes creating and providing necessary framework documents and procedure models, such as license agreements, collaboration agreements, and intellectual property commercialization models, in consultation with technology transfer centers.

A2. Support Research-Private Sector Partnerships. Encourage partnerships between research organizations and the private sector, which will facilitate the development of projects that promote the transfer of technology and knowledge.

A3. Professional Networking and Knowledge Exchange. Promote professional networking between the university and business sectors to introduce new ideas, knowledge, methods, initiatives, and procedures related to technology transfer (i.e. twinning programme).

A4. Professional Training Programme. Implement a nationwide professional training programme for technology transfer center experts. Support will be given to technology transfer centers to support the salaries of experts attending professionalization courses, contingent upon meeting certain performance indicators.

OS 3.3. Support for innovative entrepreneurship

Challenges

Low Survival Rate of start-ups. In Romania, there is currently no critical mass of innovative start-ups, which could contribute to the creation of a mature and functional entrepreneurial

ecosystem. According to the EU Startup Monitor, Romania has a very low rate of survival of innovative start-ups on the market, with only few of them managing to survive over the 5-year threshold. This can be attributed to various reasons, including limited access to support services, difficulties in securing financing; high level of bureaucracy, legislative unpredictability, inadequate corporate governance, the lack of sound business models and skills.

Regional disparities. Start-ups are concentrated in certain regions, particularly Bucharest-Ilfov and the North-West, regions which also concentrate the majority of venture capital investments. These regions host three quarters of the active acceleration and incubation structures in the country.

Limited Venture Capital Market. The Venture Capital market is at an early stage in Romania, with few active venture capital providers.

Innovation Culture. Romania lacks a widespread culture of innovation entrepreneurship. This hinders the development of a robust and dynamic entrepreneurial ecosystem. Additionally, formal education programmes related to innovation entrepreneurship are still relatively underdeveloped.

Limited coherence of the start-up funding mechanisms, which affects the medium and long-term sustainability of supported start-ups.

To support innovation entrepreneurship and promote the growth of innovative start-ups, the following actions will be considered:

A1. Financial Support for Incubation and Acceleration. Provide financial support to incubation and acceleration programmes that nurture and develop innovative start-ups with potential for growth.

A2. Balanced Funding Between Research Organizations and the Private Sector. Establish a co-participation programme in domestic venture capital funds to ensure balanced funding for research organizations and the private sector.

A3. Public Co-participation in Domestic Venture Capital Funds: Encourage public co-participation in domestic venture capital funds, including those established in partnership by universities, research institutes or consortia.

A4. Training in Innovative Entrepreneurship: Support training activities in innovative entrepreneurship, particularly by integrating courses into formal education curricula. Focus on practical skills and knowledge related to product development and launch.

A5. Legislative Revisions for Start-ups: Revise start-up legislation to align with the EU definition and adopt European best practices. This should cover areas such as innovative start-ups, Business Angels, crowdfunding, and other components to attract investments.

A6. Building a Community of Innovation Professionals: Develop a community of professionals from public and private R&I organizations directly involved in innovation activities. Facilitate their access to international ecosystems of innovation and entrepreneurial training, potentially through partnerships with top global universities.

At the same time, coordination is ensured to create synergies between financing instruments from various sources to facilitate the access of start-ups for funding, at different stages of development.

These actions aim to create a conducive environment for innovation entrepreneurship, strengthen the start-up ecosystem, and enhance the support system for innovative start-ups in Romania.

OG4. Greater collaboration at European and international levels

The objective is to enhance the competitiveness of Romania's R&D system by fostering greater integration within the European scientific community, attraction of external resources (talent, funding, know-how), and increasing Romania's involvement in European and international collaborative initiatives that address global challenges. To achieve this objective, the following interventions are planned: Interventions supporting increased participation in the EU Framework Programme for Research and Innovation (Horizon Europe), in other European and international RDI cooperation programmes and frameworks and smart specialisation are envisaged. Another line of action is the design and implementation of joint bilateral and multilateral thematic calls in partnership with countries and regions that have existing scientific and technological cooperation agreements with Romania.

OS.4.1. Increasing participation in EU RDI programmes. Synergies with Horizon Europe and other RDI programmes coordinated at European and international level

Challenges

Romania has a low participation in the EU RDI Framework Programme: the funds attracted from Horizon 2020 represent only 0.46% of the EU total and there are many Romanian participants with very low or even zero funding. The participation in fundamental research funded by H Europe (ERC grants) and breakthrough innovation (EIC) is weak. Similarly, the participation in Marie Skłodowska-Curie is very low (only 0.59% of the EU total). Capitalizing on the opportunities offered by the "Spreading excellence and widening participation" actions and the synergies between the Framework Programme and structural funds is below its potential.

Participation in P2P ("public-to-public") partnerships associated with the Horizon 2020 Programme exceeds the European average in terms of the number of networks and the number of applications, but not in terms of the absorption rate. Unfortunately, there are no studies or analyses available to conduct an impact analysis on Romania's participation in European public-private partnerships.

Romania and its regions are also insufficiently represented in the partnerships created around the RIS3 agendas at European level (i.e RIS3 thematic platforms, EIT communities, KICs, cluster partnerships, etc.). In 2018, Romania attracted from abroad approx. 92 million euros, of which around 70% from European Commission programmes, around 25% from foreign companies and 5% from other international organizations from abroad. Unlike Romania, other Eastern European countries are much more competitive in attracting R&D funds from foreign companies; for example, in 2018, Romania attracted approx. 23 million euros, far below the funds attracted by Croatia (approx. 65 million euros), Bulgaria (approx. 119 million euros), Poland (approx. 151 million euros), Hungary (239 million euros), the Czech Republic (over 1000 million euros).

The reimbursable financing opportunities offered through the financial instruments of the Horizon 2020 Programme (InnovFin) and the European Fund for Strategic Investments (EFSI) were poorly used by companies and other eligible entities in Romania, placing Romania on 21st place among EU member states, measured by the share of mobilized investments.

Actions

Increasing participation in European Union programmes in the field of RDI will be supported, mainly through the following actions:

A1. Enhancing the synergies with the Horizon Europe Programme, ERDF, FSE+, in the 2022-2027 programming framework. This action will include:

- financing those project proposals that have received the "Mark of Excellence" (SoE);
- promoting synergies with the "Extending participation/spreading excellence" Pillar of the Horizon Europe Programme. This involves actions such as attracting renowned foreign researchers through ERA Chairs and supporting the establishment of centers of excellence through Teaming actions;
- recognizing and rewarding from the state budget the outstanding performance in participating in the Horizon Europe Programme. This provides additional support to institutions to strengthen their capacity for project implementation and attract top researchers
- Leveraging multiple funding sources to encourage participation in future European Partnerships and Missions within the Horizon Europe Programme, fostering cumulative funding and institutionalized collaboration.

A2. Supporting participation in ERA-NET/ ERA-NET Cofund, JPIs, Eureka, Eurostars, Lead Agency Procedure, etc. projects, within the limits of the applicable legislation.

- Support the implementation of the ERA political agenda and the pursuit of the alignment to the principles and priorities set out in the Pact for Research and Innovation in Europe, in line with the new ERA vision. To facilitate this, the establishment of the "ERA Forum for Transition" will enable coordination with fellow EU member states. This coordination aims to prioritize investments and reforms in support of the dual transition and recovery priorities.
- Design of the methodological and operational framework that defines the governance, selection, decision-making, implementation, monitoring, and evaluation mechanisms for Romania's engagement in European Partnerships.
- The operationalization of synergies with other European programmes that support RDI and with international programmes such as EEA, Swiss and

Norwegian grants, NATO Science for Peace and Security programme, NATO Innovation Fund, the European Defense Fund, etc.

- Promote the participation in RIS3 partnerships at European level and the "Interregional Investments in EU projects".
- Ensuring the continuity and sustainability of Romania's participation in interdisciplinary research organizations and programmes (CERN, ESA, etc.).

OS.4.2. Development of bilateral/multilateral collaborations for RDI and RIS3

Challenges

The potential for cooperation through bilateral/multilateral programmes established at inter-governmental (and/or inter-regional) level is insufficiently exploited. Despite the fact that Romania currently has around 60 scientific cooperation agreements with European and non-European countries, the allocations for bilateral collaborations represent only 0.05% of the total government expenditure for R&D, in comparison to the European average of approx. 0.65%. Collaboration with third countries and global R&D leaders is limited. In the 2014-2020 period, there were no complex bilateral/multilateral projects financed in Romania, only mobility projects. Actions are needed to develop bilateral/multilateral collaboration, which provides opportunities for targeted networking in international R&D projects.

Actions

The development of bilateral/multilateral collaborations for RDI and RIS3 will be achieved mainly through the following actions:

A1. Development of bilateral/multilateral cooperation considering the national needs and strategic partnerships.

A2. Supporting mobility projects and complex bilateral/multilateral projects with global leaders in R&D and with other national strategic partners, including through the use of *Lead Agency Procedure mechanisms*, within the limits of the relevant legislation.

A3. Providing support for bilateral and multilateral initiatives aimed at defining and implementing shared research agendas. These initiatives will involve countries participating in

the EU Strategy for the Danube region, and non-EU countries within the scope of the EU neighborhood policy. This includes fostering research collaborations with the Republic of Moldova, Western Balkan countries, and others.

A4. Enhancing research cooperation through bilateral arrangements with the Republic of Moldova. This involves the establishment of a joint collaboration programme with the Republic of Moldova, promoting access to and utilization of Romania's existing research infrastructure by Moldovan researchers engaged in collaborative research projects.

A5. Foster collaboration with countries in the Black Sea region to implement the Common Maritime Agenda for the Black Sea. This will specifically involve the research component outlined in the Strategic Agenda for Research and Innovation in the Black Sea.

OS.4.3. Support for participation in European and international projects with the aim to strengthen the capacity of RDI actors

Challenges

The reduced participation in the Framework Programme and other transnational RDI programmes is explained, inter alia, by the lack of National Contact Points (NCPs) dedicated exclusively to this activity, as well as by the lack of experience in drafting quality proposals for participation in international research programmes. Enhancing the capacity of RDI actors to engage in European and international projects requires the establishment of a sustainable support system. This system will offer assistance to project initiators and participants, encompassing various aspects such as providing guidance, disseminating valuable information, conducting training programmes on project proposal writing, and facilitating the identification of suitable partners for project consortia formation.

Actions

The support for participation in European and international projects will be carried out through the following actions:

A1. Strengthening the network of Horizon Europe National Contact Points (NCPs), including the assignment of dedicated staff for this role.

A2. Expanding the network of support centers for international projects within high-performing public research organizations to ensure comprehensive coverage across Romania.

A3. Establishing "one-stop-shop" center in each development region to facilitate the engagement of regional stakeholders in national and international research and innovation programmes. These centers will work in coordination with the NCP network, Enterprise Europe Network (EEN), technology transfer centers, and international project support centers.

A4. Supporting Romania's active representation in European and international organizations, cooperation frameworks, and ad hoc groups related to research and innovation.

6

Expected results

OG1 aims to enhance both individual and institutional performance within the Romanian research system. It seeks to attract and retain highly qualified human resources by offering support at various stages of researchers' careers. Additionally, it promotes the transition to open science while upholding the highest research quality standards.

To increase the competitiveness of research organizations, the strategy emphasizes the need for objective evaluations, predictable funding based on performance, and the establishment of centers of excellence. These centers are intended to concentrate resources around research agendas at the scientific forefront, which are closely aligned with societal challenges and smart specialisation priorities.

Moreover, the Strategic Research Agenda aims to align research and innovation activities with key societal challenges, including demographic changes, climate change, social welfare and inclusion, healthcare, food security, ecological sustainability, digitization, technological advancements, and more.

OG2 focuses on promoting smart specialisation at the national and regional levels by fostering partnerships between research organizations and the private sector. These partnerships aim to establish innovation and technology centers, led by individuals with scientific or business expertise. These centers are comprehensive, encompassing RDI activities, technology infrastructures, digitalization, development of human resource development, and industry collaborations. National smart specialisations primarily target emerging technologies that have a broad impact on local industries, particularly within regional smart specialisation sectors.

OG3 is dedicated to enhancing innovation within the private sector through diverse public-private partnerships. These partnerships are designed to introduce new products, processes, and services to the market, attract and train talents, facilitate intersectoral mobility, enhance the technology transfer capacity of public research organizations, engage businesses in addressing societal challenges, implement twinning programmes for innovative ideas, and establish standardized procedures for technology transfer. Public research organizations become valuable partners for businesses seeking to develop new products and services, making innovation entrepreneurship an attractive option. The outcomes of these efforts enable enterprises of all sizes to contribute to Romania's digitalisation and the transformation of its economy toward sustainability.

OG4 aims to increase the competitiveness of the national RDI system by strengthening the European integration of the Romanian scientific community. It also seeks to attract resources from abroad and increase Romania's contribution to solving global challenges. This is achieved by participating in projects that align with Horizon Europe and other European and international

programmes. Additional measures include establishing a comprehensive operational framework for governing and evaluating Romania's participation in European Partnerships and Missions, supporting centers dedicated to international projects, and representing Romania in relevant European and international organizations and initiatives.

The expected results are presented in annex no. 3 Action Plan of SNCISI.

7

Indicators

The strategy integrates a range of indicators and targets that are linked to specific objectives and actions, identified within both the national and regional RIS3 frameworks. These indicators serve as tools for monitoring and evaluating the implementation of the strategy.

The set of indicators encompasses different categories, including: system Indicators (drawn from national, European, or OECD statistics); output, outcome indicators. These indicators and associated targets play a crucial role in tracking the strategy's effectiveness and its alignment with overarching goals and objectives.

8

Governance

SNCISI governance, monitoring and evaluation adopts the principles of multi-level national regional governance. The implementation of SNCISI is carried out through plans and programmes at national and regional level. The **responsible institutions** are: Ministry of Research, Innovation and Digitalisation, Ministry of Education, Ministry of Investments and European Projects, Ministry of Agriculture and Rural Development, Ministry of Entrepreneurship and Tourism, Ministry of Health, other ministries line that implements sectoral CD plans, the Romanian Academy, the Regional Development Agencies (ADR).

Challenges

Lack of coordination with other national strategies

In order to produce impact, science and innovation policy must go beyond the sectoral approach, connecting to strategic challenges in areas such as health, energy, digital, agriculture, entrepreneurship, industry, etc.

Likewise, the development of human resources for R&D and smart specialisation is intrinsically linked to the quality of education and especially doctoral studies.

It's essential to clarify the principles and mechanisms of national-regional correlation in the smart specialisation areas.

The capacity for strategic analysis and coordination at the level of the research authority level must be consolidated. This includes attracting and continuously training a body of experts in fields like science and innovation policy, innovation entrepreneurship, research-industry collaboration, and monitoring and evaluation.

There's a pressing need for predictability in funding and mechanisms for strategic updates based on the results of monitoring and evaluation (M&E).

Previous R&D strategies and plans were developed with assumed R&D expenditure allocation targets, which were not met in practice. The significant reduction of public funding has not only caused uncertainty within the RDI community but has also led to structural imbalances.

The need for clarification and rigor of the strategic decision flow associated with SNCISI

There's strong requirement for greater clarity and rigor in the strategic decision-making process associated with the National Strategy for Research, Development, and Innovation (SNCISI). Since there isn't a centralized monitoring system that covers the entire research, innovation, and smart specialisation system, and responsibilities for evaluation are not clearly defined, along with the proliferation of advisory councils, and the increased complexity of RDI policies,

it is crucial to establish a well-defined decision-making flow for monitoring, evaluation, and implementation of strategic adjustments as deemed necessary.

Actions

A1. The establishment of an inter-ministerial committee, coordinated by the Minister of Research, Innovation and Digitalisation, to ensure coordination with various strategies and plans developed in SNCISI-related fields, so that all entities that have responsibilities in the field ensure the completeness and coherence of RDI interventions. This committee will provide rigorous oversight and be able to act to improve the performance of the RDI sector, leading to more effective interventions and ultimately sustainable results. At the same time, coordination is ensured regarding the synergies between the various funding funds/sources so that the funded interventions in the RDI field are coherent and convergent.

An inter-ministerial committee, under the coordination of the Minister of Research, Innovation, and Digitalisation, will be established. Its purpose is to coordinate activities across various strategies and plans related to the SNCISI. This committee will ensure that all entities responsible for RDI activities work together to maintain the completeness and consistency of RDI initiatives. The committee will also provide rigorous oversight and will have the capacity to act with the aim to enhance the RDI performance, resulting in more effective interventions and ultimately sustainable outcomes. Simultaneously, it will facilitate coordination and synergy among various funding sources to ensure that funded RDI initiatives align and work together effectively.

To ensure the correlation of smart specialisation strategies:

- The regional strategies for intelligent specialisation align to the SNCISI objectives; They may include objectives and complementary activities derived from regional development visions, complementary to SNCISI; Regional operational programmes have specific targets and indicators, established by the performance framework of these programmes, correlated with RIS3 targets and indicators, contributing to the achievement of national indicators and targets;
- The national fields of smart specialisation are updated including the input regionally, in the national entrepreneurial discovery process (MCID);
- The Coordinating Committee on Intelligent Specialisation (CCSI) will formulate recommendations (to MCID, regions and other programme coordinating institutions) regarding national-regional correlation and

coordination, to increase the impact of RDI and intelligent specialisation policies.

To ensure that smart specialisation strategies are effectively aligned and correlated:

- Regional Smart Specialisation Strategies must align with the objectives of the National Strategy for Research, Innovation and Smart Specialisation (SNCISI). These regional strategies may include objectives and supplementary activities that originate from regional development visions, which complement the SNCISI. The Regional Operational Programmes should establish specific targets and indicators, in line with the performance framework of these programmes, that are correlated with the targets and indicators of the Regional Innovation and Smart Specialisation Strategies (RIS3). This correlation should contribute to the achievement of national-level indicators and targets.
- The national fields of smart specialisation should be periodically updated to include input from the regions, ensuring their participation in the national entrepreneurial discovery process (MCID).
- The Coordinating Committee on Intelligent Specialisation (CCSI) will be responsible for formulating recommendations addressed to MCID, regional authorities, and other programmes coordinating institutions. These recommendations will focus on enhancing national-regional correlation and coordination, with the aim of maximizing the impact of RDI and smart specialisation policies.

A2. The development of the strategic analysis and coordination capacity of the Ministry of Research, Innovation and Digitalisation to meet the responsibilities regarding the development and coordination of the implementation of SNCISI, as the state authority for research-development, innovation, as follows:

a) Monitoring the overall strategy implementation:

The Ministry will coordinate the National Register System for RDI and integrate the annual reports from managers of the programme associated with the strategy into the Annual Report on the progress and results of SNCISI.

b) Assessment and updating of SNCISI's priority areas:

The evaluation of the strategy begins with the assessment of related measures and programmes, as well as the RIS3 regional strategies. These assessments will be conducted in the years 2025, 2027, and 2029.

In accordance with the evaluation schedule, proposals for updating priority areas will be developed as follows:

- The revision of national-level Smart Specialisation fields will begin by evaluating the dynamics of existing priorities, continuing the entrepreneurial discovery process at the national level (MCID), including consulting MCID's advisory councils.
- At the regional level, the entrepreneurial discovery process will be continued by the Regional Development Agencies (ADRs), who will update the RIS3 and provide input to MCID for the SNCISI update.
- The Strategic Research Agenda will be updated through a continuous co-creation dialogue facilitated by MCID; MCID's advisory councils will also be consulted, as appropriate.

c) Updating the objectives, directions of action and strategic targets

The governance system and the inter-institutional dialogue will ensure the national-regional coherence of the recommendations regarding updates of strategic objectives, actions and possible priorities, as resulted from the EDPs. The multi-level governance system includes MCID Advisory Councils.

The following MCID advisory councils will develop recommendations:

- ***The Coordinating Committee on Smart Specialisation (CCSI)*** regarding policies and programmes associated with smart specialisation and, in particular, national regional correlation;

- *The Consultative College for Research, Development and Innovation (CCCDI)* will provide recommendations regarding the overall development of the national R&D ecosystem;
- *The National Council for Scientific Research (CNCS) and the National Council for the Financing of Higher Education (CNFIS)*, will provide recommendations especially regarding scientific research in higher education and increasing the performance of universities;
- *The National Council for Technological Transfer and Innovation (CNTTI)*, which, for a greater differentiation of the mission from the CCSI, will formulate recommendations in the field of technological transfer, science parks, incubators, accelerators, as well as policies to support venture capital and of the innovative entrepreneurship culture;
- *The Romanian Committee for Research Infrastructures (CRIC)* will focus on policies related to research infrastructures;
- *The Council for Open Science (CSD - new body)* will support the development of transition policies towards open science;
- *The National Council of Ethics of Scientific Research, Technological Development and Innovation (CNECSDTI)*, whose current role will be expanded in the direction of supervising the implementation in Romania of the *European Charter for Researchers* and *The Code of Conduct for the Recruitment of Researchers*.

Based on the SNCISI monitoring and evaluation reports and the recommendations of the advisory councils, MCID:

- will synthesize a position document, with recommendations regarding the updating of SNCISI and implementation programmes; the updated documents will be open to public consultation, according to the law;
- will ensure the correlation of SNCISI with sectoral strategies and policies.

The implementation of SNCISI will be achieved mainly through:

- **The National Plan for RDI 2022-2027** (PNCDI IV) developed and administered by MCID and implemented with the help of programmes managers;
- **The sectoral R&D plans of the ministries** (Ministry of Agriculture and Rural Development, Ministry of Health, Ministry of Education, Ministry of Research, Innovation and Digitalisation, Ministry of Internal Affairs, Ministry of Economy, Ministry of Entrepreneurship and Tourism, Ministry of Labor and Social Solidarity, etc.), developed and implemented by these ministries;
- Just Transition Operational Programme;
- Education and Employment Operational Programme;
- Health Operational Programme;
- Programmes of the Romanian Academy of Scientists;
- Romanian Academy Programmes, which will be elaborated by the Romanian Academy;
- The RDI priorities of the Smart Growth, Digitalisation and Financial Instruments Operational Programme developed by the Ministry of European Investments and Projects in collaboration with the Ministry of Research, Innovation and Digitization. It will be implemented by the entity designated as Management Authority and Intermediate Body for Research
- RDI priorities from the Regional Operational Programmes developed by the Ministry of European Investments and Projects. They are implemented through entities designated as Management Authorities and Intermediate Bodies;
- The RDI components of the National Recovery and Resilience Plan of Romania, which will target structural transformative investments at the level of the RDI system and will ensure complementarity with all the programmes that will finance the RDI sector in Romania;

The implementation tools for SNCISI, mentioned above, are provided in annex no. 2. The correlation of the implementation tools with the specific objectives of the strategy is described in annex no. 3.

In order to increase predictability, multi-annual plans for the project competitions will be prepared.

The multi-level governance system of smart specialisation strategies is established as follows:

1. ***The coordination structures***, responsible for approving strategies and supervising the strategic process, integrating activities, monitoring and evaluating smart specialisation strategies. These structures, based on representativeness, are:
 - At national level: Coordination Committee for Smart Specialisation (CCSI). This receives input from the other Advisory Councils subordinated to MCID, which will be involved in the process of approving smart specialisation priorities at the national level;
 - At the regional level: the Regional Innovation Consortium that approves and the Council for Regional Development that approves the RIS3 in each development region.
2. **Strategic management structures:**
 - MCID which, according to the law, is responsible for the elaboration, coordination and implementation of SNCISI;
 - Regional Development Agencies, responsible for the implementation of the ROP, as well as the coordination of the development and implementation of RIS3;
 - Romanian Academy;
 - Line ministries for specific sectoral programmes;
 - Management Authorities and Intermediary Bodies that coordinate and implement Operational Programmes involving RDI activities.

3. *The operational management structures* that manage the activities and ensure the coordination of SNCISI implementation.

At national level:

- Specialized departments of MCID will ensure the operational management of the SNCISI. The activities will include drafting/updating/revision and approving of the SNCISI, implementation of the national EDP mechanism, monitoring and evaluation, etc.;
- Management Authorities and Intermediate Bodies for the operational programmes will ensure the implementation of the smart specialisation component at the national level, financed by European funds;
- MCID departments will ensure the implementation of RDI programmes financed from the state budget for R&D;
- MCID specialized departments for the implementation of PNRR.

At the regional level:

- the Regional Development Agencies;
- the Management Authorities and Intermediate Bodies for the operational programmes, will ensure the implementation of the smart specialisation component at the regional level, financed by European funds;
- the ADR specialized departments will ensure the management of RIS3 at the operational level, through activities such as: elaboration/updating/revision and approval of RIS3, carrying out the regional EDP mechanism, monitoring and evaluation of RIS3.
- the specialized departments within the Regional Development Agencies (ADR) will be responsible for managing the Regional Innovation and Smart Specialisation Strategies (RIS3) at the operational level. This includes tasks such as creating, updating, revising, and approving RIS3, conducting the regional EDP process, and overseeing the monitoring and evaluation of RIS3.

9

Monitoring and evaluation

Monitoring

Challenges

Although progress has been made in the development of the management information systems (i.e., MySMIS, EVOC, ERRIS, Brainmap – Register of results), the RDI system as a whole still has low transparency. This lack of transparency extends to both the direct outcomes associated with programmes and projects and the essential components of the system, including organizations, individuals, research infrastructures, and innovation infrastructures. Current IT management systems are not fully interoperable; the collection of data is not conducted systematically, lacks consistency, and does not adhere to the requirement that the collected data should be accessible to all interested parties. Under these circumstances, it is challenging to support evidence-based policies effectively or to demonstrate the added value to society and the economy and the overall impact of RDI initiatives.

General principles

To establish an effective monitoring system during the 2022-2027 period, the following actions will be taken:

- *Standardization of the collection of primary data* for the mobilized resources and the achieved results, across various RDI funding programmes, as well as associated with the periodic reports of public research organizations. This harmonization will enable consistent calculation of target indicators at the programme level and, through aggregation, at the SNCISI level. It will also prevent redundant data reporting.
- *Implementation of computerization and interoperability* across all reporting systems within RDI funding programmes, covering everything from project applications to implementation and post-implementation stages. This includes holding accountable the institutions coordinating these programmes, clarifying reporting responsibilities for beneficiaries, and outlining verification mechanisms.
- *Comprehensive monitoring of progress at the beneficiary level*, with the aim of facilitating subsequent impact assessments.
- *Development of dedicated capacities for statistical analysis and forecasting*, which will capitalize on the existing information and will support policy decisions;

- *Increasing transparency and improving communication regarding the status of the RDI system.*

Complementary to the monitoring of the interventions, it is necessary to *develop a system for periodic collection of qualitative data, by survey, from the RDI system*. These data will focus on various aspects, with an emphasis on human resources (doctoral students, researchers, technical staff, research managers, innovation facilitators), innovation activities from the private sector.

National-regional correlation at the level of monitoring mechanisms:

- SNCISI has a common nomenclature of indicators, with measurable targets. This nomenclature includes indicators and targets associated with specific objectives and actions, identified at both the national and regional levels within the RIS3, to facilitate effective monitoring of outcomes on a national scale. Through this shared framework, the monitoring and evaluation system of SNCISI will identify the specific contributions of RIS3 strategies to the achievement of national targets.
- Each RIS3 includes monitoring indicators and targets associated with specific objectives and actions;
- The Ministry of Research, Innovation, and Digitalisation will monitor the regions' contributions towards achieving measurable targets outlined in the SNCISI vision. This will be supported by data from the national register system.
- The underlying data for the indicators are collected at the specific programme level and are designed to be interoperable.
- SNCISI's role is to coordinate and harmonize these diverse systems. This will involve creating a standardized monitoring and evaluation methodology and a uniform data collection mechanism for smart specialisation. This will prevent redundancies, enable their utilization, and facilitate regional-level analysis.
- The funding programmes (POR, POCIDIF, PNCDI IV, PNRR, etc.) will feed data to the national register system. Access to these data will be available to all relevant stakeholders, while adhering to personal data access policies.

Components of the monitoring system

The SNCISI monitoring system will ensure the interconnection and interoperability of all primary IT systems with the RDI National Register System. It will have the following components:

- **The nomenclature of SNCISI indicators**, detailed in Annex No. 1, facilitates the consistent collection of data. The nomenclature includes both system indicators (obtained from the national/European/OECD statistical systems), as well as output and result indicators, that can be reported directly by the beneficiaries of the initiatives under the SNCISI-associated programmes, both at the national and regional levels.

The Ministry of Research, Innovation, and Digitalisation (MCID) will be responsible for developing and updating the methodological guidelines for collecting primary data.

- **Collection systems of primary data associated with funding programmes**
 - The funding programmes, associated with national and regional programmes, will have a dedicated IT system.
 - The SMIS/MySMIS system will ensure the data collection for all axes of national and regional operational programmes that support RDI.
 - The EVOC system (UEFISCDI) will ensure data collection for the PNCDI IV programmes.
- **The RDI national registers system** ensures the integration of data collected by various primary IT systems, provides a dashboard (aggregated indicators, geographic visualizations, etc.), allows ad-hoc queries for all interested parties (government, ministries, strategic committees, MCID advisory boards, national and regional implementation bodies, RIS3 coordinators, RDI community, etc.).

The primary IT systems will be interconnected and interoperable with *the RDI National Registers System*. This system coordinated by MCID includes but is not limited to: the Register of Results, the Register of R&D Organizations, the Register of Researchers, Innovators and Entrepreneurs - components of BRAINMAP and the Register of Research Infrastructures ERRIS.

- **Qualitative and quantitative data on the dynamics of R&D ecosystems** will include, but will not be limited to, surveys/ questionnaires, studies at the level of R&D human resources and innovative enterprises, prospective analysis of global technological trends and their relevance for Romania and its strategic objectives for sustainable development.

Based on the collected information, using in particular the Integrated Platform developed by MCID, the report on the implementation progress and results of SNCISI is compiled.

Evaluation

At the level of the funding programmes and the strategy, the evaluation will be performed periodically.

National-level programmes and regional/national operational programmes for RDI funding will undergo a mid-term evaluation by March 2025 and a final evaluation at the end of the implementation period, in 2029. These evaluations will be conducted independently and will be based on self-assessment reports and evaluations provided by programme coordinators (MCID, RDI funding agencies, MIPE, ADR, Romanian Academy, Ministries with sectoral programmes, and others).

The assessment of progress in national and regional smart specialisation priorities will be carried out in 2025 and 2027, both at the national level (under the coordination of the MCID) and at the regional level (under the coordination of the Regional Development Agencies).

The evaluation will focus on the thematic focus as a result of the project calls, the resources attracted and the results obtained from the funding, the dynamics of the local, regional and national innovation ecosystems.

The result of the first evaluation (year 2025) and its consolidation (2027), will lead to the differentiation of the subfields as follows:

- *Functional niches of smart specialisation*, where there is a critical mass of actors and outcomes that support advancement in global value-added chains.

- *Emerging subfields*, in which there are a number of project applications, but the critical mass required to integrate research and innovation effectively with the needs of the business environment has not yet been achieved.
- *subfields that lack support from project proposals*. These subfields may be proposed for reevaluation or elimination.

The evaluation of regional strategies (in 2025, 2027, and 2029) will involve independent experts hired by the Regional Development Agencies. This evaluation will integrate, in addition to the results of the dedicated funding programmes and the evaluation of the smart specialisation area at regional level, the achievement of the strategic objectives and the advance towards regional vision.

The evaluation of SNCISI (in 2025, 2027, and 2029) will be contracted by MCID. This evaluation will integrate information from the evaluations of RDI programmes, of regional strategies and areas of specialisation at regional and national level. It will have a summative role, assessing various aspects, at the implementation level (allocated resources, programme implementation, policies, administrative capacity), but also result and impact (targets achieved) and the thematic focus at the national level.

10

**The continuous
process of
entrepreneurial
discovery**

To update the smart specialisation priorities during the 2022-2027 period, several activities are required at both the national and regional levels:

1. **Facilitating Project Generation** in close correlation with the competition calendar.

Thus, at least one project generation focus-group will be organized annually for each major specialisation area. The methodology used may be similar to that developed by the JRC (Methodological guidelines for the organization of entrepreneurial discovery focus groups, 2019). In addition, the project generation dialogue will also support the effort to test/calibrate interventions based on community feedback and input from managers of national smart specialisations.

It is important to emphasize that the facilitation process will not replace the launch of open competitions with independent evaluators, ensuring accessibility to these project calls to all interested parties, regardless of whether they participated in the respective workshops.

2. **Periodic updating of specialisations (in 2025 and 2027).**

This process will be based on the evaluation of existing fields and subfields, doubled by the identification of new fields with potential for smart specialisation (starting from the Qualitative Periodic Reports on the dynamics of the RDI ecosystem).

The participatory process will involve:

- *Workshops for recalibration* of the objectives and the definition of roadmaps for functional or emergent niches.
- *Workshops with an exploratory character* for the new (sub)fields identified through the *Analysis of innovation-intensive fields in Romania and their correlation with global technological trends*.
- At the national level (and optionally at the regional level), consultation to validate the results of the workshops, using/adapting the multi-criteria argumentation methodology used in 2020.

The ongoing entrepreneurial discovery process will be overseen by the Ministry of Research, Innovation, and Digitalisation (MCID) at the national level and by the Regional Development Agencies (ADRs) at the regional level.

To update the areas of specialisation based on the outcomes of the entrepreneurial discovery process, the MCID will take the lead at the national level. This process will include consultation with the Coordinating Committee on Smart Specialisation (CCSI). At the regional level, the ADRs will be responsible for the updates, incorporating input from the Regional Innovation Councils and seeking information and consultation with the CCSI.

11

Budget implications and funding sources

The actions necessary for the implementation of SNCISI will be funded through various means, including state budget, non-reimbursable external funds, public-private partnerships, and other funding sources identified as necessary during the implementation. The financial provisions will be incorporated in accordance with applicable regulations.

Details regarding the implementation instruments and indicative budgets can be found in Annex No. 2.

12

Legal Framework Implications

The strategy has been developed in compliance with the existing legislation and does not result in modifications to other currently valid normative acts.

The adoption of the strategy ensures the necessary conditions for the operationalization of the plans and programmes outlined in annex no. 2.

Annexes no. 1-3 are an integral part of this strategy.

ANNEX 1. Nomenclature of SNCISI indicators

Indicator	Code	Source
SYSTEM		
Funding Resources		
Public Research and Development Expenditures (%GDP)	S1	Eurostat/INS
Private Research and Development Expenditures(%GDP)	S2	Eurostat/INS
Expenditures for Venture Capital (% GDP)	S3	Eurostat/INS
Funds for non-R&D innovation (% business turnover)	S4	Eurostat /INS
Human Resources in R&D		
Number personnel involved in Research and Development (full time equivalent), out of which: researchers in the government/higher education/business sector	S5	Eurostat / INS
Number of PhD graduates per year	S6	Eurostat / INS
Research Infrastructures		
Cumulative value of research equipment owned by the public sector	S7	INS
The average usage rate of the R&D infrastructures with a current value above 500,000 euro, owned by the public sector, out of which for R&D activities and technological services	IS-I 1	ERRIS
Publications		
Number of articles published and indexed in the Web of Science / year	S8	Web of Science

Number of publications in the top 10% most cited publications (% of total publications)	S9	Web of Science
Number publications in the top 1% most cited publications (% of total publications)	S10	Web of Science
Number of citations of articles in patents (and legislation)	S11	Derwent
WoS publications with international co-authorship (number/1 million inhabitants)	S12	Web of Science
WoS co-publications public-private	S13	Web of Science
Share WoS articles, published in open access regime	S14	Web of Science
Intellectual property rights		
EPO Patent Applications (number/year)	S15	Eurostat
PCT patent applications (number/1 billion euro GDP adjusted at purchasing power parity)	S16	Eurostat
Community trade mark applications (number/1 billion euro GDP adjusted to purchasing power parity)	S17	Eurostat
Design applications (number/1 billion euro GDP adjusted at purchasing power parity)	S18	Eurostat
Internationalization		
Participation rate in Horizon Europe (share of Romanian organizations in total participants)	S19	European Commission
Index of the funds attracted from Horizon Europe relative to the 2014-2020 average	S20	European Commission
Number of European Research Council awards	S21	European Commission

Number of organizations participating in the European Partnerships (Horizon Europe associates)	S22	European Commission
The national public expenditure for transnationally coordinated R&D programs, as share of total R&D government expenditure, broken down on:		
Funds allocated for participation in transnational R&D organizations	S23	Eurostat
national R&D public funds for joint programmes and European partnerships, including interregional investments in EU projects.		
R&D funds for bilaterall and multilateral public programmes		
Interregional investments for innovation in EU projects	RCO96	SRN
Number of foreign researchers attracted	S24	SRN
Top research organizations		
Number of universities in the Academic Ranking of World Universities (ARWU) 1000	S25	ARWU
Number of organizations in the Top Scimago 500	S26	Scimago
Innovation in the private sector		
SMEs which introduce innovative products and/ or processes (%)	S27	Eurostat / INS
SMEs which introduce marketing or management innovations (%)	S28	Eurostat / INS
SMEs which introduce innovations inside its own organisation	S29	Eurostat / INS
Sale of new products for the market or for the company (% turnover)	S30	Eurostat /INS

Employment

Employment in companies with rapid growth (% of total employment)	S31	Eurostat / INS
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Employment in high- and medium-high technology manufacturing sectors (% occupancy)	S32	Eurostat / INS
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Employment in knowledge-intensive service sectors (% occupancy (% employment))	S33	Eurostat / INS
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Export

High-tech exports - Exports of high technology products as a share of total exports	S34	Eurostat / INS
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Exports of high and medium - technology products as a share of total exports	S35	Eurostat / INS
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Exports of knowledge-intensive services services (% service exports)	S36	Eurostat / INS
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RESULT (PROGRAMMES)

Funding Resources

Private funding complementary to the public funding (from which: grants, financial instruments)	RCR 02	SRN
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Human Resources

New R&D jobs created in the beneficiary entities (Full time equivalent)	RCR102	SRN
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Apprenticeship programmes in SMEs that benefit from financing (full time equivalent)	RCR 97	SRN
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SMEs employees, who have completed training programs for skills in smart specialisation, industrial transition and entrepreneurship (by type of skills: technical, management, entrepreneurship, ecological, others)	RCR 98	SRN
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Research Infrastructures

Nominal value of equipment for research and innovation	RCO08	SRN
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The value of research equipment put into operation	IS-P0	SRN
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Publications

Web of Science indexed articles, of which:

in open access regime	IS-P1	SRN
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international co-publications		
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Scientific articles with openly published research datasets	IS-P2	SRN
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Books, out of which published in WoS	IS-P3	SRN
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Book chapters, of which WoS indexed book	IS-P4	SRN
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Proceedings conferences, of which international conferences	IS-P5	SRN
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Publications of the funded projects	RCR 08	SRN
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IPR

Patent applications	RCR 06	SRN
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Community trademark applications	RCR 07	SRN
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Top Research Organisations

Number of organisations in the first 30% top Scimago	IS-I 1	SRN
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Innovation in firms

SMEs which introduce innovative products and/ or processes (%)	RCR 03	SRN
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SMES which introduce marketing or management innovations (%)	RCR 04	SRN
SMES which introduce innovations inside its own organisation	RCR 05	SRN
Newly created firms still on the market	RCR 17	SRN
SMEs using the services of business incubators	RCR 18	SRN
Enterprises with increased turnover	RCR 19	SRN
SME with increased value added per employee	RCR 25	SRN
Number of prototypes/demonstrators	IS-P6	SRN
Sales associated with products and services incorporating project innovations (3 years after project completion)	IS-P7	SRN
Number of transferred technologies	IS-I2	SRN
Value of licensing or sale of intellectual property rights (for transferred technologies)	IS-P8	SRN
Number of spin-offs from public research organizations	IS-I3	SRN
Number of spin-offs from companies	IS-I4	SRN, RECOM

Employment

Newly created jobs in the organisation which received funding	RCR 01	SRN
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Exports

Value of exports of products that integrate innovation (in the third year after the end of the project)	IS-P9	SRN
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ANNEX 2. SNCISI 2022- 2027 IMPLEMENTATION INSTRUMENTS

SNCISI 2022-2027 IMPLEMENTATION INSTRUMENTS

ALLOCATED BUDGET

1.	National Plan for Resilience and Recovery (NPRR)	approximately 259.43 million euros
2.	Smart Growth, Digitalisation and Financial Instruments Operational Programme (POCIDIF)	approximately 2591000 million euros
3.	Eight Regional Operational Programmes (POR)	approximately 2200 million euros
4.	National Plan for RDI IV	approximately 12000 million euros (*the estimated budget is based on a gradual annual increase in CD public expenditure by approximately 0.14% of GDP, in the period 2022-2027, to reach the set target of 1% in 2027)
5.	Romanian Academy Programmes	approximately 400 million euros (over the whole SNCISI implementation period)
6.	Transition Operational Program (POTJ)	approximately 200 million euros
7.	Education and Employment Operational Programme (POEO)	approximately 40 million euros
8.	Sectoral Plans of the Ministries	approximately 120 million euros (*total budget over the whole SNCISI implementation period)
9.	Programmes of the Romanian Academy of Scientists	approximately 12 million euros (*over the whole SNCISI implementation period)
10	Health Operational Program (POS)	approximately 386 million euros

Annex 3 – Plan of Actions for the National Strategy of Research, Innovation and Smart Specialisation 2022-2027

ACTION	EXPECTED RESULTS	RESPONSIBLE INSTITUTIONS	IMPLEMENTATION INSTRUMENTS	IMPLEMENTATION PERIOD	EVALUATION STAGES
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OG1. Development of the RDI system

OS.1.1. Increasing the number and scientific competence of researchers in the RDI ecosystem in Romania by training and attracting research talent

<p>A1. Increasing the number of researchers in the Romanian R&D ecosystem by training and attracting research talent will be achieved through:</p> <ul style="list-style-type: none"> Support provided at various research career stages, including recent PhD graduates, researchers with postdoctoral experience, senior researchers with high performance in their field; Grants for young researchers, to aid their integration in R&D organizations, through consolidation institutional research programmes; Grants dedicated to young research teams, as well as targeted support for clinical research. <ul style="list-style-type: none"> Increasing the overall performance of researchers by stimulating and sustaining their participation in professional training; Increasing the performance in the research activity of doctoral students, an important component of the research system, will be achieved by: <ul style="list-style-type: none"> Promoting partnerships between universities, National R&D Institutes, Institutes of the Romanian Academy, and private organizations engaged in research within Ph.D. programs. This aims to maximize the utilization of existing resources, including personnel and infrastructure. 	Increased number of researchers				
	Increased number of jobs in RDI Increased number of jobs in RDI				
	Increased percentage of researchers active in the Romania and reaching the level of 'leader'	Ministry of Research, Innovation and Digitalisation	PNCDI IV		Evaluation of progress in 2025 and 2027
	Mobility and training projects for funded doctoral and postdoctoral researchers	Ministry of Education Romanian Academy	Romanian Academy Programmes		Mid Term evaluation 2025
	Revised legislative and institutional framework to ensure the implementation of European regulations in the field of research and innovation Creation and development of research groups with international performance and potential for excellence	R&D public and private research organisations Ministry of European Investments and Projects Ministry of Health	Academy of Scientists of Romania PNRR POS	2027	Final evaluation at the end of the implementation period 2027

<ul style="list-style-type: none"> o Support for creating new jobs and retaining existing ones, as a horizontal action, applicable to all forms of financing; o Enabling access for doctoral students to training programs abroad, within excellent research groups and laboratories; o Encouraging full-time involvement of doctoral students in research activities by ensuring a competitive level of doctoral scholarships; o A significant increase in the engagement of doctoral students in research projects. This includes support for both public-public and public-private research collaborations to maintain a high level of training; mechanisms will be established to allow the correlation between the allocation of research positions dedicated to doctoral students in research projects and their enrollment in doctoral schools; o Supporting partnerships between research organizations from the public and the private ecosystem, to develop doctoral programs, exploit economic opportunities from the results obtained, and facilitate the transition of graduates from doctoral studies into the job market; o Supporting investments in laboratories with cutting-edge technology, both in the private and in the public environment. These investments create an environment conducive to attracting research talent and retaining them within the Romanian research system. 					
A2. Support the mobility and training of doctoral and postdoctoral researchers, including by funding projects that have received the label of excellence and by accessing Marie Skłodowska-Curie COFUND programmes.				2027	<p>Evaluation of progress in 2025 and 2027</p> <p>Mid Term evaluation 2025</p> <p>Final evaluation at the end of the implementation period 2027</p>

<p>A3. Adequacy of the legislative, institutional and procedural framework regarding the research-innovation system. To achieve this action, the following measures will be taken:</p> <ul style="list-style-type: none"> • Encouraging research organizations to adopt the European Charter for Researchers, the Code of Conduct on the Recruitment of Researchers, and the Bonn Declaration on Academic Freedom. These initiatives aim to promote best practices and ethical standards in research and academia. • Implementing measures to align with the European Commission's recommendations on the valorization of research result, the EU framework for research careers, and promoting gender equality in research. These measures reflect values that are recognized and assumed at national level. Their adoption will not only facilitate the recognition and appropriate positioning of Romanian researchers' international experience but also encourage research institutions to become integration into international personnel flows part of international personnel exchanges. • Developing regulations for the career progression of technological development engineers by harmonizing relevant legislation. This is essential to ensure that the career path for these professionals is well-defined and aligns with national and international standards. 				2025	Final evaluation at the end of the implementation period 2025
<p>A4. The development of a " Platform of advanced studies and research", in the form of a virtual network that brings together medium or long-term research projects (e.g., 5-7 years), coordinated by top international researchers. The projects are aimed at creating and developing research groups with</p>				2027	<p>Evaluation of progress in 2025 and 2027 Mid Term evaluation 2025 Final evaluation at the end of the</p>

international visibility and performance and potential for excellence.					implementation period 2027
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<p>A1. This action aims to support: (1) accessibility, reuse of scientific research data and better visibility of scientific production; (2) higher quality results by eliminating duplication, facilitating research replication and combating scientific fraud; (3) transition to storing the knowledge base in digital repositories; (4) increased transparency of the spending of public funds for research; (5) stronger research collaboration, accelerated innovation and increased competitiveness; (6) openness towards/ active participation of Romanian researchers in the European Research Area (ERA).</p> <p>The transition to open science and the progress towards excellence in scientific research will be achieved by:</p> <p>Free access to publications</p> <ul style="list-style-type: none"> obligation to publish in open access journals from the main stream of knowledge or in platforms with free accession (ex: Open Research Europe); the eligibility of required costs will be guaranteed; fair costs for accessing international publications; open access publishing will be guaranteed at national level. This will be achieved by transformative negotiations ("transformative agreements") awards will be granted for the Romanian journals indexed in Web of Science, with impact factor or with an absolute influence score above the average of their field and for the adoption of the best practices on open access publishing (such as obtaining DOAJ SEAL accreditation); promoting and supporting the existing and new open science initiatives, in particular for the long-term storage of 	<p>National support mechanism for the transition to open science established and implement</p>	<p>Ministry of Research, Innovation and Digitalisation</p>			
	<p>Free access to publications and research data</p>				
	<p>Increased quality of knowledge production (top-cited articles, triadic, dyadic patents, USPTO+EPO)</p>	<p>R&D public and private research organisations</p>	<p>PNCDI IV</p>	<p>2027</p>	<p>Evaluation of progress in 2025 and 2027</p> <p>Mid Term evaluation 2025</p> <p>Final evaluation at the end of the implementation period 2027</p>

open access publications, having as goal their integration in specific databases and/or EOSC;

- awarding grants for open access publication in journals indexed in Journal Citation Reports, with an impact factor or absolute influence score above the average for their field.
- sustaining the strategic interest in providing access to the scientific literature in the main stream of knowledge, including through synergy funding mechanisms.

Open access to research data

Open access to research data will be promoted according to the principle of *"as open as possible, but as closed as necessary"* for research projects that produce scientific data and in line with the principle of responsible management of research data.

- the obligation to draw up management plans associated with research data, in compliance with the FAIR and open data principles, in RDI projects funded by public funds. Research infrastructures will also be supported in the development and implementation of data management plans associated with experiments.
- ensuring the eligibility of costs associated with the management of research data resulted from research activity funded by public money.
- providing grants for the preparation of data underlying the results of scientific research for open access publication/storage.
- promoting and supporting existing and new open science initiatives, in particular for the long-term storage of research data for integration into disciplinary databases and/or EOSC.

Establishing and implementing a national support mechanism for the transition to open science

Under the supervision of the Open Science Council of the MCID, this mechanism will provide support for:

- the definition and implementation of open science-specific policies, the coordination of the development and implementation of the recommendations of the *Strategic Document regarding the framework for the development and of open science in Romania*;
- the development of specific open science capabilities;
- the coordination of the expert network at the level of research organisations;
- the coordination of the development of the management capacity for open science at the level of research organizations

A2. Actions to encourage citizen participation.

Complementary to encouraging citizen participation in defining the strategic research agenda, projects that encourage citizen participation at different stages of the research process, such as data collection, will be supported. Various forms of citizen involvement will be piloted, to complement expert assessments from the perspective of the final beneficiaries.

A3. Continue and expand the funding for exploratory research projects and complex frontier research projects.

This action aims to support and promote advanced scientific research and multi-disciplinary, interdisciplinary and transdisciplinary significant advances at the knowledge frontiers. It also aims to encourage new methods and techniques, including innovative approaches and investigations at the interface between established disciplines.

PNCDI IV

2027

Evaluation of progress in
2025 and 2027
Mid Term evaluation
2025
Final evaluation at the
end of the
implementation period
2027

PNCDI IV

2027

Evaluation of progress in
2025 and 2027
Mid Term evaluation
2025
Final evaluation at the
end of the
implementation period
2027

OS.1.3. The increase of the competitiveness of the research organizations

ACTIONS	EXPECTED RESULTS	RESPONSIBLE INSTITUTIONS	IMPLEMENTATION INSTRUMENTS	IMPLEMENTATION PERIOD	EVALUATION STAGES
<p>A1. Creation of a system for evaluating the performance of all public R&D units/institutions, in order to ensure the comparability of indicators and their achievements.</p> <p>All public R&D units and institutions will periodically undergo external evaluation of their performance, in accordance with a series of indicators specific to each entity, as the basis of institutional funding. The assessment will provide recommendations for institutional development and will assign each entity to a performance class. Competitive institutional funding facilitates institutional development and the path to excellence. Moving an entity from one class to another will be possible as a result of external evaluation.</p>	Performance appraisal system institutional for all units and the institutions of public law developed and applied	Ministry of Research, Innovation and Digitalisation	PNRR	2023	Final evaluation at the end of the implementation period 2023
<p>A2. Competitive institutional funding for R&D</p>	<p>Securing institutional funding on a competitive basis</p> <p>Creation of centers of excellence on research thematic concentration based on partnerships between research organisations</p>	<p>Romanian Academy</p> <p>R&D public and private research organisations</p>	<p>PNCDI IV Romanian Academy Programmes</p> <p>Academy of Scientists of Romania PNRR POS</p>	2027	<p>Evaluation of progress in 2025 and 2027</p> <p>Mid Term evaluation 2025</p> <p>Final evaluation at the end of the implementation period 2027</p>
<p>A3. Creation of Centers of Excellence by sustaining partnerships between research organizations (public-public), around a common research agenda/thematic focus.</p> <p>The centers will have medium-long term funding, spanning from five to seven years. They will aim to ensure a balance between the development or expansion of existing research infrastructures and conducting actual research aligned with a strategic agenda focused on scientific frontiers and addressing societal challenges.</p>	<p>Research and Development Performance Fund</p> <p>Solutions proposed by national research and</p>	Ministry of European Investments and Projects		2027	<p>Evaluation of progress in 2025 and 2027</p> <p>Mid Term evaluation 2025</p> <p>Final evaluation at the end of the implementation period 2027</p>

A4. The NUCLEU Programme funding will be continued, expanded, and adapted as part of the National Research Development and Innovation Plan (PNCDI IV). According to the current legislation, the Nucleu Programme is specifically designated for National Research and Development Institutes. Its primary objective is to establish and reinforce the knowledge foundation and early-stage components for future projects.	development institutes to respond to societal needs			2027	Evaluation of progress in 2025 and 2027 Mid Term evaluation 2025 Final evaluation at the end of the implementation period 2027
A5. Development of research performance funding fund for public and private CD organisations.				2024	Final evaluation at the end of the implementation period 2024

OS.1 .4. Modernisation and efficient use of RDI infrastructure by facilitating open access and ensuring the sustainability

ACTIONS	EXPECTED RESULTS	RESPONSIBLE INSTITUTIONS	IMPLEMENTATION INSTRUMENTS	IMPLEMENTATION PERIOD	EVALUATION STAGES
A1. The upgrading and efficient use of RDI infrastructure to facilitate open access and ensure its sustainability with multiplier and spillover effect of knowledge and RDI results in the economy will be achieved mainly through the following types of measures: <ul style="list-style-type: none"> consolidate the design and implementation capacity of access policies to research infrastructures that received public funds and ensure the transparency of these policies. Tools will be developed to facilitate and financially support access to research infrastructures (and related scientific data) financed by public money. Support for access will be provided to researchers, academics, students and doctoral students for research activities and educational purposes. support the orientation towards research and technological services offered by the research infrastructures, through: 	<p>The update and implementation of the National Research Infrastructure Roadmap.</p> <p>National consortia established between similar or complementary infrastructures, capable of providing integrated service packages.</p>	<p>Ministry of Research, Innovation and Digitalisation</p> <p>R&D public and private research organisations</p>	<p>PNCDI IV</p> <p>POCIDIF</p>		<p>Evaluation of progress in 2025 and 2027</p> <p>Mid Term evaluation 2025</p>

<ul style="list-style-type: none"> o support the management capacity associated to supply of services (scientific, technological) by the research infrastructures; o establish national consortia between similar or complementary infrastructures, able to offer integrated service packages; o support national participation in European collaboration/coordination mechanisms, ERIC type; o further development of the https://eertis.eu platform and its internationalization, to facilitate access to services and ensure transparency of information about existing infrastructures, equipment and the services offered; o co-financing of the costs for scientific and technological services performed for public or private beneficiaries (especially start-ups and innovative SMEs), through experiment voucher schemes. The ERRIS platform will be developed with specific functionalities for the implementation of an integrated system for monitoring and reporting the degree of use of the research infrastructures and of the research results obtained through the use of the infrastructures. <ul style="list-style-type: none"> • accreditation of testing laboratories, ensuring testing and certification capacities in areas of strategic interest, a balanced geographical distribution and their sustainability. • develop, implement, monitor, evaluate and update the national <i>Roadmap</i> of research infrastructures, which will include: <ul style="list-style-type: none"> o <i>the list of Romania's participation in international infrastructures/European research infrastructure consortia (ERIC), updated based on the analysis of previous results and the strategic opportunity (at national and/or regional level), including from the perspective of international cooperation activities. Excellence research projects related to the valorisation of ESFRI Roadmap infrastructures hosted by Romania will be supported, including the European Research Infrastructure Consortia (ERIC) in which Romania participates.</i> 	<p>Projects in the field of advanced technologies funded - Investments in research directions with high potential for practical application, targeting products with high added value that can be assimilated by the domestic industry.</p> <p>Accredited testing laboratories providing testing and certification capabilities in strategic areas.</p> <p>Increased number of research infrastructures with publicly available access policies, including within the https://eertis.eu/ platform.</p> <p>Research projects of excellence utilizing ESFRI infrastructures hosted in Romania.</p>	<p>Ministry of European Investments and Projects</p> <p>Ministry of Health</p>	<p>POS</p>	<p>2027</p>	<p>Final evaluation at the end of the implementation period 2027</p>
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- o List of Romania's participation in ESFRI Roadmap, updated on the basis of dedicated consultations, aiming at capitalizing on ERDF – Horizon Europe synergies.

- update, based on evaluation, the list of *Installations and specific objectives of national interest* (IOSIN); the cost for their operationalisation will be integrated in the institutional funding of the host organizations. This list will be based on the use and demand of these infrastructures, the associated research programmes, and policies for access and management of research data.
- compiling a list of proposals for new eligible public investments, based on the needs of the research-innovation community, industry and public actors, needs that are not covered by existing infrastructure. A research programme of excellence associated with the use of ESFRI infrastructures hosted by Romania and participation in international research infrastructures, in accordance with existing agreements.
- Strengthening achievements in the field of advanced technologies through proactive measures and investments in research directions with high potential for practical application. These directions aim to develop products with high added value that can be assimilated by the domestic industry, which is still undergoing restructuring and/or formation in sectors of national and European interest.

Increased utilization of IOSINs for research teams from abroad and/or for experiments requested by the business environment.

OS.1 5. Connecting research and innovation activities with societal challenges - Strategic Research Agenda

<p>A1. Connecting research and innovation activities with major societal challenges (demographic changes, climate change, welfare and social inclusion, health, food security, green energy, technological changes, etc.) will be achieved mainly through the following measures:</p> <ul style="list-style-type: none"> Provide funding to projects that target societal challenges (the basis for open project calls and a reference for participation in international initiatives). Support solutions to clearly identified problems, with the involvement and co-financing from various public and/or private institutions, through dedicated calls. 	Increased quality of knowledge production	Ministry of Research, Innovation and Digitalisation	PNCDI IV Sectorial Plans of the Ministries	2027	Evaluation of progress in 2025 and 2027 Mid Term evaluation 2025 Final evaluation at the end of the implementation period 2027
	Supported projects in the field of major societal challenges that ensure the connection of research and innovation activities with societal challenges				
A2. Support the dialogue through national missions, to which research programmes with clearly defined objectives can be subsumed, and to which strategies of the research organizations or competence centers can converge. These can be correlated with European missions.	Competence centers that will implement the Strategic Research Agenda of the Horizon Europe missions established and operationalized	Ministry of European Investments and Projects Ministry of Health	PNRR POS	2027	Evaluation of progress in 2025 and 2027 Mid Term evaluation 2025 Final evaluation at the end of the implementation period 2027
ACTIONS	EXPECTED RESULTS	RESPONSIBLE INSTITUTIONS	IMPLEMENTATION INSTRUMENTS	IMPLEMENTATION PERIOD	EVALUATION STAGES

OG2. Supporting innovation ecosystems associated with smart specialisations

OS 2.1. Supporting and encouraging involvement in smart specialisation projects and capitalizing on results

A1. Encouraging the creation of partnerships between research organizations and the private environment to support smart specialisation areas through the development of Innovation and Technology Centers . These centers should be coordinated by leaders with scientific and/or business experience. The centers mainly cover RDI activities (including attracting top researchers from abroad), technological infrastructure, human resource development and industry liaison capabilities. In the preparatory phase, it is crucial to formulate a well-defined	Innovation and technology centers established through partnerships between research organizations and	Research, Innovation and Digitalisation			Final evaluation at the end of the implementation period 2026
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<p>R&I agenda, an action plan for technology transfer, and devise a strategy for collaboration with industry and end users. This planning should be a collaborative effort between research organizations and businesses. In the partnership associated with innovation and technology centers, the participation of large companies is also supported. These projects should have the goal of conceiving, constructing, and testing prototype models for new or significantly enhanced products, technologies, methods, systems, or services. This support should span the entire journey from the inception of an idea to its successful introduction to the market</p>	<p>the private sector, developed and operationalized, to support the design, realization and testing of demonstration models for new or significantly improved products, technologies, methods, systems or services</p>	<p>R&D public and private research organisations</p>	<p>POCIDIF</p> <p>PNCDI IV</p>	<p>2026</p>	
<p>A2. Supporting mobilization for participation in RIS3 partnerships developed at national level and making interregional investments in EU projects through:</p> <ul style="list-style-type: none"> • <i>The development and operationalization of a group of managers of smart specialisation fields</i> at national level, with the role of monitoring the implementation of interventions and the evolution of ecosystems. They will also facilitate the dialogue with decision-makers. • The <i>Smart Specialisation Portal</i> will be created. This will be an online communication tool, which will serve as a central hub for providing detailed information on national and regional smart specialisation areas. The portal will include information on ongoing projects, results achieved (through inter-operation with the national R&D Registers), communities associated with these initiatives, competition schedules, and entrepreneurial discovery events. • <i>Administrative Capacity Strengthening</i>: Enhance the administrative capacity of the national and/or regional innovation ecosystems by providing training, facilitating the exchange of experiences, and sharing best practices. This training and knowledge exchange should focus on smart specialisation, industrial transition, and entrepreneurship. It aims to equip stakeholders with the skills and knowledge necessary to effectively drive smart specialisation strategies forward. 	<p>Partnerships projects between research organizations and the private environment</p> <p>Increased administrative capacity of the national and/or regional ecosystem of innovation (through training, exchange of experience and good practices, in the field of smart specialisation smart and industrial transition (entrepreneurship))</p>	<p>Ministry of European Investments and Projects</p> <p>Ministry of Health</p>	<p>POTJ</p> <p>POS</p>	<p>2027</p>	<p>Evaluation of progress in 2025 and 2027</p> <p>Mid Term evaluation 2025</p> <p>Final evaluation at the end of the implementation period 2027</p>

<ul style="list-style-type: none"> • <i>Support for Collaboration Between Research and Private Sector:</i> Encourage collaboration between research organizations and the private sector through RDI collaborative projects that address areas of smart specialisation. At the regional level, competitions will be launched, targeting specific areas of regional specialisation, with the goal of localizing project results within the respective region. Similarly, at the national level, competitions should be designed to target national areas of smart specialisation. • <i>SME Access to Scientific and Technological Experiment Services:</i> Promote access for small and medium-sized enterprises (SMEs) to scientific and technological experimentation services. This can be facilitated through vouchers that allow SMEs to access these services. 					
OS 2.1. Supporting and encouraging involvement in smart specialisation projects and capitalizing on results					
<p>A1. Increase funding for the specific areas and niches of smart specialisation to unlock the economic potential and enhance regional competitiveness. This funding should be geared towards leveraging the outcomes of scientific research, aligning them with business and economic goals, and ensuring they contribute to sustainable development objectives.</p> <p>Promoting collaboration between research organizations and the private sector is crucial for nurturing the local and regional innovation ecosystem, as well as for achieving a critical mass. One approach to foster such collaboration consists in the creation of smart specialisation parks.</p> <p>The Smart Specialisation Strategies of the regions, RIS3, 2022-2027 aim to define interdisciplinary innovation directions that lead to obtaining strongly differentiated products and services, based on local resources. These strategies focus on achieving economic transformation through innovation, capitalizing on</p>	<p>Projects in areas of specialisation intelligent at the regional level</p>	<p>Ministry of European Investments and Projects</p>	<p>POR</p>	<p>2027</p>	<p>Evaluation of progress in 2025 and 2027</p> <p>Mid Term evaluation 2025</p> <p>Final evaluation at the</p>

sectors and economic activities with innovation potential and drawing on the outcomes of research and development efforts. Simultaneously, they consider unique resources, global challenges, European industrial competitiveness, global trends, and the regional, national, and European context.

These strategies are structured and informed by the findings of socio-economic analyses, comparative advantages of each region, as well as their strengths and opportunities. They aim to provide a coherent and well-articulated response to regional challenges and shortcomings. The ultimate goal is to establish a strategic vision that not only fosters the smart economic development of each region but also enhances their adaptability to address contemporary societal challenges, facilitating the transition to a knowledge-based economy.

RIS3 initiatives adopt a bottom-up approach, which involves active participation from a wide array of actors within the regional innovation ecosystem. This collaborative engagement takes the form of an inclusive Entrepreneurial Discovery Process (EDP), with the aim of establishing the areas in which focus the investments related to the Specific Objectives (i) the development and increase of research and innovation capacities and the adoption of advanced technologies and (iv) the development of skills for smart specialisation, industrial transition and entrepreneurship within *Policy Objective 1 of the Cohesion Policy "A more competitive and smarter Europe" for the period 2021-2027*.

end of the
implementation period
2027

OG 3. Mobilization towards innovation

OS 3.1. Encouraging and facilitating collaboration between research organizations and the private sector to participate in innovation projects and capitalize on the outcomes

A1. Support the collaborative projects between research organizations and the private sector. Support for collaborative projects that involve both research organizations and the private sector. These projects have the objective of designing, building, and testing prototype models for new or substantially improved products, technologies, methods, systems, or services, and span

Collaborative projects between research organizations and the private environment with the aim

Research,
Innovation and
Digitalisation

POCIDIF

2027

across the entire process from the initial concept to bringing these innovations to the market.	to introduce new products, processes, services on the market innovative SMEs		PNCI IV		
A2. Support enterprises to launch new products, services on the market, including: (1) Preparing the launch of a minimum viable product (MVP) with the aim of market validation; support for (2) <i>the go to market</i> stage and (3) continuous development		R&D public and private research organisations		2027	
A3. Support R&D initiatives, coming from the public/private environment, that aim to explore and validate ideas with commercial potential, particularly at the pre-spin-off stage.	Support for Innovative firms		POS	2025	
A4. Supporting SMEs, by financing projects with a high degree of innovation, with the potential to achieve concrete results, with a real impact on the market, by offering innovation vouchers allocated for the purchase of services from public and private knowledge providers.		Ministry of European Investments and Projects		2025	
A5. International Patenting Support vouchers for SMEs. This action entails granting international patenting vouchers to SMEs interested in patenting the outcomes of their R&D activities.	Patented products, processes, services			2027	
A6. Solving Business-Defined Problems: Support is provided to research organizations or consortia, which may include both research organizations and businesses, for projects that address specific challenges or problems defined by businesses.		Ministry of Health		2027	Evaluation of progress in 2025 and 2027 Mid Term evaluation 2025 Final evaluation at the end of the implementation period 2027
A7. Supporting SMEs to develop their own RDI capacities, including through access to programmes that promote intersectoral and international researcher mobility.				2027	Evaluation of progress in 2025 and 2027 Mid Term evaluation 2025 Final evaluation at the end of the implementation period 2027

<p>A8. Open innovation mechanism. Development of an open innovation mechanism, which involves a staged selection process, designed to address innovation needs identified by the public sector. Projects with a strong practical focus, such as transferring innovations to economic operators, and experimental and demonstrative projects, are supported through this mechanism.</p>				2027	<p>Evaluation of progress in 2025 and 2027 Mid Term evaluation 2025 Final evaluation at the end of the implementation period 2027</p>
<p>OS 3.2. Development of technological and knowledge transfer at the national level to increase the visibility of results and their impact in the economic environment</p>					
<p>A1. Unified Process for Technology Transfer. Establish a unified process for the development, management, and monitoring of technology transfer activities at the national level within the relevant public authority. This includes creating and providing necessary framework documents and procedure models, such as license agreements, collaboration agreements, and intellectual property commercialization models, in consultation with technology transfer centers.</p>	<p>Collaborative projects between public research organizations and the private environment for technology transfer</p>	<p>Research, Innovation and Digitalisation</p>	<p>PNCDI IV</p>	2024	<p>Evaluation at the end of the implementation period 2024</p>
<p>A2. Support Research-Private Sector Partnerships. Encourage partnerships between research organizations and the private sector, which will facilitate the development of projects that promote the transfer of technology and knowledge.</p>		<p>R&D public and private research organisations</p>		2027	<p>Evaluation of progress in 2025 and 2027 Mid Term evaluation 2025 Final evaluation at the end of the implementation period 2027</p>
<p>A3. Professional Networking and Knowledge Exchange. Promote professional networking between the university and business sectors to introduce new ideas, knowledge, methods, initiatives, and procedures related to technology transfer (i.e. twinning programme).</p>		<p>Ministry of European</p>		2027	<p>Evaluation of progress in 2025 and 2027 Mid Term evaluation 2025 Final evaluation at the end of the implementation period 2027</p>

<p>A4. Professional Training Programme. Implement a nationwide professional training programme for technology transfer center experts. Support will be given to technology transfer centers to support the salaries of experts attending professionalization courses, contingent upon meeting certain performance indicators.</p>		Investments and Projects		2025	Evaluation at the end of the implementation period 2025
<p>OS 3.3. Support for innovative entrepreneurship</p>					
<p>A1. Financial Support for Incubation and Acceleration. Provide financial support to incubation and acceleration programmes that nurture and develop innovative start-ups with potential for growth.</p>	Incubation and acceleration projects	Research, Innovation and Digitalisation	PNCDI IV	2027	Evaluation of progress in 2025 and 2027 Mid Term evaluation 2025 Final evaluation at the end of the implementation period 2027
<p>A2. Balanced Funding Between Research Organizations and the Private Sector. Establish a co-participation programme in domestic venture capital funds to ensure balanced funding for research organizations and the private sector.</p>		R&D public and private research organisations	POCIDIF	2027	Evaluation of progress in 2025 and 2027 Mid Term evaluation 2025 Final evaluation at the end of the implementation period 2027
<p>A3. Public Co-participation in Domestic Venture Capital Funds: Encourage public co-participation in domestic venture capital funds, including those established in partnership by universities, research institutes or consortia.</p>		Ministry of European Investments and Projects	POEO	2027	Evaluation of progress in 2025 and 2027 Mid Term evaluation 2025 Final evaluation at the end of the implementation period 2027
<p>A4. Training in Innovative Entrepreneurship: Support training activities in innovative entrepreneurship, particularly by integrating courses into formal education curricula. Focus on practical skills and knowledge related to product development and launch.</p>		Ministry of Entrepreneurship and Tourism Ministry of Health	POS	2027	Evaluation of progress in 2025 and 2027 Mid Term evaluation 2025 Final evaluation at the end of the implementation period 2027

A5. Legislative Revisions for Start-ups: Revise start-up legislation to align with the EU definition and adopt European best practices. This should cover areas such as innovative start-ups, Business Angels, crowdfunding, and other components to attract investments.				2023	Final evaluation at the end of the implementation period 2027
A6. Building a Community of Innovation Professionals: Develop a community of professionals from public and private R&I organizations directly involved in innovation activities. Facilitate their access to international ecosystems of innovation and entrepreneurial training, potentially through partnerships with top global universities				2027	Final evaluation at the end of the implementation period 2027

O.G. 4 Greater collaboration at European and international levels

OS.4.1. Increasing participation in EU RDI programmes. Synergies with Horizon Europe and other RDI programmes coordinated at European and international level

A1. Enhancing the synergies with the Horizon Europe Programme, ERDF, FSE+, in the 2022-2027 programming framework. This action will include: <ul style="list-style-type: none"> financing those project proposals that have received the "Mark of Excellence" (SoE); promoting synergies with the "Extending participation/spreading excellence" Pillar of the Horizon Europe Programme. This involves actions such as attracting renowned foreign researchers through ERA Chairs and supporting the establishment of centers of excellence through Teaming actions; recognizing and rewarding from the state budget the outstanding performance in participating in the Horizon Europe Programme. This provides additional support to 	<p>Projects in synergy with Horizon Europe actions and other European and international funded programs</p> <p>Participation in the ERA-NET, ERA-NET Confund, JPIs, etc. projects.</p>	<p>Research, Innovation and Digitalisation</p> <p>R&D public and private research organisations</p>	<p>PNC DI</p> <p>IV</p> <p>POCIDIF</p>	2027	<p>Evaluation of progress in 2025 and 2027</p> <p>Mid Term evaluation 2025</p> <p>Final evaluation at the end of the implementation period 2027</p>
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<p>institutions to strengthen their capacity for project implementation and attract top researchers</p> <ul style="list-style-type: none"> Leveraging multiple funding sources to encourage participation in future European Partnerships and Missions within the Horizon Europe Programme, fostering cumulative funding and institutionalized collaboration. 			PNRR		
			Other sources MCID		
<p>A2. Supporting participation in ERA-NET/ ERA-NET Cofund, JPIs, Eureka, Eurostars, Lead Agency Procedure, etc. projects, within the limits of the applicable legislation.</p> <ul style="list-style-type: none"> Support the implementation of the ERA political agenda and the pursuit of the alignment to the principles and priorities set out in the Pact for Research and Innovation in Europe, in line with the new ERA vision. To facilitate this, the establishment of the "ERA Forum for Transition" will enable coordination with fellow EU member states. This coordination aims to prioritize investments and reforms in support of the dual transition and recovery priorities. Design of the methodological and operational framework that defines the governance, selection, decision-making, implementation, monitoring, and evaluation mechanisms for Romania's engagement in European Partnerships. The operationalization of synergies with other European programmes that support RDI and with international programmes such as EEA, Swiss and Norwegian grants, NATO Science for Peace and Security programme, NATO Innovation Fund, the European Defense Fund, etc. Promote the participation in RIS3 partnerships at European level and the "Interregional Investments in EU projects". Ensuring the continuity and sustainability of Romania's participation in interdisciplinary research organizations and programmes (CERN, ESA, etc.). 	<p>Design of the methodological and operational framework, which describes the mechanism of governance, selection, decision, implementation, monitoring and evaluation of Romania's participation in the European Partnerships</p>	<p>Ministry of European Investments and Projects</p>		2027	<p>Evaluation of progress in 2025 and 2027</p> <p>Mid Term evaluation 2025</p> <p>Final evaluation at the end of the implementation period 2027</p>
			POS		
	<p>Romania's participation in international research organizations and programs</p>	<p>Ministry of Health</p>			
				2026	<p>Evaluation at the end of the implementation period 2026</p>
				2024	<p>Evaluation at the end of the implementation period 2024</p>
				2027	<p>Evaluation of progress in 2025 and 2027</p> <p>Mid Term evaluation 2025</p> <p>Final evaluation at the end of the implementation period 2027</p>
				2027	<p>Evaluation of progress in 2025 and 2027</p> <p>Mid Term</p>

					evaluation2025 Final evaluation at the end of the implementation period 2027
OS.4.2. Development of bilateral/multilateral collaborations for RDI and RIS3					
A1. Development of bilateral/multilateral cooperation considering the national needs and strategic partnerships	Cooperation projects bilateral/multilateral Mobility projects Actions associated with the Strategic Agenda of Research and Innovation for the Black Sea region	Ministry of Research, Innovation and Digitalisation R&D public and private research organisations Ministry of Health	PNCDI IV POS		Evaluation of progress in 2025 and 2027 Mid Term evaluation 2025 Final evaluation at the end of the implementation period 2027
A2. Supporting mobility projects and complex bilateral/multilateral projects with global leaders in R&D and with other national strategic partners, including through the use of <i>Lead Agency Procedure mechanisms</i> , within the limits of the relevant legislation.					
A3. Providing support for bilateral and multilateral initiatives aimed at defining and implementing shared research agendas. These initiatives will involve countries participating in the EU Strategy for the Danube region, and non-EU countries within the scope of the EU neighborhood policy. This includes fostering research collaborations with the Republic of Moldova, Western Balkan countries, and others.					
A4. Enhancing research cooperation through bilateral arrangements with the Republic of Moldova. This involves the establishment of a joint collaboration programme with the Republic of Moldova, promoting access to and utilization of Romania's existing research infrastructure by Moldovan researchers engaged in collaborative research projects					
A5. Foster collaboration with countries in the Black Sea region to implement the Common Maritime Agenda for the Black Sea. This will specifically involve the research component outlined in the Strategic Agenda for Research and Innovation in the Black Sea.					

OS.4.3. Support for participation in European and international projects with the aim to strengthen the capacity of RDI actors					
A1. Strengthening the network of Horizon Europe National Contact Points (NCPs), including the assignment of dedicated staff for this role	National Contact Points Network for Horizon Europe supported/developed Support centers for supported international projects Representations of Romania in European and international organizations and initiatives	Ministry of Research, Innovation and Digitalisation R&D public and private research organisations Ministry of Health	PNCDI IV	2027	Evaluation of progress in 2025 and 2027
A2. Expanding the network of support centers for international projects within high-performing public research organizations to ensure comprehensive coverage across Romania					Mid Term evaluation 2025
A3. Establishing "one-stop-shop" center in each development region to facilitate the engagement of regional stakeholders in national and international research and innovation programmes. These centers will work in coordination with the NCP network, Enterprise Europe Network (EEN), technology transfer centers, and international project support centers.					Final evaluation at the end of the implementation period 2027
A4. Supporting Romania's active representation in European and international organizations, cooperation frameworks, and ad hoc groups related to research and innovation.					

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