National Research, Development and Innovation Policy of the Czech Republic 2021+

Council for Research, Development and Innovation

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Contents

1 Introduction

1.1 Context of the creation of the NRDIP 2021+

The National Research, Development and Innovation Policy of the Czech Republic 2021+ (NRDIP 2021+) is a strategic document at national level encompassing research, development and innovation.[1] It represents a strategic framework for the advancement of all components of research, development and innovation (RDI) in the CR (fundamental research, oriented and applied research, experimental development and innovation) and makes use of their synergy to advance the knowledge society and support the economic, environmental, cultural and social development of the CR. A strategic document for RDI contributes towards the fulfilment of certain essential criteria for the utilisation of EU funds in the 2021–2027 programming period.[2]

Research and development (R&D) is an integral part of the process of garnering experience and knowledge as a whole in response to the dynamically changing conditions of people's lives. These changes necessitate extensive R&D and the subsequent application of the acquired knowledge through innovations in all areas of society. These include changes brought about by what are known as major societal challenges, as well as new technology trends, most notably digitisation or robotization, and cyber security. R&D in the CR also reflects European and worldwide trends, also known as global megatrends.[3] Global megatrends with particular significance for the CR include population ageing, climate change, pandemics and the related challenges, healthcare challenges, growing socio-economic inequality, the multipolarisation of the world and the aforesaid digitisation or cyber security.

RDI activities have an impact both on maintaining and improving economic competitiveness and on health and improvements in the quality of life and the environment. Consequently, they deliver both market-relevant results and results whose relevance lies in quality of life, culture or social innovations. All activities in support of RDI should therefore take into account both the specific features of technical, medical or scientific fields and the potential of social sciences and the arts.

All modern technologies that are now such an integral part of society are based on discoveries and inventions that were the outcome of many preceding generations' desire for knowledge. The possibilities and the economic and social impact of the vast majority of key discoveries in recent centuries were not evident at the time they were made: it often took several decades before the scientific knowledge found practical applications. Preserving young people's desire for knowledge, which is an important driving force for social development, is a prerequisite for the general prosperity of our society.

[1] The NRDIP 2021+ was based on the updated Methodology for Preparing Public Strategies approved by government resolution no. 71 of 28 January 2019.
[2] In the CR this basic condition is fulfilled by the National RIS3 strategy. NRDIP 2021+ represents a strategic Framework that is important for designing the National RIS3.
[3] A megatrend can be understood as a long-term tendency that has a long-term impact on our thinking, our activities, the organisation of society and the future reality of the world.

1.2 Focus of the NRDIP 2021+

The vision of the NRDIP 2021+ is to provide effective support to RDI and target RDI in a way that contributes to the prosperity of the CR as a country whose economy is based on knowledge and the ability to innovate; to ensure that citizens have good living conditions and the CR is a recognised partner in the community of European countries and globally.

The principal objective is to realise this vision. Improving the country's innovation performance, as expressed, for example, by the innovation scoreboard of the European Union (EU), will be an important contribution to achieving this objective.

It is desirable for the CR to move up from the "moderate innovators" group to the "innovation leaders" group and attain scores above the EU average.[4] This objective is linked to a European analytical document entitled "European Innovation Scoreboard" and was thus defined in accordance with the Innovation Strategy of the Czech Republic 2019–2030 (Innovation Strategy) approved by the Czech government in February 2019.

The NRDIP 2021+ will contribute to develop and progress in the following key areas:

- Management and funding of the RDI system
- Motivating people to pursue careers in research and developing people's potential;
- Quality and international excellence in RDI
- Cooperation between the research and application spheres
- The CR's innovation potential

Strategic objectives and measures for achieving them are derived from these key areas.

[4] As per the Summary Innovation Index (SII) – see Annex – Analysis of RDI Development to Date.

2 Starting points for preparing the NRDIP 2021+

2.1 Key international documents

The NRDIP 2021+ builds on key international documents on RDI, whose content represents a framework for formulating the substantive objectives of supporting RDI in the CR. An overview of these documents is given in the annexes.

The future of RDI will be substantially influenced by global megatrends – profound changes in the socio-economic, environmental, technological and political arenas. The new professions that will be born out of these changes will require new skills. Conversely, entire fields that fail to react to change swiftly enough may cease to exist. Accelerated cross-border exchange of knowledge and technologies in the context of transnational chains and the development of transitive economies will further enhance the growth of RDI activities all over the world. At the same time, the growing hegemony of world powers in the field of dynamic knowledge growth and new research findings must be taken into account. Megatrends in RDI, and above all technology megatrends, are significant from the perspective of the links between them and research specialisations.[5]

In line with the key European documents on research, the NRDIP 2021+ follows up the UN's Agenda 2030, as support for research can help find a solution to all 17 sustainable development objectives (17 SDGs).[6] RDI is directly enshrined in the wording of some of the objectives in connection with ending hunger and promoting sustainable farming (SDG 2); health (SDG 3); affordable energy (SDG 7); inclusive and sustainable industry and innovation (SDG 9); and sustainable use of seas and oceans (SDG 14). Research and development activities are also an important tool for achieving other objectives, particularly the objective for sustainable economic development and dignity of work (SDG 8) and global cooperation (SDG 17). The UN's Global Environment Outlook 6[7] stresses that the absolutely fundamental objectives include access to drinking water (SDG 6), which is a direct precondition of both the aforesaid SDG 2, SDG 3 and SDG 7, but also the objective of sustainable cities (SDG 11), sustainable consumption and production (SDG 12), and above all climate action (SDG 13) and ecosystems and biodiversity on land (SDG 15). Some objectives are relevant to the working of a number of other systems, including the research, development and innovation system. These also include gender equality (SDG 5) and decent work (SDG 8).

The Czech Republic is one of the countries that pledged to implement Agenda 2030 and the sustainable development objectives. These commitments and the CR's policies converge in the Implementation of Agenda 2030 in the CR, which the government approved by resolution no. 670 of 17 October 2018. In this way the government both formulated the responsibilities of ministries for implementing the SDGs and linked their implementation with the Strategic Framework of the Czech Republic 2030 (2017) and its implementation plan (2018). The main

[5] The National Research and Innovation Strategy for Intelligent Specialisation of the CR (National RIS3) treats global megatrends similarly. The description of global megatrends in the annexes is taken from the National Research and Innovation Strategy for Intelligent Specialisation of the CR 2021–2027.
[6] Agenda 2030 for Sustainable Development and its Sustainable Development Goals (SDGs) were adopted at the UN summit on 25 September 2015. They entered into effect on 1 January 2016. This is a long-term programme covering all areas of human activity.
[7] The UN's Global Environment Outlook 6 [online cit. 30.4.2020], available from https://www.unenvironment.org/resources/global-environment-outlook-6

global social megatrends with significance for the CR were also identified in this context. These megatrends, like the SDGs themselves and the objectives of the Strategic Framework of the Czech Republic 2030, need to be factored in when formulating the substantive objectives of supporting RDI in the CR.

The principal instrument for supporting RDI in the EU in the years 2021 to 2027 will be Horizon Europe, the 9th EU framework programme for research and innovation. The programme's official proposal was published by the European Commission on 7 June 2018. This will be a major contribution to increased cooperation between Member States within the EU's R&D structures (European Research Area, ERA) and international cooperation with associated countries that decide to take part. The financial resources of Horizon Europe will be channelled towards both supporting excellent science in the research sector and the commercialisation of research findings and supporting breakthrough innovations in the enterprise sphere. Considerable emphasis will be placed on supporting knowledge transfers from the research environment to industry, with a view to giving commercial value to knowledge capital when developing goods and services with high value added. The need for research and innovation activities to make sufficient allowance for European society's socio-economic requirements will also be duly stressed.

When drawing up the NRDIP 2021+, attention was paid to assessing support for research, development and innovation to date at the European level. This assessment was done before Horizon Europe was formulated by the independent High Level Group chaired by Pascal Lamy and the European Innovation Council (Lamy Report – "Investing in the European Future We Want" and "Europe is Back"). A report entitled "Mission-Oriented Research & Innovation in the European Union – A problem-solving approach to fuel innovation-led growth", written by Professor Mariana Mazzucato, special advisor to Carlos Moedas, Commissioner for research, development and innovation, and presented on 22 February 2018, is particularly inspiring.

"Developing Our Economic Base: a European model for the future", the second pillar of the European Council document entitled "A New Strategic Agenda 2019–2024" from June 2019, identifies an urgent need to boost investment in people's skills and education, to do more to foster entrepreneurship and innovation and to strengthen research efforts, above all by tackling the problem of the fragmented nature of European RDI.

Other key international starting points for the NRDIP 2021+ include evaluation reports and statistics (European Innovation Scoreboard, European Semester: Commission's Diagnosis of the Czech R&D System; European Research Council statistics; Thomson Reuters Web of Science, OECD) and other relevant documents and sources.

2.2 Key national documents

The NRDIP 2021+ is interconnected with key strategic documents at national level. A list of these documents is given in the annexes.

Innovation Strategy is a fundamental strategic document orienting Czech society towards the future, as expressed by its title: "Czech Republic: The Country For The Future". It sets out the importance of two basic instruments of future prosperity: RDI on the one hand and digitisation on the other. Supporting these means steering the Czech economy towards future prosperity. The strategy's nine interconnected pillars comprise starting points, key strategic objectives and

the tools for achieving them. Each pillar has its own institutional guarantor, usually at ministry level, and specific managerial responsibility is defined. The execution of the Innovation Strategy is under the overall control of the Czech government through the RDI Council. One aspect of the Innovation Strategy is the launch of a new brand for use in international relations and to present the CR abroad – Czech Republic: The Country For The Future. As far as corporate expenditure on RDI is concerned, the Innovation Strategy reckons with putting in place the right conditions for business spending to account for 1.5% of GDP after 2024, which would mean annual increases of approx. CZK 89 billion. In the field of R&D funding, it reckons with increasing funding levels to 2% of GDP by 2020, 2.5% of GDP by 2025, and 3% of GDP by 2030, i.e. an annual increase of 1 percentage point; of that amount, 1% of GDP would come from public monies, with 1.5% and 2% of GDP coming from business spending in 2025 and 2030, respectively. The innovation ecosystem will be significantly strengthened by support for innovation and research centres. The exploitation of know-how acquired with public support will also benefit from enhanced intellectual property protection. In the Innovation Strategy structure, NRDIP 2021+ is one of the tools for achieving objectives in the “Financing and Evaluation of R&D” pillar.

The National RIS3 strategy ensures the effective targeting of finances at activities leading to stronger research and innovation capacities, focusing on priority areas with good potential at the national and regional level with a view to making full use of the CR’s knowledge potential. From this perspective the National RIS3 implements part of the NRDIP 2021+ tasks on the level of oriented and applied research and operates within the policy’s framework.

The main implementation platform for the Sustainable Development Goals in the CR is the Strategic Framework Czech Republic 2030, which the Czech government approved on 19 April 2017. It sets out long-term sustainable development priorities in six key areas and serves as an overarching framework for departmental, regional and local strategies and concepts. In the context of this strategic framework, objective 8 “The Czech Republic has well-functioning and stable institutions to support applied research and development and to identify opportunities in this area” has a direct link to RDI. The objective is divided into two specific targets, the first focusing on stable capacity and conditions for R&D and the second on increased innovation by businesses. At the same time, though, the theme of research, development and innovation is reflected in other objectives, either directly (objective 23.3 “The state system of support for oriented and applied research will ensure a steady influx of knowledge, innovation of democracy and long-term effectiveness of governance”), or indirectly. The path to achieving the objectives of the said strategic framework takes the form of an implementation plan approved by Czech Government Resolution No. 669 of 17 October 2018.

Other key documents for the NRDIP 2021+ include National Priorities of Oriented Research, the Government Strategy for Equality of Women and Men in the Czech Republic for 2014–2020, the Concept of the Research, Experimental Development and Innovation Information System for 2021–2025, and the collection of strategies and concepts summarily referred to as Digital Czechia. The NRDIP 2021+ also takes into consideration other relevant departmental documents and materials (strategies, concepts, proposals). The principal analytical document at national level is Analysis of the Existing State of Research, Development and Innovation in the Czech Republic and A Comparison with the Situation Abroad, as well as data from the

Czech Statistical Office and other relevant sources. The creation of the NRDIP 2021+ was also informed by outputs from conferences, workshops and other RDI-linked events.

3 Initial state

The preparatory phase of the creation of the NRDIP 2021+ focused on researching available statistical data and information sources at European and national level. These became the basis for interpreting developments to date and identifying strengths and weaknesses in key areas of the national system of RDI. Detailed statistics and a description of the state of affairs are presented in the annexes.

The main starting point that was chosen for analysing the state of RDI in the CR and comparing it with other countries was a composite indicator called the summary innovation index (SII). To complete the picture, this is complemented by another composite indicator, the global innovation index (GII). Unlike the SII, the GII comprises indicators dealing with "soft" areas that could influence the quality of the RDI system (e.g. political environment, regulation *et al.*). The innovation output index (IOI) provides a fuller picture. These data make it possible to say that in overall innovation performance the CR remains below the EU average. Although an improving tendency can be detected in many areas, the CR still cannot rank itself among strong innovators or innovation leaders.

Even though positive development can be observed in most of the SII and GII sub-indexes, international comparison is required to fully understand the state of the national RDI system. In this comparison the CR hovers around the EU average. That makes it necessary to step up activities, measures and recommendations that will elevate the CR among the innovation leaders. As a result of the analysis, indicators (areas) were therefore identified in which the CR could improve and which can be regarded as an opportunity for progress in key areas of the NRDIP 2021+ and a contribution towards the fulfilment of the vision and principal objective of the NRDIP 2021+, but also as a complementary contribution towards achieving the objective of the Innovation Strategy. The development of national indicators should not be the sole measure of progress in RDI, however, as that only shows change over time. There are also limits to interpreting composite indicators, mainly because of the considerable loss of information on initial values, which can lead to misinterpretations. That makes it necessary to add to the presented statistics the more detailed qualitative evaluation that is the subject of the following part of this chapter as the description of the initial state.

Management and funding of the RDI system

Competences in the RDI support system are defined by the RDI Act, whose most recent update entered into effect on 12 March 2020. The RDI Act was amended nineteen times in the period up to 2018. During 2018, a "small technical amendment" of this act was drafted, mainly in connection with a change in the evaluation of research organisations. The preparation of this amendment necessitated comprehensive changes in the legislation on the RDI support system. The amendment left no room for more far-reaching change taking into account certain other requirements, such as the need to add rules on support for innovation. The issues that had to be left to one side owing to the small technical amendment's limited scope and narrow focus were included in a debate on the preparation of a follow-up change to the legislation on RDI.

The RDI environment in the CR has undergone dynamic development in the last ten years or so. Total spending on R&D in the CR has been rising for a long time and is approaching the EU average as a percentage of GDP. EU funding has also contributed significantly to the development of the research system in recent years. This money led to the development of

research and innovation infrastructure and capacities in both the public and private sectors. The increase in spending on R&D was accompanied by a growing number of employees in R&D and research workers in the public and private sectors. Spending on R&D from business sources is rising constantly, with the trend indicating the growing importance of research activities in businesses.

Since 2017, the research organisations evaluation system has been changing, with a transition from the existing, quantity-based system to evaluation of the quality and impacts of R&D (Methodology 2017+). In addition to this assessment change, the system for evaluating targeted support is also being changed. Here, a system of expert guarantors is gradually being introduced, sector priorities are being unified and aid overlaps are being eliminated. In the case of both institutional and targeted support, the weaknesses are the low levels of coordination and proportionality in the innovation chain: fundamental research → applied research → innovation → product → profit → reinvestment in research. Public-sector bureaucracy leads to additional administration costs and fails to stimulate the private sector sufficiently.

In terms of total spending on RDI (as a % of GDP), the CR is still around the EU average even though RDI spending has been rising constantly in recent years. However, various instruments and funding sources need to be applied and suitably combined, an open approach to R&D results created with the assistance of national funding should be supported, and intellectual property tools, especially industrial property tools, need to be supported. In addition to state aid for RDI and expenditure on RDI from public sources, there is key spending on RDI from private sources that account for more than half (almost 60% in 2018) of total expenditure on RDI. For private-sector expenditure to keep rising, the right conditions must be put in place to motivate businesses, which can be done via direct and indirect support.

The insufficient venture capital investment in innovative businesses is a weakness of the RDI system in the CR. Risk capital is not put into businesses based on research results, which can impact on the commercialisation of results and on innovation activities. The relatively undeveloped risk capital market, both on the side of investors (inexperience, risk aversion) and on the side of businesses (insufficient number of high-quality projects), was identified as the biggest obstacle in terms of the accessibility of risk capital in the CR. Another major obstacle is red tape, and the lack of awareness among potential beneficiaries is also a hindrance. The insufficient quantity of venture capital in innovative businesses is reflected in the SII index. This indicator is extremely sensitive to one-off investments: a spike in venture capital investments was registered in 2009, with its effects persisting until 2011, when investors invested over EUR 1 billion in StarBev (Staropramen). As some sources claim, the low level of interest in venture capital can also be explained by the absence of an investment tradition and of suitable legislation. Putting in place the right conditions and incentives for investment in start-ups is a key RDI opportunity for the CR.

As far as the design of the targeted support provision conditions is concerned, the considerable bureaucracy and formalistic approach to management and control are fundamental obstacles. This is primarily a question of the complicated and confusing grants provision system, providers' differing conditions and requirements (e.g. different draft project structures), the lack of uniformity in the interpretation of the rules, methodologies and regulations for providing support to RDI, the lengthiness of control processes during inspections at beneficiaries etc.

In line with the Innovation Strategy, and on a complementary level as part of the proposals for cutting red tape in the provision of RDI support, discussions have focused on increasing the share of institutional support for long-term conceptual development of research organisations for funding research organisations. After the correct categorisation of the types of support into targeted and institutional is redressed, efforts will be made to achieve a ratio between the two types of support that does not bring about a needlessly high administrative burden and provides research organisation employees with reasonable certainty.

Making use of the tools of legal protection of intellectual property, and above all patent protection, reflects the position of Czech industry that is focused predominately on subcontracting in value chains. The systemic support for intellectual property protection is not sufficiently conceptual. Specifically, the Update of the National RDI Policy 2016–2020 does not address the issue of intellectual property; nor is this issue covered by any of its objectives or any specific measures. The Update of the National RDI Policy 2016–2020 only uses the Number of PCT Applications per Million Inhabitants indicator and Revenues from the Sale of Patent Licences indicator as indicators of other set objectives. The objectives in the National RIS3 strategy, updated in 2018, do not include support for intellectual property protection either. Improvement in this area could potentially contribute to a better overall assessment for the CR in terms of SII and GII and, most importantly, to a healthier economy. The CR lags far behind the EU average in terms of the number of PCT patent applications, despite very slight growth in recent years. That is borne out by the SII Intellectual Property sub-index.[8] According to the SII, the CR remains consistently near the middle point of the countries being compared, but in the Intellectual Property sub-index it has been consistently down around 20th place. The GII, which is defined by the World Intellectual Property Organization, currently compares around 129 countries. In the Intellectual Property sub-index, the CR occupied 19th place in the EU28.
A country's political environment is undoubtedly important for the design and management of the RDI system, with particular regard to putting in place a uniform RDI support system at national level. According to the GII, political stability and security are among the CR's strengths. On the other hand, the rules for dismissing employees in the CR are some of the strictest in Europe, which is viewed as a weakness in the context of the GII. The cost of dismissing employees is too high, just as the duration of unemployment support is too long. The weakness of the design and management of the RDI system probably cannot be regarded as a key to a solution, but it is good to be aware that in times of economic crisis, shortcomings in the design and management of the RDI system can lead to problems in sectors like the automotive industry, which plays an important role in national RDI.

Motivating people to pursue research careers

The RDI environment in the public sector is considerably different from the private-sector environment, particularly in terms of the intensity of pressure for R&D results and efficiency (and these also differ considerably from one research organisation to another). This is often reflected in uncertain plans for the development of research organisations (including the implementation framework), poorly functioning personnel processes and ineffective or no tools for helping eliminate these shortcomings in the current system. Depending on how these tools are targeted, the CR should consciously work on eliminating the problem with the shortage of workers with technical education and experts who are able to work in multidisciplinary teams.

[8] SII uses Intellectual assets as the sub-index name. It comprises the number of PCT patent applications, the number of European Union trademarks and industrial designs that are industrial property rights. The term intellectual assets is used imprecisely in the name of the sub-index.

The shortage of "domestic" experts in various areas of RDI can also be offset to some extent by attracting them from other countries. This means support for foreign students to study science and technology fields at Czech universities (e.g. promoting Czech universities abroad, expanding the range of fields taught in English, make the university environment in the CR more attractive by enabling long-term employment for foreign teachers etc.) and support for foreign nationals with excellent qualifications in technical professions to work in RDI in the CR. The gender imbalance in research persists. While the proportion of women studying for doctorates is growing and now stands at 45%, among research workers it has been falling since 2005 and now stands at 23%. After completing their doctorate, women often do not enter the field of RDI, so the potential of people with scientific qualifications is not being fully exploited in the CR. The inadequate conditions for combining a research career with parenthood can worsen the gender imbalance. This is partly linked to the duration of parental leave, which in the CR is one of the longest in the EU. In this context it is therefore necessary to flag up a number of structural barriers resulting from the science environment. For example, compulsory mobility without further support; excellence not taking into account career breaks; low salaries making it impossible to pay for child minders; etc. Consequently, a change of the conditions should be targeted so that attention is not deflected away from the research work itself.[9] In the GII, the number of women employed in R&D in the CR is seen as a weakness. If we want to improve the CR's position in the SII, the direct link to the Gender Equality Index needs to be taken into account. This is documented by the Report on the Implementation of Council Conclusions of 1 December 2015 on Advancing Gender Equality in the European Research Area, drawn up by SWG GRI,[10] and also by the GENDERACTION project report that was completed in September 2019:[11] both demonstrate the correlation between the EU Innovation Scoreboard and the Gender Equality Index.

The advancement of the knowledge society in the CR and the increasing application of modern technologies in day-to-day life and elsewhere make it necessary to improve education at all types of schools, which includes revising and modifying the education system. The expected development of modern technologies makes it necessary to ensure that there are suitably qualified experts in fields such as ICT and digital technologies, nanotechnologies and advanced materials, microelectronics, biotechnologies, space activities, autonomous mobility etc. The key megatrend – digitisation – makes it essential to focus on putting in place the right conditions for greater numbers of experts in information technology fields.

The CR lags behind the EU average in terms of people's preparedness for research, as shown by both the SII and GII. The SII focuses more on the number of people completing doctorate studies, the percentage of the population aged 25–34 with completed tertiary education or the percentage of the population pursuing lifelong education. Compared to the EU average, the values of these indexes in the CR are insufficient across the board, even though there has been some improvement over time. The GII moreover focuses on spending on education. The research shows that compared to other EU Member States, the CR underfunds education, and

[9] See the study Akademici a akademičky 2018: Návrhy opatření na podporu rovnosti ve výzkumném a vysokoškolském prostředí; Sociological Institute of the CAS, Prague, 2018.
[10] Home - Consilium [online] [cit. 30.4.2020], available from https://www.consilium.europa.eu/register/en/content/out?&typ=ENTRY&i=ADV&DOC_ID=ST-1213-2018-INIT
[11] GENDERACTION [online]. Copyright © [cit. 30.4.2020]. Available from https://genderaction.eu/wp-content/uploads/2020/03/D3.2._MonitoringERApriority4implementation.pdf

university education in particular – this is viewed as a weakness of the system. In addition, the GII takes into account both graduates and STEM graduates. There is room for improving the CR's position in this area, but increasing the number of graduates and the spending on education should not comprise an increase in the "education inflation rate". Developments in the CR are exceptionally dynamic, so a simple comparison of the state of affairs does not deliver the necessary results. Despite the pressure for increasing the number of graduates in technical fields, the Czech education system should monitor demand on the market/among employers and adjust its portfolio of study courses according to these trends on the job market. It is also essential that education and research do not focus entirely on momentary, current requirements, but are tailored to the overall trends of the 21st century.

Quality and international excellence in R&D

In the Czech Republic, targeted support for excellent research projects, based on first-class scientists and often conducted through "high risk/high gain" projects, and key systematic support in research institutions have so far been rare and, therefore inadequate. That is mainly reflected in the very low success rate of Czech applicants for European Research Council (ERC) projects. Only some research organisations provide sufficient support for their centres' ambitions to join the ranks of excellent research teams in Europe. The low involvement in the CR is not only detrimental to the state of research in and the scientific prestige of the CR, it has financial impacts on the country. Participation in ERC projects is universally regarded as an indicator of research institutions' quality, or even as an important indicator of national research as a whole.

In the interest of improving the quality of research in the CR, it is also necessary to make the research environment more open by connecting it to the international research community, promoting international R&D cooperation and supporting two-way international mobility.

In the R&D fields whose outputs are intended to help improve people's lives (medical sciences, town planning, design, mobility etc.), the perspective of gender and social roles and the needs and experiences of people of different sexes and age should be mainstreamed. In other countries this is a dynamically developing field that was part of Horizon 2020 and will also feature in Horizon Europe. The potential benefits of mainstreaming this issue are linked not only to applications for European funding, but also to the increased innovation potential quality and fairness of Czech R&D outputs. Publicly funded RDI should therefore ensure that its outputs help improve the lives of the widest possible range of people (men and women).

Even though the number of publications in the top 10% of most cited publications has gone up, it is still unsatisfactory. This may be influenced by the design of the results assessment using the previous methodology that preferred quantity over quality. There is sufficient room for improving the CR's standing in this area, and Methodology 2017+ should also contribute to an improvement. To some extent, both composite indicators, SII and GII, try to identify the quality and excellence of research. The SII features Attractive Research System – this sub-index deals with research publications in the top 10% of the most cited publications. The GII features QS University Ranking, a ranking of the 1000 best universities in the world.

Unfortunately, universities in the CR are far off the top 100. Having said that, at least a positive trend can be observed.[12]

Despite a marked development in the past period and improvements in research productivity and quality, the Czech research system remains relatively closed-off to international cooperation. The CR's score in international cooperation are better than the EU average. Specifically, the CR achieves good scores in International Scientific Co-publications (SII). Participation by research teams from the CR in international research programmes has been unsatisfactory to date. The CR has a sufficient number of research centres with state-of-the-art equipment, making possible outstanding, globally competitive results, but the productivity of Czech research centres is not sufficiently high and effective, unfortunately.

The CR's main priorities in international cooperation include participation in ERA and, primarily, as effective participation as possible in the EU's framework R&D programmes. Independent projects involving bilateral and multilateral cooperation and support for participation in significant international governmental and non-governmental organisations and activities are also important. What is utterly fundamental and crucial for the CR is cooperation with the most eminent European research institutions. Involvement in international H2020 projects was one way for Czech scientists and research teams to fund their research activities from public EU finances and simultaneously establish international contacts for further research collaborations. Analytical studies by the European Commission and the Technology Centre of the Czech Academy of Sciences categorically show that international comparisons of the standard indicators keep delivering the same result: the CR is consistently one of the EU Member States with the lowest participation in EU framework programmes.[13]

That means effort needs to be made to boost the internationalisation of R&D. Making use of newly built R&D centres and investing in "large research infrastructures" are an opportunity in this regard. Participation in international project consortia with support for projects (co-)funded out of the EU's framework R&D programmes is also limited by the low number of Czechs in European structures. A more effective Europe-facing science policy would be beneficial in this regard.

The issue of international cooperation needs to be seen in broader contexts, however. There is more to it than international cooperation between public research organisations on research projects and researcher mobility. The issue of inter-regional and cross-border cooperation between research organisations and firms, especially small and medium-sized enterprises (SMEs), is growing in importance. This cooperation is leading towards firms climbing up European value chains. The EU is preparing a new instrument for this area (Interregional Innovation Investments).

Inter-regional and cross-border cooperation is a path towards overcoming the enclosed nature of the R&D environment in a given region. It leads to an open research environment (active measures against in-breeding) and mainly helps ensure that regional actors connect to the international research community.

[12] See the information on *Ministerstvo zdravotnictví České republiky [online].* MZČR: ©2010 [cit. 30. 4. 2020]. Available from http://www.msmt.cz/ministerstvo/novinar/ceske-univerzity-stoupaji-ve-svetovem-zebricku.
[13] The CR's participation in H2020 and in the Euratom programme in the January 2014 – May 2017 period, ECHO, 2017, Annex 4-5/2017.

It is documented in the GII that there are hardly any global companies in the CR carrying out cutting-edge research. This is partly because of the Czech economy's size and orientation. There is also a lack of joint ventures and strategic alliances. One positive example is Škoda-Volkswagen. In the interests of improving this state of affairs, it is essential to focus attention on supporting alliances with Czech companies, especially SMEs, and coordinating information and support for cooperation to activate Czech businesses that display a high technical and technological standard and possess the capital necessary for forming such alliances. It is also important to motivate for excellence and in this regard to support SMEs, which are often on the cutting edge of innovation and come up with solutions with a significant impact on the given sector; technology transfers also need to be supported.

Cooperation between the research and application spheres

Despite the marked and very fast growth in private and public spending on RDI and the increase in co-publications in recent years, there is still acknowledged to be insufficient long-term cooperation between the research and application spheres in the CR when compared to other EU Member States (the two spheres are to a large extent separate from and independent of each other).

To make better use of the findings of public research in corporate innovation, it is essential to make the dissemination and sharing of knowledge from research organisations more effective, improve the work of technology transfer centres set up in public research organisations and boost motivation to adopt innovations in the private sector, particularly higher-order innovations following up excellent research. Suitable use must be made of industrial property protection tools. If research is co-funded privately, the industrial property protections must respect the actual needs of the partner, its market standing etc. In the case of contract research, the use of industrial property protection is entirely in the hands of the entity commissioning the research.

Corporate research in the CR is driven mainly by companies owned or co-owned from abroad. Purely Czech companies often work as subcontractors for foreign firms and their research activities, and their innovation capacity is limited in comparison with foreign firms. That makes it necessary in future to get Czech companies to expand their research and development activities and to base their competitiveness not on cheap labour but on the application of new knowledge and production with higher value added, especially in growth-area technologies such as nanotechnology, information and communication technology, biotech, space technology etc. The challenge for the future is the ability not just to discover and develop new solutions in the Czech Republic, but to exploit and sell them so that the lion's share of value added remains in the Czech economy. At the same time, the presence of transnational companies and foreign-owned enterprises should be leveraged, with support given to cooperation between them and Czech firms and to the integration of Czech firms into global innovation networks. Although cooperation between the private and public sectors was viewed in terms of the amount of contract research in the previous methodology for assessing research organisations targeted support programmes for RDI, this criterion can easily lead to a distorted picture of the research environment, irrespective of the fact that "contract research" is defined in the Framework as economic activity with all the related consequences. Continued use of the volume of contract research as an indicator appears very problematic. Public and private sector ties are assessed in the SII by means of three indicators: Innovative SMEs collaborating with

others; Public-private co-publications; and Private co-funding of public R&D expenditures. Only in the first indicator does the CR exceed the EU average; in the other two, it is below average. Although the previous methodology for assessing research organisations and targeted support for RDI assessed public and private sector cooperation by means of the volume of contract research, with research organisations marked up in the assessment, it seems that this motivation did not have a sufficient effect on increasing cooperation. Attention should also be paid to firms, typically SMEs, which base a significant part of their business on products with high value added and often on innovative solutions. One of the key factors influencing these firms' success is whether they integrate into international supply chains. A suitable form of support is the CR's involvement in national and international project frameworks that enable firms to develop international partnerships and establish themselves in international supply chains.

The CR's innovation potential

The standard of cooperation between the research sphere and large firms in the CR reflects their position in value chains and their ownership structure. Only a very limited number of large firms are founded on Czech capital. The growth of successful local firms in economically or socially vulnerable territories is limited by the low innovation demand in such firms, among other things.

Innovative start-ups are one of the main drivers of innovation in the economy, so the fostering of a start-up ecosystem is a major contribution to increased competitiveness and value added in Czech businesses. To date, start-ups in the form of spin-off firms carrying out technology transfers from the public research sphere into practice represent the majority of the unfulfilled potential.

In recent years, SMEs have had to contend with a shortage of qualified employees. SMEs also do not possess sufficient capacities (human, knowledge and financial) to break onto foreign markets. In the CR, there is also a lack of awareness of alternative forms of enterprise (social enterprise, shared economy etc.).

The shortage of equity for the growth of established firms and start-ups is one of the main reasons for supporting SMEs with public money. Business activities should be supported from their first steps or while they are growing to ensure they do not end prematurely. Increasing investments in equity should help elevate the CR among innovation leaders – the CR's score in the Venture Capital Investments indicator is currently very low (5% of the EU average).

Support should also be channelled into the area of SME cooperation with large firms, which still constitute the main source of economic production in the CR. It is also typically the case that SMEs, and especially start-ups, are in a worse position than large firms in terms of obtaining loans – whether the disadvantage lies in the interest rate or the options for guarantees.

Attention should also be focused on developing special consulting services targeting solutions to the problems that SME's currently face, or developing and expanding services for start-ups with a view to increasing their capabilities and know-how for further development and operation on foreign markets.

As regards SMEs, the possibility of creating functional, synergic and complementary links between the use of European funds at national level under OP TAC and ensuring innovative Czech SMEs participate more and succeed more in Horizon Europe is a challenge for the EU 2021+ programming period. Results to date in this field have been unsatisfactory. Besides differing implementation rules and the difficulty in coordinating the timing of the two instruments, the persisting traditional ties between partners from the "old" Member States plays a role: these entities remain the predominant applicants for and beneficiaries of centrally run programmes. Synergic effects with EU programmes can also be achieved through national programmes, as occurred in the case of the funding of Seal of Excellence projects from the GAMA programme. The CR will strive to achieve these synergies with the help of both EU funds and national financing.

Progress in the CR's innovation potential can be observed partly through the sub-pillar called Innovation-friendly Environment. In 2018, the CR stood at 75% of the EU average. In this sub-pillar, it is important to monitor the Innovation-driven Entrepreneurship indicator, which reached 78.1% of the EU28 average. The CR should therefore focus on areas that will help improve the conditions for innovation-based enterprise.

The proportion of SME value added in 2018 was 54.7%, with SME employees accounting for 57.7% of all private-sector employees in the CR in 2017. In the CR, this enterprise segment generates on average 48% of total output and SMEs account for approximately a third of Czech direct exports (specifically 28.2% in 2018).[14] Attention should be paid to supporting innovation potential in and internationalising the economic activities of SMEs so that these businesses succeed in global competition and on EU markets. The growth of SMEs and strengthening of their innovation capability is a challenge for the entire CR.

The key here is for SMEs to boost innovation capability and make effective use of intellectual property and to develop enterprise and innovation infrastructure. The unsatisfactory state of affairs in the use of intellectual property protection rights and in the generation of results with legal protection is reflected by the value of the Intellectual Assets sub-pillar (63.8% of the EU average). The very low production of PCT patent applications (23.2% of the EU average) is evidence not only of SME's poor innovation performance but also of their usual position in the production chain, where patent applications are filed by the manufacturers of "end" products or those who can supply products based on breakthrough innovations to their customers.

The innovation potential of Czech public administration and the public sector in general must also be developed. The public sector's interest in innovation is growing only gradually, even though this is one of the fundamental trends in Europe that is significantly supported by continuing digitisation. Innovation in public administration is currently only partly the upshot of a targeted and deliberate process: innovations arise largely by chance or on an *ad hoc* basis, with insufficient support allocated to innovation. A systematic effort is leading to the gradual digitisation of public administration, which is tied to new legislation[15] and new strategic documents (in addition to the overarching Digital Czechia strategy, there are also the 5G

[14] [online]. Copyright © [cit. 30. 4. 2020]. Available from http://amsp.cz/wp-content/uploads/2019/09/Zpráva-o-vývoji-podnikatelského-prostředí-v-České-republice-v-roce-2018-ma_ALBSBEEQPHQL.pdf

[15] See Act No. 12/2020 Coll., on the right to digital services and amending certain acts, amendment of the Banking and Geodetic Acts.

network development strategy, the AI development strategy and others). Two significant factors hampering innovation in public administration are its risk-averseness and the insufficient funding earmarked for implementing and testing innovative solutions. An equally significant factor holding back innovation in public administration is the currently insufficient sharing of findings and know-how from abroad, where innovative public-administration management has been an important topic and subject of research for many years now. In addition, the CR lacks a suitable form of networking for innovative actors in public administration and transfer of Czech innovative best practice and frameworks and opportunities for using research infrastructure capacities for the needs of public administration, especially in the field of research and preparation of innovative products (the use of large research e-infrastructures is an example). It is essential to work to get a systemic hold on these shortcomings, partly via public-administration innovation laboratories. There is extensive innovation potential: not just in public administration itself, but throughout the public sector, whose innovation demand could drive dynamic growth in new solutions and thus opportunities for endogenous “Czech” business.

4 Strategic objectives

NRDIP 2021+ has the following five themed strategic objectives:

Objective 1: Put in place a strategically managed and effectively funded system of research, development and innovation in the CR

1.1 Ensure an appropriate ratio between the amounts of the institutional and targeted funding components with a view to making the research environment stable and effective, while maintaining at least the existing level of targeted funding.

1.2 Put in place the right legislative conditions for new targeted support tools for innovation and the relevant processes; introduce systematic assessment of targeted support programmes; streamline RDI administration; and ensure open access to R&D results in line with European legislation.

1.3 Ensure strategic and evidence-based management of RDI.

1.4 Ensure that targeted support programmes have a synergic effect so that their results and effects fulfil the NRDIP 2021+ vision and the concept of providers for the various sectors, and ensure that programmes are evaluated on the basis of predefined criteria linked to the objectives of each programme.

1.5 Expand the acquisition and application of further sources of RDI funding (in addition to national and international public funding and in particular private funding); in the case of public funding, introduce and apply other forms of support in addition to grants (loans, subsidised interest rates, guarantees, tax relief and other forms) as listed in the directly applicable EU legislation.

1.6 Create a mutually complementary funding scheme for research organisations' capacities out of funds for their long-term conceptual development and for large research infrastructures.

1.7 Ensure that targeted support for fundamental research is effective; support the best teams, regardless of the limits of average sector success; ensure coordination; and eliminate overlaps between grant projects and other types of project.

1.8 Cut RDI bureaucracy, mainly when project proposals are filed and costs are reported and billed on the basis of the same rules for all providers ("single methodological environment").

1.9 Ensure open access to R&D results and data that are created using public resources and freely shareable, and negotiate with leading research publishers to define rules for their publication in Open Access as per the CzechELib project.

1.10 Ensure effective use is made of industrial property protection tools, including support for the industrial property protection knowledge base.

1.11 Motivate the providers of institutional and targeted RDI support to focus a portion of research capacities on specific support for monitoring, analysing and proposing solutions for current challenges and threats with pan-societal impacts (focus area).

Objective 2: Support research organisations in creating motivational working conditions and developing human potential across the research and development spectrum

2.1 Create a system for supporting the development of human potential at institutional level.

2.2 Create an environment that increases motivation to pursue careers in research and make it sustainable in the CR.

2.3 Acquire and retain experts from home and abroad; put in place high-quality conditions for them.

2.4 Put in place the right conditions for combining research work and parenthood and for women returning from maternity leave and women and men returning from parental leave.

Objective 3: Improve the quality and international excellence of research and development in the CR; make the CR more open and attractive for international research and development; and intensify the integration of Czech RDI into the European Research Area

3.1 Support research teams' involvement in Horizon Europe, bilateral international mobility and international cooperation by research organisations and enterprises.

3.2 Support synergies of Czech and international RDI through financial instruments and by strengthening areas with synergic potential; increase state budget funding for RDI in fundamental/breakthrough areas of research fields or areas in which RDI results can fundamentally help tackle major societal challenges.

3.3 Increase the institutional component of funding for those research organisations that achieve good results by international comparison using Methodology 2017+.

3.4 Effectively promote priority orientations or topics of Czech research and innovation in work programmes implementing the EU framework programme for research and innovation, Horizon Europe (2021-2027).

Objective 4: Promote broader cooperation between the research and application spheres in research, development and innovation

4.1 When preparing and implementing programmes, foster cooperation between the research and application spheres in all relevant research fields.

4.2 Put in place conditions that stimulate partnerships and cooperation between all elements of the RDI system, ensuring an equal footing for partners and based on these partnerships' mutual benefit, including appointing corporate research representation.

4.3 Ensure a flow of information and topics for RDI between the research and application spheres, making use of the National Innovation Platforms.

4.4 Create tools for supporting long-term strategic cooperation between the research and application spheres.

4.5 Continue to support long-term RDI cooperation between research organisations and businesses and the practical implementation of joint results of applied research.

Objective 5: Achieve the expansion of research, development and innovation in businesses and in the public sector

5.1 Support businesses in their development of research, development and innovation activities in the CR leading to products with greater value added.

5.2 Improve the conditions for knowledge-based start-ups; systematically support the formation of spin-offs and start-ups.

5.3 Bring about an increase in the volume of investment in equity, which is a key source of funding for the future use of R&D results in innovations and for business.

5.4 Bring about an increase in the volume of funding from enterprise sources for R&D.

5.5 Create tools to support the digital transformation of businesses as one of the key conditions for increasing competitiveness, value added and involvement in important parts of the value chain.

5.6 Support businesses, research organisations and the public sector in joint research based on modern technologies (5G networks, AI, VR/AR); as a priority, support projects strengthening specialisation in the product chain with high value added.

5.7 Monitor and methodologically cooperate on the implementation of RDI results in the public sector; support public-sector involvement in creating demand for research and development and in cooperation in the execution of research projects.

5.8 Support the public sector in defining research requirements in the field of socially beneficial research, especially in the field of climate change, environmental risks, environment protection and proportionate food self-sufficiency.

5 Actions

Actions will be implemented within the framework of the defined staffing and financial limits of the concerned state budget headings, i.e. of the various government departments. Departments will secure funding in the context of their approved budgets and medium-term budgetary outlooks.

A detailed description of the individual actions is given below. Table 5.1 contains an overview of the measures and their links to the strategic objectives.

Action 1:	**Put in place a single legislative environment for the working of the RDI system**
Comments The current system of public support for RDI was introduced by the RDI Act, whose most recent update entered into effect on 12 March 2020. The RDI Act has been amended nineteen times. Consequently, despite all efforts to the contrary, it became less clear and harder to use. A fundamental amendment of the Act is necessary for several reasons. The first reason is that the amendment of Act No. 110/2009 Coll. incorporated into the RDI Act concepts linked to innovation, but the Act itself still does not contain rules on the procedure and conditions for providing grants for innovations and or define responsibility for them at the level of central state authorities. These changes will be combined with the introduction of further non-grant support tools (loans, guarantees etc.) and the amendment of the relevant legal regulations. The second reason is the need to introduce systematic evaluation of targeted support programmes, in particular evaluation of their impacts and benefits from using their results. The third reason is to streamline RDI administration where the requirements of the law are in place, in particular in RDI public procurement and in the implementation of innovation programmes, where the standard process needs to be sped up and simplified. Other necessary changes include ensuring open access to publicly funded R&D results and to peer-reviewed scientific articles and research data, in line with the European legislation.	
Timing: 1) 2021 – entry into effect of the amendment of the Act after prior submission of the full wording of the amendment to the Czech government, Chamber of Deputies and Senate for approval 2022+ – implementation of the amendment	
Responsibility: OG CR – Department of RDI Council	
Co-responsibility: RDI support providers	
Indicators: 1) Binary – approval of full wording of the amendment of the Act by the Czech government 2) Binary – approval of full wording of the amendment of the Act by the Chamber of Deputies and the Senate 3) Binary – entry into effect of the amendment	
Link to NRDIP 2021+ strategic objectives: Objective 1 (1.2) and also Objectives 3, 4 and 5	
New action	

Action 2: **Long-term evidence-based strategic funding of the RDI system**
Comments The purpose of the Action is to ensure long-term stable and predictable funding for the RDI system that is closely linked to the priority areas defined by strategic documents and departmental RDI concepts, with the emphasis on strengthening institutional funding, further to the outputs of the assessment of research organisations by means of Methodology 2017+ and in line with the RDI Act. Strategic documents and departmental RDI concepts determine the priority fields of applied research whose development will be supported through the preparation and implementation of the support tools. To support the priority areas defined by the appropriate departments, a system of direct support will be created and strengthened, i.e. programmes of targeted support; suitable conditions will be created for the development of the innovation environment for research organisations and enterprises, including start-ups; the role of departmental research organisations will be boosted and international cooperation will be fostered, with the primary objective of making use of the framework programmes for research and innovation. The development of the various areas must be done conceptually, taking into account synergies with other issues and in line with evidence-based policy, and with a view to strengthening cooperation between all components of the RDI system. Targeted financing (programme financing) will be underpinned by evaluation of programmes' impacts and benefits. The changes will be rolled out gradually as the various Methodology 2017+ evaluation segments get underway, as proposals for new programmes are submitted and as Innovation Strategy measures are implemented. The changes were commenced during the RDI Council's negotiations on the initial draft budget for 2021 (i.e. in spring 2020), which marked the start of the gradual financial stabilisation of the RDI system. As part of the implementation of the Action, the results of R&D assessment as per Methodology 2017+ will be used to increase the share of institutional funding, and a functional scheme for targeted and systemic support will be gradually implemented with a direct link to programme assessment and the Innovation Strategy and its Action Plan. Another aspect of the Action is to secure independent expert materials (i.e. analytical surveys, studies etc.) for strategic management of the RDI system in the CR and to assess the implementation method, in other words the benefits and impacts that the National Research, Development and Innovation Policy of the CR has on the Czech economy and society, where it is essential to make systematic use of strategic intelligence capacities in this sector area. The work of these capacities will include "technology foresight" and "technology assessment" with regard to the CR's need to monitor the latest science and technology trends and predict the possible socio-economic impacts of the implementation of new technologies. The main objective is therefore to make systematic use of strategic intelligence capacities for the purposes of adopting informed political decisions on RDI funding out of public money in the CR. Maximum possible use will be made of information from patent databases when monitoring the latest technology trends.
Timing: 1) 2021+ – applying the results of RDI assessment using Methodology 2017+ to the distribution of institutional support, and implementation of a functional system for targeted and systemic support with a direct link to programme assessment and the Innovation Strategy

2) 2025 – full introduction of the long-term stable and predictable RDI funding system in the proposal for RDI expenditure for the given year, medium-term budgetary outlook for the next 2 years and long-term outlook for the next 4 years 3) 2020+ – preparation and submission to the government for approval and implementation of a "shared activities project" in the 2021–2027 period, focusing on the development and use of strategic intelligence tools in the preparation of materials underpinning the creation, implementation and evaluation of policies, strategies and concepts of research, development and innovation
Responsibility: OG CR – Department of RDI Council and MoEYS
Co-responsibility: RDI support providers
Indicators: 1) Binary – approval of proposed RDI expenditure for the given year, of the medium-term budgetary outlook for the next 2 years and the long-term outlook for the next 4 years, with the full introduction of the strengthening of institutional funding (further to the outputs of research organisation evaluation using Methodology 2017+) and of the functional system for targeted and systemic support with a direct link to programme assessment and the Innovation Strategy and Action Plan for its implementation 2) Proportion of changes in the RDI funding system underpinned by independent evidence drawn up using strategic intelligence
Link to NRDIP 2021+ strategic objectives: Objective 1 (1.1, 1.3) and also Objective 4.5 and Objective 3
Link to Action 5 of the NRDIP Update 2016–2020

Action 3:	**Evaluation of targeted RDI support programmes, including assessment of their impacts and the benefits from using their results**
Comments The existing programme assessment system rooted in the RDI Act and follow-up government resolutions distinguishes three phases of programme assessment – assessment of the draft programme, interim assessment and assessment immediately after the programme ends. Section 35(2)(d) of the RDI Act provides that the RDI Council is obliged to ensure that the results of completed RDI programmes are evaluated. Programme assessment is based on the Fundamental Principles of the Preparation and Assessment of Programmes and Groups of Grant Projects of Research, Development Innovation (the Principles), which were approved by Government Resolution No. 351 of 13 May 2015 and are a binding document on targeted RDI programme assessment, and on Methodology 2017+. The purpose of the measure is to put into practice the fourth phase of programme assessment in line with the Principles. After a period of time, programmes' impacts (economic, social, environmental *et al.* depending on the programme's focus) and the benefits arising from practical application of their results (again depending on the programme's focus) will be evaluated. A programme's impacts and benefits cannot be assessed immediately after it ends: in applied research it takes several years for the results	

to be applied in practice (in some areas practical application is predicated on testing lasting several years); similarly, in fundamental research the benefit to global knowledge can only be assessed after several years (e.g. citations of the given work etc.). That is why a period of 3–5 years after completion of the programme is proposed. The assessment will be done just once for each programme but after a suitable period of time, depending on the nature of the programme and at the proposal of its provider. At the same time, providers must be able to obtain the necessary data from support beneficiaries even after the programme has ended. All that necessitates an amendment of the RDI Act so that a given programme already includes suitable criteria at the proposal stage and projects can be selected and evaluated according to these criteria. To that end, the RDI Council, working with research, development and innovation support providers, will create a document for assessing targeted RDI support based on the Principles and Methodology 2017+. This document will lay down a structure for targeted programme assessment and binding assessment parameters. Gradually, from 2021 onwards, these criteria will be required of all new programmes in line with this document; they will be proposed by the provider in coordination with the relevant R&D Council rapporteur. For existing programmes, the assessment of impacts and benefits will be introduced as appropriate, i.e. for the purpose of assessing the suitability or unsuitability of the given programme's parameters for preparing the subsequent programme or for preparing the given provider's concept for the coming period.
Timing: 1) 2021+ – preparation, submission to the Czech government for approval, and implementation of the document on assessment of targeted RDI support 2) 2021+ – gradual introduction of programme impacts and benefits assessment; in the case of programmes currently underway, after their completion this assessment will be applied as appropriate (for the purpose of assessing the suitability or unsuitability of the given programme's parameters for preparing the subsequent programme) and in the form of a material to be put before the RDI Council, or possibly the Czech government, at the same time as the assessment of the results of programmes completed in the preceding year
Responsibility: OG CR – Department of RDI Council
Co-responsibility: RDI support providers
Indicators: 1) Assessed RDI programmes completed 3–5 years previously, with assessed impacts and benefits, as a proportion of all targeted support 2) Number of targeted support programmes whose RDI public tender documentation includes the integration of social roles, needs and experiences of people of various sexes and ages as an assessment criterion in the RDI content
Link to NRDIP 2021+ strategic objectives: Objective 1 (1.4) and also Objective 3
Link to Action 6 of the NRDIP Update 2016–2020

Action 4:	**Expand the acquisition and use of other sources of RDI funding**
Comments	

At this point in time, all state support for RDI is provided in the forms of grants and tax breaks. The CR does not make use of other forms of support (loans, interest rates subsidies guarantees and other forms listed in the directly applicable EU regulations (Article 5(2) of Commission Regulation (EU) No 651/2014). The amendment of the relevant legislation (Act No. 47/2002 Coll., on support for small and medium-sized enterprises and amending Act No. 2/1969 Coll., on the establishment of ministries and other central organs of state administration of the Czech Republic, as amended) will make it possible to make use of other forms of support than grants, which will mainly be practical for innovation programmes and also for some specific applied-research programmes, e.g. those focusing on knowledge transfer from research organisations (feasibility studies etc.). The roll-out of other forms of aid will thus simultaneously make it possible to use other forms of RDI funding (in addition to Czech and international public funding and in particular private funding), which, in conjunction with reduced bureaucracy, will lead to greater involvement of enterprises and their resources in project implementation. The greater involvement of foreign funding is covered by Objective 3 measures (support for the involvement of research teams in Horizon Europe etc.). Enterprises will be offered tax deductions to motivate them to perform R&D. In the case of investment aid, projects with higher value added that can prove a link to research activities will take precedence, with the objective of implementing primarily technologically demanding investments that guarantee economic growth in the future and further spending on research, development and innovation from non-public sources. The use of EU funds is envisaged for the implementation of this Action.
Timing: 1) 2021+ – implementation of the amendments of the relevant legislation 2) 2022+ – gradual use of other forms of support than grants in draft programmes
Responsibility: OG CR – Department of RDI Council, MoIT
Co-responsibility: RDI support providers
Indicators: 1) Non-grant forms of support as a proportion of total targeted support for programmes 2) Proportion of other sources of RDI funding (foreign and in particular foreign sources)
Link to NRDIP 2021+ strategic objectives: Objective 1 (1.5) and also Objective 5 (5.4)
New action

Action 5:	**Creating a mutually complementary funding scheme for research organisations with large research infrastructures**
Comments Further to the approval of large research infrastructures for funding from public money in the CR in the period up to 2022 (Czech Government Resolution No. 836 of 12 December 2018), the MoEYS will use the tools set out in pillar 5 of the Innovation Strategy Action Plan: Innovation and Research Centres to prepare a large research infrastructure support system for the period of the upcoming multiannual budget framework in the years 2023–2029. The CR is keen to continue to operate unique facilities for high-knowledge and technologically demanding research, development and innovation that will be made accessible to all its potential users from the community of research organisations and innovative enterprises on the Open Access principle. However, in future the large research infrastructure system in	

the CR needs to be even more closely linked to major societal challenges facing the CR and must reflect, besides the needs of the research community (bottom-up approach), the perspective of the CR's sector priorities as defined by their appropriate stakeholders, i.e. ministries (top-down approach), with a greater focus on analysing the socio-economic benefits and impacts of large research infrastructure in the CR, e.g. in connection with the National RIS3 strategy). This Action only applies to large research infrastructures. As far as R&DfI centres are concerned, these arose out of projects funded in Priority Axis 1 and Priority Axis 2 of OP R&DfI. Most R&DfI centres operate as a separate division or organisational unit that is part of a research organisation. They can be funded using the funding instruments of targeted and institutional support. Centres that arose out of projects funded out of Priority Axis 1 of OP R&DfI perform research and development to a globally comparable standard. Centres funded out of Priority Axis 2 of OP R&DfI were the CR's "regional research and development centres", but many of them nevertheless attain at least national significance with considerable international reach. R&DfI centres in the CR are part of specialised research and development centres that have been emerged gradually since 2005. After NPU I and II programme projects were completed, the development of the centres is dealt with as part of the long-term conceptual development of research organisations (see Government Resolution No. 352 of 20 May 2019, which indicates that the transfer of NPU I per Government Resolution No. 1067/2015 has been resolved and the transfer of NPU II is currently being resolved). Ensuring the working of R&DfI centres will remain the full responsibility of the institutions operating the given centres, including ensuring long-term available funding, including long-term conceptual development of research organisations.
Timing: 1) 2020–2021 – drawing up of a Large Research Infrastructures International Peer-review Assessment Methodology (II/2020) and subsequent launch of the actual assessment process (I/2021) 2) 2022 – government decision on the funding of large research infrastructures of the CR in the 2023–2029 period (IV/2022)
Responsibility: MoEYS
Co-responsibility: ---
Indicators: 1) Binary – approval of the funding of large research infrastructures of the CR in the 2023–2029 period by the Czech government 2) Proportion of support for large research infrastructures taking into account the CR's societal challenges
Link to NRDIP 2021+ strategic objectives: Objective 1 (1.6) and also Objective 3
New action

Action 6:	**Make targeted support for fundamental research more effective and ensure that the best teams in each field are supported**
Comments	

The emphasis currently needs to be placed on developing first-class fundamental research in the CR supported with public money and using public tenders. Promoting excellence in fundamental research through the EXPRO and JUNIOR STAR projects that make it possible for scientific research to be conducted to an international standard in Czech research organisations puts in place attractive conditions for top-level experts. Drawing on experiences with evaluating these grant project groups (GPGs) when evaluating other GPGs will make it possible to support fields that achieve first-class results comparable with international standards. Possibilities that emerge for first-class international-standard project proposers from the introduction of a multilateral agreement with 15 European grant agencies under the Science Europe organisation will be exploited. One of the priorities will be to support junior researchers in order to put in place the right conditions for excellent young scientists. One benefit will be the creation of an international environment in Czech research organisations through support for talented young scientists arriving from abroad. Improving the quality of fundamental research is an essential precondition for creating an environment for high-quality applied research and development. It is envisaged that the work of all RDI support providers will be coordinated, including identifying projects with application potential.
Timing: 1) 2022+ – implementation of changes leading to support for research worker mobility, including support for international cooperation 2) 2022+ – implementation of procedures for identifying fundamental-research projects with application potential 3) 2025 – assessment of measures ensuring the best teams are supported
Responsibility: GA CR
Co-responsibility: OG CR – Department of RDI Council
Indicators: 1) Number of important science publications created by scientists working in institutions in the CR 2) Number of applications filed for ERC grants and total number of ERC grants awarded 3) Success rate in obtaining other international or foreign grants 4) Numbers of new research groups founded with an independent programme on a first-class international level 5) Number of excellent researchers working in the CR (Highly Cited Researchers, recipients of prestigious commendations and grants)
Link to NRDIP 2021+ strategic objectives: Objective 1 (1.7)
New action

Action 7: **Reducing bureaucracy in RDI**
Comments

The Action is designed to cut excessive bureaucracy in RDI, which diminishes capacities and resources on the side of beneficiaries (research organisations and enterprises) and on the side of providers. The measure focuses on three main areas where administration can and must be streamlined. The first area is the legal rules on RDI support in connection with the proposed amendment of the act and other sub-statute regulations. It will concentrate on simplifying the process for proving eligibility, obtaining the necessary information from public registers and the possibility of a change in the beneficiary of grant projects. Another part of the Action is rules on dealing with unutilised funds that cut red tape. Another area comprises changes in the provision of support, where various providers have different rules in their internal regulations (e.g. what can be covered by staff costs and to what limit). The standard methodological environment should contain primarily common rules on expenditure eligibility, rules on approving project changes, rules for selecting suppliers, specimen documents (e.g. specimen tender documentation, specimen support provision agreement) etc. The rules issued by individual providers would only contain deviations from the common standard. The third area relates to an appropriate ratio between the levels of institutional and targeted funding with a view to making the research environment stable, effective and less bureaucratic.
Timing: 1) 2021– entry into effect of the amendment 2) 2022 – submission to the Czech government of a methodological environment standard for cutting bureaucracy in RDI support 3) 2021+ – gradual attainment of an appropriate ratio between the levels of institutional and targeted funding
Responsibility: OG CR – Department of RDI Council
Co-responsibility: RDI support providers
Indicators: 1) Binary – entry into effect of the amendment with provisions cutting bureaucracy 2) Proportion of the methodological environment standard for RDI support in specimen documents (e.g. tender documentation, support provision agreement) 3) Annual ratio between institutional support for long-term conceptual development of research organisations and targeted support
Link to NRDIP 2021+ strategic objectives: Objective 1 (1.8)
New action

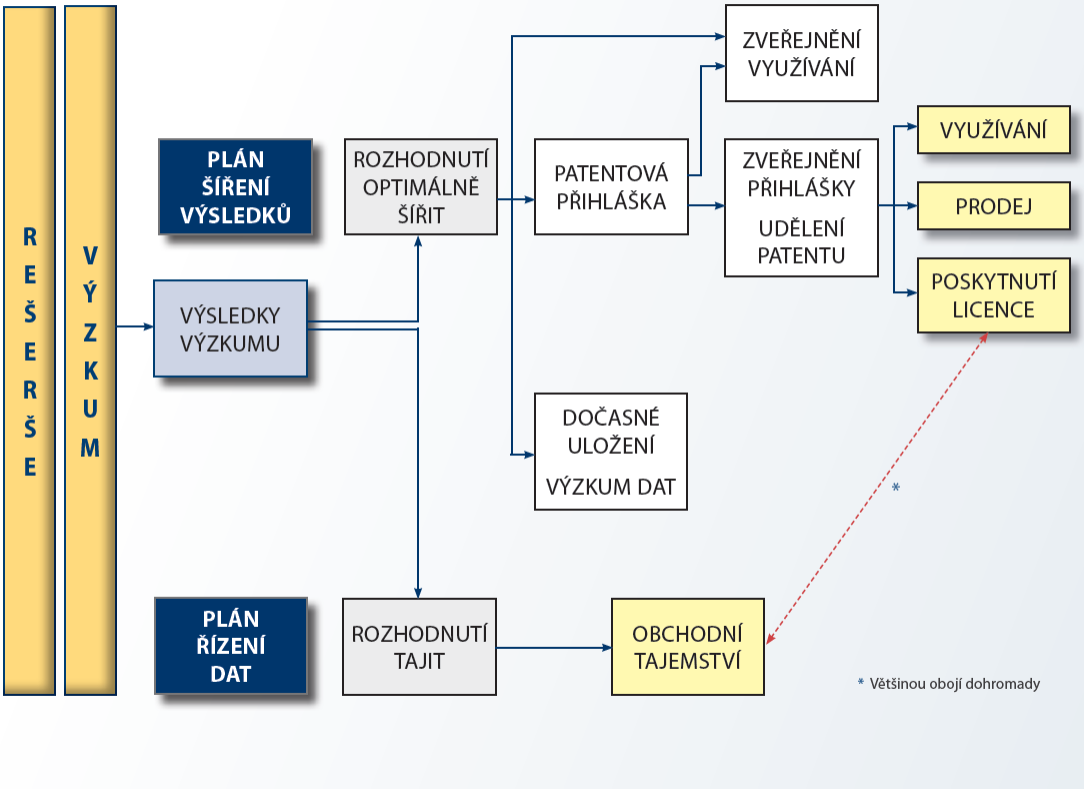
Action 8:	**Open access to R&D results and data that can be freely disseminated; upgrade and streamlining of the RDI IS**
Comments The Action focuses on ensuring open access to R&D results and data and developing the RDI IS in line with the Concept of the Research, Experimental Development and Innovation	

Information System for 2021–2025 so that the measure, in close connection with NRDIP 2021+, helps achieve the policy's objectives by ensuring that the RDI IS provides state administration and providers, research organisations, enterprises and the expert public with credible information necessary for funding, evaluation and decision-making. This mainly involves improving user convenience; expansion for further support for bibliometric analysis; supporting Open Access; including implementation of the European Open Science Cloud initiative in the CR; re-use of data already entered in other public administration information systems (connection to basic registers); cooperation in sharing data originally entered in the RDI IS by other state authorities; changes to and expansion of identifiers and the content of entries; description of the results life cycle; option of full-text searches in the RDI IS; promotion of the importance of the RDI IS in the media; and use of user feedback. Another part of the measure will be the continued implementation of the requirements of Directive of the European Parliament and of the Council (EU) 2019/1024 on open data and re-use of public sector information. The implementation of the measure will also take place in connection with the Digital Czechia set of strategies and concepts and assessment of the implementation of the Action Plan for the Czech Republic National Strategy of Open Access to Scientific Information for 2017–2020. In addition, the built national licensing centre CzechELib and the developed national e-infrastructure, which will ensure coordination and infrastructure support up to the level of individual research organisations, will play a key support role in the implementation of Open Access between the national and institutional levels in the CR. Another aspect of implementation will be the negotiation of rules with prominent research publishers for Open Access publication further to the CzechELib project. The use of EU funds is envisaged for the implementation of this Action.
Timing: 1) 2021 and beyond in line with the timings contained in the RDI IS Concept for 2021–2025 2) 2021+ – creation of an action plan following up the Action Plan for the Czech Republic National Strategy of Open Access to Scientific Information for 2017–2020
Responsibility: RDI Council
Co-responsibility: RDI support providers
Indicators: According to the outputs contained in the RDI IS Concept for 2021–2025
Link to NRDIP 2021+ strategic objectives: Objective 1 (1.9) and also Objectives 2, 3, 4 and 5
New action

Action 9: **Create an Industrial Property Protection Support Concept**
Comments Creating an Industrial Property Protection Support Concept, with the emphasis on patents, and the subsequent implementation of the Action will eliminate (or significantly reduce) the causes of the insufficient use of industrial property rights identified in the analysis section, and the following in particular:

- Raise awareness about industrial property protection in the education system
- Raise awareness about industrial property protection in the application sphere
- Design conditions for research organisations in a way ensuring there is sufficient motivation to have an effective licence policy
- Put in place motivation for research organisations for technology transfer
- Make use of patent information when formulating science, research and innovation plans
- Introduce patent searches in draft projects in the relevant fields
- Make use of patent information in all phases of the assessment of publicly funded programmes and projects
- Define types of RDI results so that the results of publicly funded research are not registered for ineffective industrial protection (should be included among PCT application results; conversely, the industrial model result is ineffective)
- Constantly take into account industrial property protection when defining objectives and measures in strategic and conceptual documents;
- Ensure specialists have sufficient expertise in industrial property when formulating the conditions for publicly funded support for industrial property protection
- Keep records of and promoting options for funding for industrial property protection and management
- Ensure the presence in every government department dealing with RDI of a person responsible for industrial property protection
- Leverage the competence of existing industrial property experts in state administration

The following flowchart summarises the issue of industrial property protection in R&D:



REŠERŠE	SEARCHES
VÝZKUM	RESEARCH
PLÁN ŠÍŘENÍ VÝSLEDKŮ	RESULTS DISSEMINATION PLAN
VÝSLEDKY VÝZKUMU	RESEARCH RESULTS
PLÁN ŘÍZENÍ DAT	DATA MANAGEMENT PLAN
ROZHODNUTÍ OPTIMÁLNĚ ŠÍŘIT	OPTIMAL DISSEMINATION DECISION
ROZHODNUTÍ TAJIT	DECISION TO KEEP SECRET
PATENTOVÁ PŘIHLÁŠKA	PATENT APPLICATION
DOČASNÉ ULOŽENÍ | VÝZKUM DAT	TEMPORARY STORAGE | DATA RESEARCH
OBCHODNÍ TAJEMSTVÍ	TRADE SECRET
ZVEŘEJNĚNÍ VYUŽÍVÁNÍ	PUBLIC USE
ZVEŘEJNĚNÍ PŘIHLÁŠKY | UDĚLENÍ PATENTU	PUBLICATION OF APPLICATION | AWARD OF PATENT
VYUŽÍVÁNÍ	USE
PRODEJ	SALE
POSKYTNUTÍ LICENCE	GRANTING LICENCE
*většinou obojí dohromady	*usually both together

Timing:

1) 2021 – submission of a draft Industrial Property Protection Concept to the Czech government for approval
2) 2021–2025 – implementation of Industrial Property Protection Concept measures
3) 2026 – assessment of Industrial Property Protection Support Concept measures

Responsibility: Office of Industrial Property

Co-responsibility: ---

Indicators:

1) Binary – approval of the Industrial Property Protection Concept by the RDI Council and Czech government
2) Number of patent applications to EPO by Czech applicants
3) Number of applications for Czech patents by Czech applicants
4) Proportion of the use of industrially protected results of applied research (sale of licences etc.)

Link to NRDIP 2021+ strategic objectives: Objective 1 (1.10)

New action

Action 10:	**Create an environment that increases motivation to pursue careers in research**

Comments The Action focuses partly on supporting the growth of research workers' professional skills and abilities and partly on improving their working conditions in research organisations. The supported measures include putting in place personal development and career plans and expanding continued education and lifelong learning. It comprises steps to develop the necessary skills and expertise in research and managerial work and teamwork enabling cooperation with other RDI actors to develop and deepen. The measure will also support the development of research organisations in order to improve the transparency and quality of the stewardship of human potential. In the context of EU funds, it is envisaged that finances will be used *inter alia* on measures such as structural change projects, support for the acquisition of the "HR Excellence in Research Award", reducing gender imbalances in RDI, improving work/life balance conditions etc. The Action will be implemented via assessment of providers' research organisations in line with Methodology 2017+, module 4 Viability, which states that developing human potential is one of the criteria of the comprehensive assessment of research organisations at provider level. In addition, allowance will be made for the conclusions and recommendations contained in the "Interim Assessment of the Implementation of Measures of the Action Plan for the Development of Human Resources for Research, Development and Innovation and Gender Equality in Research, Development and Innovation in the CR for 2018-2020", discussed at the 357th session of the RDI Council on 27 May 2020,[16] and the Strategy for Equality of Women and Men for 2021-2030.[17]
Timing: 1) 2021–2025 – on a regular basis (complete assessment of research organisations, including universities) 2) 2025 – assessment of the development of human potential as an evaluation criterion in the assessment of research organisations for the purposes of providing institutional support for long-term conceptual development
Responsibility: RDI support providers
Co-responsibility: OG CR – Department of RDI Council
Indicators: 1) Proportion of research organisations creating an environment that increases motivation to pursue a career in research 2) Level of aid allocated and actually utilised in support of the measure from EU funds (relevant only if these finances are available) 3) Number of supported research organisations and projects
Link to NRDIP 2021+ strategic objectives: Objective 2 (2.1, 2.2, 2.4) and also Objective 3
Link to Action 15 of the NRDIP Update 2016–2020

Action 11:	**Acquire and retain R&D experts from the CR and abroad**

[16] RDI Council resolution and complete material accessible at http://vyzkum.cz/FrontClanek.aspx?idsekce=891621
[17] Currently being prepared for submission to the government.

Comments

The shortage of experts, especially in some science and technology fields, is a long-term problem in RDI that goes beyond the existing period of a shortage of people on the labour market. This problem is marked both in research organisations (in locations with a large concentration of research organisations there are tugs-of-war over experts, which leads to brain drain from less developed locations) and even more so in enterprises, where it is one of the factors preventing greater innovation. There is still no long-term system for forecasting expected demand on the labour market in connection with envisaged technology trends and the potential challenges that businesses will have to react to in good time.

Another key aspect of this measure will be the Action Plan tools identified in the Innovation Strategy, Pillar 2: Polytechnic Education.

Last but not least, there is a brain drain to developed countries, which must be countered both by creating an environment that increases motivation to pursue research careers in the CR and by acquiring experts from abroad and breaking down the barriers to their residence in the CR. This is an interdepartmental issue that must mainly be tackled by three departments: MoEYS as the central state authority for R&D and simultaneously the body responsible for university education; MoLSA, whose remit covers employment; and MoFA for the aspect of acquiring experts from abroad.

The use of EU funds is envisaged for the implementation of this Action.

Timing:

1) 2021+ – introduction of implementation measures for acquiring and retaining RDI experts from the CR and abroad
2) 2026 – assessment of the efficacy of implementation measures for acquiring and retaining RDI experts from the CR and abroad

Responsibility: MoEYS in collaboration with MoLSA and MoFA; MoI, MoE, MoIT, CAS and OG CR – Department of R&D Council

Co-responsibility:

Indicators:

1) Proportion of fields in RDI where there is a favourable institutional environment of European standard for recruiting, retaining and developing experts

Link to NRDIP 2021+ strategic objectives: Objective 2 (2.3) and also Objective 3

Link to Actions 22, 23 and 24 of the NRDIP Update 2016–2020

Action 12:	**Put in place the right conditions for combining research work and parenthood and for women returning from maternity leave**

Comments

The representation of women among research workers has long been falling: women account for less than a quarter (23%) of research workers in the CR. The proportion of women in doctorate study is, however, growing (now around 45%). The inflexibility of targeted support systems when confronted with parenthood is a major factor reducing (primarily) women's willingness to go into a career in research after completing doctorate study. Data and analyses also show that the representation of women in decision-making,

assessment, expert and advisory bodies has long been very low. In other countries, institutions funding research out of public money work to improve awareness in the field of gender prejudice and gender in the field of knowledge. The Action involves the following measures mainly targeting grant projects, because in applied-research programme projects, an entire team works on the project and e.g. the interruption of a project would cause the team to disintegrate:

- Introduce "re-entry grant projects" for researchers returning from maternity or parental leave and after career breaks
- Make it possible to suspend work on grant projects on the grounds of pregnancy or maternity or parental leave in the case of solo projects and to introduce the opportunity to hand over and take back a project role after return from maternity or parental leave in the case of project teams
- Make selected costs of childcare services linked to research professions deductible for solo project workers and project team members (e.g. deductible costs of child minding services for the children of breastfeeding mothers when they attend research conferences)
- In addition to long-term research mobility conditions, introduce other possibilities for demonstrating international involvement (e.g. short-term stays, participation in international projects, doctorate study abroad, authorship of publications by international teams etc.)
- When performing Methodology 2017+ assessments, take into account research organisations that have a demonstrable system addressing working conditions, including conditions for combining work and parenthood

In addition, allowance will be made for the conclusions and recommendations contained in the "Interim Assessment of the Implementation of Measures of the Action Plan for the Development of Human Resources for Research, Development and Innovation and Gender Equality in Research, Development and Innovation in the CR for 2018-2020", discussed at the 357th session of the R&D Council on 27 May 2020[18], and the Strategy for Equality of Women and Men for 2021-2030[19].

The use of finances from EU funds is envisaged for creating these conditions as part of the development of human potential in research organisations.

Timing:

1) 2021+ – implementation of the conditions for combining research work and parenthood and for women returning from maternity and parental leave in those fields where the proportion of women is markedly lower than the proportion of men
2) 2026 – assessment of implementation of the Action

Responsibility: RDI support providers

Co-responsibility: OG CR – Department of RDI Council, OG CR – Unit of Cross-cutting Agendas

Indicators:

[18] RDI Council resolution and complete material accessible at http://vyzkum.cz/FrontClanek.aspx?idsekce=891621

[19] Currently being prepared for submission to the government for approval.

1) Proportion of women in those fields where the proportion of women in research is markedly lower than that of men 2) Proportion of research organisations which demonstrably put in place favourable conditions for combining research work and parenthood and for women returning from maternity leave
Link to NRDIP 2021+ strategic objectives: Objective 2 (2.4) and also Objective 3
Link to Action 15 of the NRDIP Update 2016–2020

Action 13:	**Involve research teams in Horizon Europe, and possibly other EU programmes; bilateral international mobility and international cooperation between research organisations and enterprises; and support for providing systemic access to the results of science and research**

Comments

There are several causes of the long-standing low success rate of Czech teams in EU Framework Programmes (now Horizon) and the current EIC pilot. One of the main causes is a lack of experience with equivalent types of project, which applies to all areas of research.

The first part of the Action therefore focuses on going ahead with and developing the existing tools designed to support research teams' greater involvement in Horizon Europe (and above all ERC activities and partnerships and schemes under the EIC). These tools currently exist under the stewardship of MoEYS and GA CR, CAS and TA CR in collaboration with the appropriate ministries. At the same time, the first part of the Action could be reinforced with new support tools designed to achieve the same (e.g. the outline of a programme being prepared by the MoEYS under the Innovation Strategy designed to interconnect excellence in research and application and implement the equivalent of the ERC or bolster the CR's involvement in social challenges in partnerships, which is being supported by the TA CR as a pilot in collaboration with the responsible ministries). Support for "high risk/high gain" projects is also appropriate in this context.

Another part of the Action concerns information support for Horizon Europe. Given the need to fundamentally step up international RDI cooperation between research organisations and enterprises, with particular regard to their involvement in EU framework programmes for RDI, it is necessary to put in place high-quality information and advisory resources for research organisations and enterprises. These resources would both mediate information about declared or new calls under the 9th EU framework programme for research and innovation, Horizon Europe (2021-2027), and other international grant schemes (e.g. COST, EUREKA etc.), they would also provide expert advice on financial, legal and other specific issues in the preparation and submission of proposals, or implementation of supported international RDI projects (Technology Centre of CAS, National Contact Centre for Gender and Science and others). In parallel with that, the CR wants to strengthen communication with RDI stakeholders from the whole of Europe [e.g. by making use of National Contact Points operating in the CR, as well as the Czech Liaison Office for Research, Development and Innovation in Brussels (CZELO), or interlinking the existing activities of national contact persons, representatives in programme committees and representatives in ERA-NET Cofund providers consortia or future partnerships]. Last but not least, the work of the "Welcome Office" for research workers and innovators arriving in the CR is important. The information and advisory resources should include the provision of information on possible

ways of using intellectual property rights, from the perspective of both users of foreign protected solutions and applicants.

The third part of the measure is the systematic and constant provision of up-to-date information on the results of global science in the CR, which is a primary precondition for the creation and maintenance of RDI excellence and an indispensable step leading to the internationalisation of the Czech research and innovation environment. Given the fundamental need to have access to the latest results of global research, it is necessary to see to the economical and effective purchasing of these results in the form of shared activities and then to their provision to science and research workers in both the public and private sectors. The Action's purpose is to preserve the continuity of the principal activities of the "National Centre for Electronic Information Resources CzechELib", i.e. to continue centralised purchasing of key electronic information resources, citation databases and bibliometric tools and the operation of a comprehensive system for acquiring and managing electronic information resources and creation of ancillary analyses and statistics or member institutions and organisations and for bodies of Czech state administration operating in RDI fields. Thanks to the know-how and bargaining power concentrated in the National Centre and international consortia, when the transition to the Open Access model is being made negotiations will be conducted to arrange more advantageous conditions for the publishing of RDI results by domestic authors and for effectively opening them up to the international community.

The use of EU funds is envisaged for the implementation of this Action.

Timing:

1) 2020+ – preparation, submission to the Czech government for approval, and implementation of the "shared activities project" in the 2021–2027 period, focusing on enhancing the integration of the CR's research and innovation system into the European Research Area and fostering engagement in international cooperation by research organisations and enterprises in the CR in research, development and innovation
2) 2020+ – preparation, submission to the Czech government for approval, and implementation of the "shared activities project" in the 2021–2027 period, focusing on systematically and constantly making available current information about global research results in the CR

Responsibility: MoEYS, GA CR, CAS, TA CR in collaboration with the appropriate ministries

Co-responsibility: OG CR – Department of R&D Council, MoIT

Indicators:

1) Success rate of Czech projects in Horizon Europe
2) Improved effectiveness of the "National Centre for Electronic Information Resources CzechELib"
3) More effective communication by Czech representatives in the EU's research and innovation structures

Link to NRDIP 2021+ strategic objectives: Objective 3 (3.1) and also Objective 4

New action

Action 14:	**Support for synergies between Czech and international R&D though international programme cooperation by the CR**
Comments The programme for international programme cooperation in R&D in the coming period (following up the existing INTER-EXCELLENCE programme) will focus on a broad range of international cooperation activities developed both within the framework of the European Research Area and outside it. In line with its precursors' long-standing tradition, the programme will also provide support for project teams in the CR working on COST and EUREKA projects. At the same time, it will focus on supporting the development of the CR's bilateral cooperation in research and development fields with European and non-European states undertaken on the basis of international agreements negotiated by the CR, whether at governmental and/or departmental level. The use of EU funds is envisaged for the implementation of this Action.	
Timing: 1) turn of 2020/2021 – preparation of the programme and its approval by the Czech government 2) 2021 – performance of public tenders in RDI 3) 2022-2029 – implementation of supported projects	
Responsibility: MoEYS	
Co-responsibility: TA CR	
Indicators: 1) Binary – approval of the programme by the Czech government, including criteria for assessing the programme's impacts and benefits after its completion 2) Proportion of programme indicators fulfilled	
Link to NRDIP 2021+ strategic objectives: Objective 3 (3.2)	
Link to Actions 4 and 12 of the NRDIP Update 2016–2020	

Action 15:	**Increase the institutional component of funding for those research organisations that achieve good results by international comparison as per Methodology 2017+**

Comments From 2017 on there has been regular annual assessment of research organisations using Methodology 2017+. In addition, a comprehensive assessment is being introduced in the individual segments so that the RDI system is not viewed solely in terms of results. The assessment method to date that focused entirely on evaluating outputs of RDI led to increased research output but also to deformations, as the focus on the quantity of results did not drive improved quality. If monies are to be distributed responsibly for the long-term conceptual development of research organisations, information about the quality of the research they carry out is required. From 2020 on, annual monitoring and complete evaluation takes place in five-year cycles. Results are assessed at national level by the RDI Council, with foreign experts being gradually involved in the assessment. Assessment at the level of providers is done by the bodies whose budget headings cover the support provided. Evaluation of the quality of research organisations is done using five basic modules: Quality of Selected Results; Research Performance; Social Relevance of Research; Viability; and Strategy and Concept. The relative significance of the models varies depending on the research organisation's position in the R&D system. After the first five-year assessment cycle 2020-2024 at national level ends, its results will be reflected in an increase in the institutional component of funding for those research organisations that achieve high-quality results in international comparison using Methodology 2017+.
Timing: 1) 2020-2024 – performance of the first five-year comprehensive assessment cycle at national level 2) 2025 – results of the first five-year cycle to be reflected in an increase in the institutional component of funding for those research organisations what achieve high-quality results in international comparison using Methodology 2017+
Responsibility: OG CR – Department of RDI Council in collaboration with RDI support providers
Co-responsibility: ---
Indicators: Relative change in the proportion of institutional support in the case of individual providers compared to 2017 and correlation of this change to the results of the national-level assessment
Link to NRDIP 2021+ strategic objectives: Objective 1, Objective 2, Objective 3 (3.3)
Link to Action 10 of the NRDIP Update 2016–2020

Action 16:	**Ensure coordinated representation of the CR in the programme committee of Horizon Europe (2021-2027) so that the CR's priorities as stemming from the priority focuses of Czech research and innovation are promoted effectively**
Comments	

The Action focuses on ensuring that the CR is suitably represented in the various thematic configurations of the programme committee of Horizon Europe (2021-2027) so that the CR's priorities are effectively promoted in the working programmes implementing the framework programme. It comprises effective coordination between the MoEYS as the main authority in charge of the CR's international R&D cooperation and the relevant departments representing sector policies that are reflected in the EU's framework programme. Implementation of the Action will help ensure that the priority focuses or topics of Czech research and innovation are sufficiently incorporated into the framework programme's working programmes and into the individual calls.
Timing:
2021+ – ensuring the work of Czech delegates selected and nominated in 2020 to the Horizon Europe programme committee (2021-2027) in collaboration with the relevant Czech stakeholders
Responsibility: MoEYS
Co-responsibility: MoIT, MoT, MoAH MoA, MoE, MoI, MoD, MoC
Indicators:
Greater involvement of Czech research organisations and enterprises in Horizon Europe (2021-2027) – compared to Horizon 2020 (2014-2020) – as regards the number of proposals submitted/successful involvements in projects and the level of funding that Czech research organisations and enterprises obtain from the Horizon Europe budget
Link to NRDIP 2021+ strategic objectives: Objective 3 (3.4)
New action

Action 17:	**Fostering cooperation between the research and application spheres when preparing and implementing programmes**
Comments	
The results of applied-research programmes are intended to be used in the application sphere, be that the private sector or public sector (education, healthcare, culture, environment etc.). For that reason, providers must work with representatives of the application sphere in the programme preparation phase; they must discuss draft programmes' objectives, parameters, criteria etc. with them so that the results of the programme's projects are used in the application sphere. The second phase of cooperation comes in project selection, done with the participation of application-sphere representatives (on the condition of impartiality, of course) on the boards of programmes. Even though cooperation has improved during the last two years, the state of affairs differs considerably from programme to programme and in both phases; there are still some programmes whose preparation was done solely by the research sphere (or, even worse, by the provider's employees) and/or programmes where the research or more commonly application sphere is not represented on the programme boards. Coordinating and managing the cooperation process is the responsibility of the provider – besides ensuring impartiality, the provider does not discuss the entire tender documentation, merely those parts where representatives of the research and application spheres can give the benefit of their expertise with a view to making sure that the programme is viable under the given conditions and its results will be	

usable in practice (see the assessment of programme impacts and benefits in Objective 1). The Action's purpose is therefore to ensure cooperation between the research and application sphere in the preparation and implementation of new programmes; in the case of programmes already underway, the purpose is to ensure research-sphere representatives participate in expert advisory bodies during public procurement.
Timing: 1) 2021+ – ensuring cooperation between representatives of the research sphere and application sphere in the preparation and implementation of all new applied-research programmes; in the case of programmes already underway, ensuring cooperation on implementation if an RDI public tender is held 2) 2025 – evaluation of cooperation between the research and application spheres in the preparation and implementation of applied-research programmes 3) 3–5 years after completion of the programme – assessment of its impacts and benefits per Objective 1
Responsibility: RDI support providers
Co-responsibility: OG CR – Department of RDI Council
Indicators: 1) Proportion of programmes in which cooperation took place between the research and application spheres in the preparation and implementation of applied-research programmes, reported separately for the enterprise sphere and public sector 2) Number of public consultations of key documents of individual providers (draft programmes, general structure of tender documentation, government departments'/providers' conceptual documents 3) Criteria defined for a given programme for assessing its impacts and benefits
Link to NRDIP 2021+ strategic objectives: Objective 4 (4.1) and also Objective 4.5
New action

Action 18:	**Support for cooperation between the research and application spheres and application of its results in the humanities and social sciences**
Comments In the humanities and social sciences, cooperation between the research and application spheres, which is one of the strategic objectives of NRDIP 2021+, has a number of features specific to these fields. One consequence is that the users of results are mostly not enterprises but the responsible authorities and organisations of state administration operating mainly in humanities fields (e.g. National Heritage Institute et al.) or state and local government authorities whose work deals mainly with the social sciences. Their cooperation during the project design phase results in higher-quality results and, above all, better use of research results in practice, which brings a number of significant social and economic effects. The areas where the results of these sciences are used are the cultural and creative industries, which include architecture, advertising, design, TV and radio, music, film, the art market, books and printing, videogames, stage design, cultural tourism *et al*. "Strengthening targeted support for institutions whose results are applied in practice and targeted support for applied social sciences research" is one of the Innovation Strategy's goals.	

The Action will be executed through new programmes following up the existing ones, specifically the MoC programme NAKI III (2023-2030) and the TA CR programme following on from the ETA programme from 2024, depending on the current capacities of the Czech state budget. The Action will be executed not only through support for cooperation between the research and application spheres and the use of the achieved results in practice, but also through synergic steps, especially continuing with the long-standing coordination of activities by the two providers in the when preparing and implementing their programmes; cutting bureaucracy; monitoring the use of results in the cultural and creative industries; and compliance with the condition that the research topics included in the Concept of Applied Research in the Field of National and Cultural Identity for 2023-2030 (NAKI III) will be exclusively topics for the MoC research programme, and the TA CR will propose such topics for its programme that are complementary to the MoC programme topics without any overlaps. The use of EU funds is envisaged for the implementation of this Action.
Timing: 1) 2023 – start of work on the MoC programme NAKI III 2) 2024 – start of work on the TA CR programme following up ETA 2027 – interim assessment of the execution of the Action according to the programmes' defined indicators
Responsibility: MoC and TA CR according to the government-approved programmes
Co-responsibility: OG CR – Department of RDI Council
Indicators: 1) Number of projects in the humanities and social sciences involving cooperation between the research and application spheres 2) Number of results applied in practice and achieved in cooperation between the research and application spheres in the humanities and social sciences
Link to NRDIP 2021+ strategic objectives: Objective 4 (4.1) and also Objective 4.5 and Objective 1
Link to Action 17 of the NRDIP Update 2016–2020

Action 19:	**Conditions for partnership and cooperation between all components of the RDI system, including the appointment of a corporate research representative body, in all relevant research fields**
Comments While the previous Actions 17 and 18 deal with cooperation between the research and application spheres in the preparation and implementation of programmes (where above all cooperation with the application sphere is lacking), at national level the corporate research situation is different. Here, public-private cooperation takes place either through standard procedures (interdepartmental consulting process etc.) or through negotiations with the relevant central authorities, where they are affected by a given issue (invitations to sessions of the RDI Council etc.). In the case of businesses, national-level cooperation with business representatives (in particular the Confederation of Industry and Transport, but also the	

Chamber of Commerce *et al.*) has been taking place to a satisfactory standard during this electoral term. The main problem at national level is cooperation with the research sphere, which is divided into three segments (in Methodology 2017+ terminology: universities, CAS research organisations, and departmental research organisations). While universities and CAS institutions are represented in the RDI system, corporate research is not. Corporate research can only partially be substituted by the biggest and longest-standing association of industry and agriculture research organisations, the Association of Research Organisations. As in the case of representatives of universities and CAS institutions, corporate research has differing views on how to deal with fundamental conceptual questions of the support system, and these views first need to be unified. Only then are negotiations at national level possible.
Timing: 1) 2022 – appointment of a representative body for corporate research 2) 2021+ – tackling of fundamental conceptual questions of the RDI support system together with corporate-research representatives
Responsibility: OG CR – Department of RDI Council
Co-responsibility: RDI support providers
Indicators: 1) Proportion of fundamental conceptual questions of the RDI support system discussed with corporate-research representatives
Link to NRDIP 2021+ strategic objectives: Objective 4 (4.2) and also Objective 1
New action

Action 20:	**Support for long-term RDI cooperation between research organisations and businesses and the practical application of joint results of applied research**
Comments Supporting and deepening long-term cooperation between research organisations and businesses is hugely beneficial and also essential for their further development and for the advancement of RDI in the CR. There are several supported projects in this field that are close to the topics at issue and often are worked on by various entities in the national innovation system. Seeking out these groups and initiating closer communication and cooperation between them can be an effective support tool in the context of existing or planned programmes. In view of the tools already being used to foster long-term cooperation between research organisations and the private sector (in particular Centres of Competence Centres and National Centres of Competence, OP R&DfI and OP RDE, Projects to Support Excellence in Fundamental Research) and given the experiences associated with the use of these tools, the key thing is to focus on the synergic use and interconnection of research centres and groups that already exist. This should focus on those that are active in the fields prioritised by the state (National RIS3 strategy at regional and national level) or are key to boosting the CR's competitiveness. The Action will be executed by implementing a programme of the TA CR and other relevant providers following up the existing programme in the sense of bringing together similarly	

focused national competence centres and other projects supported out of the state budget or European programmes. The use of EU funds is envisaged for the implementation of this Action.
Timing: 1) 2021+ – interim assessment of NCC projects, including the option of terminating unsuccessful projects in line with the programme's conditions 2) 2027 – final assessment of the programme, or possibly assessment of that part of the programme executed through projects selected in the 1st and 2nd RDI tenders if a 3rd RDI tender is announced 3) 2021+ – preparation of further programmes, their approval by the Czech government, and implementation
Responsibility: TA CR, MoI
Co-responsibility: OG CR – Department of RDI Council, MoIT and other relevant ministries in cooperation with TA CR
Indicators: 1) As per the conditions of the NCC programme 2) Binary – approval of new programmes by the Czech government, including criteria for assessing the impacts and benefits of programmes after their completion 3) Number of projects involving cooperation between the research and application spheres 4) Number of results used in practice and achieved in cooperation between the research and application spheres
Link to NRDIP 2021+ strategic objectives: Objective 4 (4.4, 4.5)
New action

Action 21: **Implementation of the National RIS3 strategy**
Comments The National RIS3 strategy is a basic condition for RDI interventions from EU funds. This basic condition comes under the authority of the MoIT, which is responsible for preparing and seeing to the implementation of the National RIS3 strategy. Constant attention needs to be paid in the 2021-2027 programming period to ensuring that the National RIS3 strategy and related processes are executed in line with the criteria laid down by EU regulations and the European Commission's requirements. The Action focuses on the proper implementation of the National RIS3 strategy, which will enable effective targeting of funding (European, national, regional and private) at priority innovation specialisations so that the CR's knowledge potential is used to the full. The National RIS3 strategy puts in place a framework and process for defining these areas (known as the entrepreneurial discovery process, or EDP), eliminating the main barriers to development and creating effective support tools. At national level, EDP is tied to the working of National Innovation Platforms, which are one of the ways (see NRDIP 2021+ actions linked to Objective 4 for other ways) to ensure a flow of information and topics for RDI between the research and application spheres. As such they can be used be used both for

EDP and implementation of the National RIS3 strategy and for gaining feedback from the research and application spheres on the focus of medium-term and long-term RDI priorities in the CR. In this regard, close cooperation with the RDI Council and its advisory bodies is envisaged.

One of the objectives of the National RIS3 strategy is to support the development of research and development activities, mainly in oriented and applied research taking place in applications and the leveraging of new innovations in production with higher value added, especially in technologies with good potential. The Action also seeks to increase corporate expenditure on RDI and provide effective support for industrial property. Another purpose of the National RIS3 strategy is to build up the research and innovation system's ability to respond to social challenges and megatrends and to generate solutions for the CR's specific requirements ensuing from these challenges and megatrends. For that reason, the Action will also seek to define and support thematic missions focusing on finding solutions for the identified requirements.

Another objective of the National RIS3 strategy is to build up regional research and innovation systems. In this context, the Action seeks to support international, interregional and cross-border cooperation between research organisations and firms, especially SMEs, designed to move the firms higher up global value chains. As part of the Action, the involvement of Czech entities in international platforms focusing on this kind of cooperation will also be promoted.

The use of EU funds is envisaged for the implementation of this Action.

Timing:

1) 2021 – document entitled National Research and Innovation Strategy for Smart Specialisation in the CR 2021–2027" in the wording approved by the Czech government and relevant European Commission bodies
2) 2021–2027 – continual EDP in the implementation of the National RIS3 strategy, as part of which the flow of RDI information and topics between the research and application spheres will intensify, making use of National Innovation Platforms; creation of a process within the context of the National RIS3 strategy to identify thematic missions; implementation of RDI support programmes covering the entire RDI cycle in enterprises

Responsibility: MoIT

Co-responsibility: MoEYS, TA CR, IPO, MoT, CzechInvest, regional government

Indicators:

1) Binary – approval of a document entitled National Research and Innovation Strategy for Smart Specialisation in the CR 2021–2027" by the Czech government and relevant European Commission bodies
2) Continual EDP in the context of the National RIS3 strategy (number of meetings of National Innovation Platforms)
3) Binary – creation of a process within the context of the National RIS3 strategy to identify thematic missions

Link to NRDIP 2021+ strategic objectives: Objective 5 (5.1, 5.3 and 5.4) and also Objectives 1 and 4 (4.3)

Link to Action 25 of the NRDIP Update 2016–2020

Action 22:	**Development of defence and security research, with the possibility of use in civilian applications**
Comments The Action focuses on two areas. The first area is ensuring cyclically repeated identification of defence and security priorities. Defence and security rank among every state's principal tasks and have a major impact on both the development of applied research and societal change. The essence of the defence and security issue and the state's considerable exclusivity (as guarantor) necessitate a specific approach to the creation of expert inputs into the affected policies. The second area focuses on creating a system for the long-term coordination of investment in defence and security with the development of Czech industry so that Czech firms are involved in developing the latest systems and have the opportunity, under the given conditions, to translate them into the civilian sphere and vice versa. The emphasis will be placed on synergies between supported activities with European community programmes (European Defence Fund) and activities of European defence policy and activities in the context of NATO and European Defence Agency science panels; supporting the co-funding of Czech entities' involvement in project consortia will be another aspect. In future, the core of the management of the entire issue will therefore be concepts under the authority of the MoI and MoD, which will process inputs from the relevant policies and from trends in the security and technology environments. Based on these, they will propose topics and their prioritisation and the way these should be reflected in programmes under their authority or, by agreement, under the authority of other providers. The use of EU funds is envisaged for the implementation of this Action.	
Timing: 1) 2021+ – preparation and implementation of strategic documents (policies) and implementation programmes	
Responsibility: MoD and MoI	
Co-responsibility: OF CR – Department of RDI Council, TA CR, MoLSA, MoFA, MoEYS, MoT, MoE	
Indicators: 1) Number of projects ensuring the long-term combination of investments in defence and security with the development of Czech industry 2) Assessment of the programme's impacts and benefits in terms of the criteria defined during approval	
Link to NRDIP 2021+ strategic objectives: Objective 5 (5.1) and also Objective 4	
Link to Action 26 of the NRDIP Update 2016–2020	

Action 23:	**Complete the development of a functional system supporting the formation, development and internationalisation of innovative enterprises (start-ups, spin-offs)**

Comments

The objective is to create a comprehensive system of support for the formation and development of innovative enterprises. The Action encompasses a streamlining of the rules for supporting the formation of new enterprises, especially technology start-ups and spin-offs; raising all stakeholders' awareness for greater legal certainty in issues linked to the founding of spin-offs, for clarifying possible forms of support and support measures, and for better availability of services. Czech enterprises (especially SMEs) which do not yet have their own R&D activities or cooperate with research organisations will be encouraged to start and develop their own R&D activities and to conduct R&D in collaboration with research organisations. Support for registrations and industrial property management will be used to encourage firms to start and develop research and development activities.

Another part of the Action is support for the development of ancillary innovation infrastructure services to help start-ups grow, perform strategic management, safeguard and use industrial property rights, introduce new production processes, transfer technologies and succeed on markets in the CR and abroad. The services will also help introduce modern digital technologies and improve internal processes in enterprises, making innovation activities more effective.

Under the Action, a methodological document for the formation of spin-offs will be created; a single website for comprehensive information about start-up support will be created; and specialised incubators will be created to support technology start-ups in key areas for the CR's competitiveness.

Another aspect of the Action is support for technology and knowledge transfer in research organisations and at universities. In this context, the role of tools to support the proof-of-concept phase will be strengthened to make it possible to verify the commercial potential of R&D results in practice. At the same time, the IPO website will offer free teaching aids for educators created by the European Patent Organisation (EPO) and European Union Intellectual Property Office (EUIPO) or interactive e-learning courses on the basics of industrial rights. The IPO will offer lectures on intellectual and primarily industrial property for research organisations, transfer centres, universities, innovative firms and small and medium-sized enterprises. This Action follows directly from the Innovation Strategy.

The use of EU funds is envisaged for the implementation of this Action.

Timing:

1) 2021+ – implementation of the various parts of support for the formation, development and internationalisation of innovative enterprises (start-ups, spin-offs)
2) 2025 – interim monitoring of execution of the Action in terms of the defined criteria
3) 2028 – assessment of the Action's impacts and effects in terms of the defined criteria

Responsibility: MoIT

Co-responsibility: OG CR – Department of RDI Council, MoEYS, IPO, CzechInvest, TA CR

Indicators:

1) Change in the number of newly supported enterprises (first-time beneficiaries) compared to the previous period 2) Change to the economic indicators of the supported enterprises before the provision of support and after 3) Change to the number of start-ups and spin-offs formed compared to the previous period, and number of those that will be economically active after three years
Link to NRDIP 2021+ strategic objectives: Objective 5 (5.2)
Link to merged Actions 18, 19 and 21 of the NRDIP Update 2016–2020

Action 24: **Digital transformation of enterprises**
Comments Support for projects focusing on the introduction of digitisation and artificial intelligence in enterprises, in particular SMEs, as part of the innovation of production, services, management, employee skills and other related activities. This will facilitate, accelerate and intensify the digital transformation of the industrial environment and the related research, development and innovation, both domestically and on an international scale. In order to ensure the effective introduction of digitisation (and artificial intelligence) in the business environment, a network of DIHs will be built and supported to provide services to businesses in the following areas: • Development and testing of products before final production and launch on the market • Provision of services and capacities linked to the use of the available digital infrastructure • Support in the search for investments • Education and skills development The use of EU funds is envisaged for the implementation of this Action.
Timing: 1) 2021+ – implementation of the various parts of support for the formation, development and internationalisation of innovative enterprises (start-ups, spin-offs) 2) 2025 – interim monitoring of execution of the Action in terms of the defined criteria 3) 2028 – assessment of the Action’s impacts and effects in terms of the defined criteria
Responsibility: MoIT
Co-responsibility: CzechInvest
Indicators: 1) Number of projects with elements of digitisation and artificial intelligence in national programmes 2) Number of projects with elements of digitisation and artificial intelligence with the involvement of Czech businesses in international programmes 3) Number of fully functional DIHs

4) Increase in the total value of services provided by DIHs to Czech and foreign businesses per year 5) Number of employees newly trained in digital skills
Link to NRDIP 2021+ strategic objectives: Objective 5 (5.5)
New action

Action 25:	**Comprehensive support for the development and use of artificial intelligence (AI)**
Comments The European Commission defined the development of artificial intelligence (AI) as one of the top priorities for 2021-2027. The main method for delivering on this priority is building networks of European Artificial Intelligence Excellence Centres. The CR's ambition is to found and develop a European AI Excellence Centre on the basis of a consortium of academic research centres and to see to the centre's full integration and cooperation with European partner institutions and other research institutions. The CR's principal aim in artificial intelligence is to increase the value added of innovative processes and services in consequence of the use of AI technologies. The top priority of the National Strategy for Artificial Intelligence in the Czech Republic is to help businesses, especially small and medium-sized enterprises, cope with the technological and economic challenges and opportunities of the digital economy and Industry 4.0. The national theme of the National Strategy for Artificial Intelligence in the Czech Republic is effective use of AI for a safer society. AI should be a key factor in dealing with this successfully. The effective transfer of cutting-edge research findings into industrial practice will play a central role in coping with the coming changes, and it is here that support from the relevant programmes and other instruments will be targeted. The use of EU funds is envisaged for the implementation of this Action.	
Timing: 1) 2021+ – implementation of the individual parts of the Action 2) 2025 – interim monitoring of execution of the Action in terms of the defined criteria 3) 2028 – assessment of the Action's impacts and effects in terms of the defined criteria	
Responsibility: MoIT	
Co-responsibility: RDI support providers	
Indicators: 1) Number of enterprises making use of AI technology 2) Number of employees dealing with AI technologies in firms 3) Number of projects transferring cutting-edge AI results into industrial practice	
Link to NRDIP 2021+ strategic objectives: Objective 5 (5.6)	
New action	

Action 26:	**Support for the creation of an innovation system in public administration**

Comments

The Action aims to foster and nurture innovation culture in Czech public administration by means of a systemic approach to this issue. The MoI will set up an innovation laboratory to overarch the systemic measures. The innovation lab's activities will focus on supporting and fostering innovative thinking, capacities and leadership, and will do this via training programmes and workshops for public administration employees and their superiors. The lab will also serve as a methodological centre and a space for developing and testing innovative solutions. Based on analysis of good practice in other countries and follow-up analysis of the existing innovation system in Czech public administration, specific recommendations will be formulated for central and local government authorities. These recommendations will be implemented with cooperation from the said organisations and the innovation laboratory. With a view to increasing motivation, an Award for Innovation in Public Administration will be set up. This award will be used to highlight breakthrough innovative solutions in the CR and a systemic approach to innovation. Systemic support for innovations in public administration is also enshrined in the concept of Client-oriented Public Administration 2030 and its Action Plan for 2021–2023.

Timing:

1) 2020 – analysis of foreign good practice in the field of innovation in public administration
2) 2021 – analysis of the innovation system in Czech public administration
3) 2021 – creation of an innovation laboratory
4) 2021+ – implementation of recommendations arising from the analysis, with cooperation between the innovation lab and central and local government authorities
5) 2021 – first year of the newly established Award for Innovation in Public Administration
6) 2025 – assessment of the Action's impacts and effects in terms of the defined indicators

Responsibility: MoI

Co-responsibility: MfRD

Indicators:

1) Number of implemented recommendations for a systemic approach to innovation in public administration
2) Number of innovative solutions created in public administration

Link to NRDIP 2021+ strategic objectives: Objective 5 (5.7)

New action

Action 27:	**Redefining the National Priorities of Oriented Research, Experimental Development and Innovation (NPOR), with a view to making Czech society more resilient – supporting specific research programmes relevant to the defined threats with a pan-societal impact**

Comments

21st century global risks and threats can be divided into a number of types, each of which requires a specific type of monitoring, analysis and solution. These are mainly threats linked to the population's health, environmental changes, technological development, demographic development, global economic shocks, migration processes, war and political crises and the overthrow of state, national and transnational structures. The 2008 global financial and economic crisis, SARS epidemic (2002-2003), 2020 CoV-19 pandemic, lifestyle diseases, and climate problems point to a need for systemic research into these processes in order to put in place the right conditions for an appropriate, effective response. The same applies to risks linked to dramatic technological development, uncontrolled migration processes, crises of democratic governance, tension between the global and local dimensions of politics and demographic changes. The Action's aim is to redefine the NPOR in order to make Czech society more resilient so that RDI support providers, and especially targeted support providers, are motivated to support specifically focused research programmes relevant to the defined threats with a pan-societal impact, and to do so by flexibly allocating and regrouping parts of research capacities and financial resources under their authority.
Timing: 1) 2020+ – redefinition of the NPOR in order to increase the resilience of Czech society
Responsibility: OG CR – Department of RDI Council
Co-responsibility: RDI support providers
Indicators: 1) Binary – redefinition of the NPOR in order to increase the resilience of Czech society 2) Specifically focused research programmes implemented
Link to NRDIP 2021+ strategic objectives: Objective 1 (1.11)
New action

Action 28:	**Fostering cooperation between the research and application spheres and applying its results in the environmental field (in particular adaptation to climate change and sustainable management of natural resources)**
Comments Cooperation between the research and application spheres, which is one of the strategic objectives of the NRDIP 2021+, has a number of specific features in the environmental area, and especially in adaptation to climate change and sustainable management of natural resources. One consequence is that the users of research results are largely state and local government authorities. Although enterprises are users of the research results to some extent, this is often only on the basis of requirements. The results of environmental research can be used in tackling fundamental contemporary problems (study of climate change in the present and in the geological past and subsequent modelling of climate change impacts on social and economic systems and the development of adaptation measures; modelling of climate change impacts on water, ecosystems, agro-ecosystems and agriculture;	

conservation of biodiversity and eco-system services; scrutiny climate extremes, including their impacts on landscape and society, including follow-up development of new technologies and innovations for mitigating the impacts of climate change; study of adaptation to climate change while retaining agriculture competitiveness and reasonable food self-sufficiency; *et al.*), which are in line with the Strategy for Adaptation to Climate Change in the Conditions of the CR 2021+ that is currently being prepared. The Action will be implemented under TA CR and National Agricultural Research Agency ("NARA") programmes in collaboration with the MoE and MoA.
Timing: 1) 2023 – start of the relevant calls in TA CR programmes and the NARA programme 2) 2027 – interim assessment of the execution of the Action according to the programmes' defined indicators
Responsibility: MoE, MoA, TA CR
Co-responsibility: ---
Indicators: 1) Number of projects involving cooperation between the research and application spheres in the environmental field (in particular adaptation to climate change and sustainable management of natural resources) 2) Number of results applied in practice and achieved with cooperation between the research and application spheres in the environmental field (in particular adaptation to climate change and sustainable management of natural resources)
Link to NRDIP 2021+ strategic objectives: Objective 5.8:
New action

Table 5.1: Overview of actions and their links to the strategic objectives

		Objective 1: Put in place a strategically managed and effectively funded system of research, development and innovation in the CR	Objective 2: Support research organisations in creating motivational working conditions and developing human potential across the research and development spectrum	Objective 3: Improve the quality and international excellence of research and development in the CR; make the CR more open and attractive for international research and development; and intensify the integration of Czech RDI into the European Research Area	Objective 4: Promote broader cooperation between the research and application spheres in research, development and innovation	Objective 5: Achieve the expansion of research, development and innovation in businesses and in the public sector
A 1	Put in place a single legislative environment for the working of the RDI system	•		•	•	•
A 2	Long-term evidence-based strategic funding of the RDI system	•		•		
A 3	Evaluation of targeted RDI support programmes, including assessment of their impacts and the benefits from using their results	•		•		
A 4	Expand the acquisition and use of other sources of RDI funding	•				•
A 5	Create a mutually complementary funding scheme for research organisations with large research infrastructures	•		•		•
A 6	Make targeted support for fundamental research more effective and ensure that the best teams in each field are supported	•				
A 7	Reducing bureaucracy in RDI	•				
A 8	Open access to R&D results and data that can be freely disseminated; upgrade and improved effectiveness of the RDI IS	•	•	•	•	•
A 9	Create an Industrial Property Protection Support Concept	•				
A 10	Create an environment that increases motivation to pursue careers in research		•	•		
A 11	Acquire and retain R&D experts from the CR and abroad		•	•		
A 12	Put in place the right conditions for combining research work and parenthood and for women returning from maternity leave		•	•		
A 13	Involve research teams in Horizon Europe, and possibly other EU programmes; bilateral international mobility and international cooperation between research organisations and enterprises; and support for providing systemic access to the results of science and research			•	•	
A 14	Support for synergies between Czech and international R&D though international programme cooperation by the CR			•		
A 15	Increase the institutional component of funding for those research organisations that achieve good results by international comparison as per Methodology 2017+	•	•	•		

A 16	Ensure coordinated representation of the CR in the programme committee of Horizon Europe (2021-2027) so that the CR's priorities as stemming from the priority focuses of Czech research and innovation are promoted effectively			•		
A 17	Fostering cooperation between the research and application spheres when preparing and implementing programmes				•	
A 18	Support for cooperation between the research and application spheres and application of its results in the humanities and social sciences	•			•	
A 19	Conditions for partnership and cooperation between all components of the RDI system, including the appointment of corporate research representative body, in all relevant research fields	•			•	
A 20	Support for long-term RDI cooperation between research organisations and businesses and the practical implementation of joint results of applied research				•	
A 21	Implementation of the National RIS3 strategy	•			•	•
A 22	Development of defence and security research, with the possibility of use in civilian applications					•
A 23	Complete the development of a functional system supporting the formation, development and internationalisation of innovative enterprises (start-ups, spin-offs)					•
A 24	Digital transformation of enterprises					•
A 25	Comprehensive support for the development and use of artificial intelligence (AI)					•
A 26	Support for the creation of an innovation system in public administration					•
A 27	Redefining the National Priorities of Oriented Research, Experimental Development and Innovation (NPOR), with a view to making Czech society more resilient – supporting specific research programmes relevant to the defined threats with a pan-societal impact	•				
A 28	Fostering cooperation between the research and application spheres and applying its results in the environmental field (in particular adaptation to climate change and sustainable management of natural resources)					•

6 Priorities in applied research

Based on the conclusions contained in the annexes, the priorities of oriented and applied research are defined thus:

- Medium-term priorities of oriented and applied research for the 2021–2025 period in support of oriented and applied research leading to innovations: these priorities correspond to areas of intelligent specialisation in the National Research and Innovation Strategy for Smart Specialisation of the CR 2021–2027.
- Long-term priorities covering the entire spectrum of RDI (except fundamental research) for the 2021–2030 period: these are set out in the National Priorities of Oriented Research, Experimental Development and Innovation.

7 Expected development of expenditure on RDI

Section 5a(1) of the Act on RDI Support provides that the government defines the total expenditure on RDI of individual budget headings on the basis of a proposal by the RDI Council. The structure of the proposal for breaking down state budget expenditure on RDI is defined by the RDI Council, which sends it to the budget heading administrators. They, in turn, draw up the proposal for RDI spending under their budget heading in a way ensuring that projects begun in previous years and other commitments are covered preferentially. The state budget heading administrators submit their proposals to the RDI Council, which negotiates with them to finalise the expenditure proposal. The RDI Council submits the resulting proposal for state budget expenditure on RDI, its breakdown and the medium-term outlook to the government. After discussion by the government, the MoF incorporates it into the draft act on the state budget in line with the budgetary rules.

The expected development of RDI expenditure for the 2020–2026 period is based on a material approved by the Czech government on 20 May 2019.[20]

[20] Government Resolution No. 352 of 20 May 2019 on the proposal for Czech state budget expenditure on research, experimental development and innovation for 2020 with a medium-term outlook to 2021 and 2022 and a long-term outlook to 2026.

Table 7.1: Long-term Czech state budget expenditure on RDI for 2020–2026 (CZK million) – not including expenditure covered by incomes from EU programmes and financial mechanisms

	Govt. Resolution No. 352 of 20 May 2019	Approved medium-term outlook		Expected achievement of the objective of the Innovation Strategy of the CR 2019–2030			
Total	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**
Total state budget expenditure	**36,968**	**37,468**	**38,004**	**45,466**	**47,973**	**50,781**	**50,531**
of which OP**			**552**	**850**	**1,100**	**1,350**	**1,100**
percentage of GDP*	**0.63**	**0.62**	**0.62**	**0.73**	**0.75**	**0.78**	**0.76**
Innovation Strategy objective (public funding = 1% of GDP)			**61,321**	**62,548**	**63,799**	**65,075**	**66,376**
percentage of GDP*			0.62	0.73	0.75	0.78	1.00

** The MoF estimate from November 2019 was used for the development of GDP; the baseline assumption for year-on-year GDP growth after 2021 is growth of 2%*

*** from 2022 expected allocation of the share of the state budget; plan per MoEYS as of 8 April 2019*

Table 7.2: Plan for stimulating private funding while maximising the motivational effect of public instruments

Indicator	2020	2021	2022	2023	2024	2025
GDP (CZK million)	5,894,000	6,011,880	6,132,118	6,254,760	6,379,855	6,507,452
Business funding (CZK million)***	71,696	76,322	81,105	86,048	91,157	97,612
percentage of GDP*	1.22	1.27	1.32	1.38	1.43	1.50
Year-on-year growth in business funding (%)		6.45	6.27	6.10	5.94	7.08
		2026	**2027**	**2028**	**2029**	**2030**
		6,637,601	6,770,353	6,905,760	7,043,876	7,184,753
		104,922	113,710	122,806	132,221	143,695
		1.58	1.68	1.78	1.88	2.00
		7.49	8.38	8.00	7.67	8.68

**** The expected development of R&D spending from business sources is based on data published by the Czech Statistical Office for 2007–2017, taking into account the implementation of the Innovation Strategy's strategic objective; the specific tools for stimulating business spending are covered in the "Long-term Strategic Funding of Research, Development and Innovation", which was approved by resolution of the RDI Council at its extraordinary session on 8 September 2017, item A3-b. The material was noted by the government at its 33rd session of 11 October 2017.*

8 Abbreviations

AI	Artificial Intelligence
NRDIP Update 2016-2020	Update of the National Research, Development and Innovation Policy of the Czech Republic for 2016–2020
AR	Augmented Reality
CAS	Czech Academy of Sciences
CR	Czech Republic
CzSO	Czech Statistical Office
DIHs	Digital Innovation Hubs
EDP	Entrepreneurial Discovery Process
EIC	European Innovation Council
EOSC	European Open Science Cloud
EPO	European Patent Office
ERA	European Research Area
ERAC	European Research Area Committee
ERC	European Research Council
EU	European Union
EU Funds	EU Cohesion Policy Funds for the 2021–2027 programming period
FTE	Full-time equivalent
GA CR	Grant Agency of the Czech Republic
GERD	Total Gross Domestic Expenditure on Research and Experimental Development
GII	Global Innovation Index
HC	Headcount
GDP	Gross Domestic Product
ICT	Information and communication technologies
IOI	Innovation Output Index
RDI IS	Research, development and innovation information system

MoF	Ministry of Finance
MoC	Ministry of Culture
MfRD	Ministry for Regional Development
MoD	Ministry of Defence
MoIT	Ministry of Industry and Trade
MoLSA	Ministry of Labour and Social Affairs
SME	Small and medium-sized enterprise
MoEYS	Ministry of Education, Youth and Sports
MoI	Ministry of the Interior
MoH	Ministry of Health
MoA	Ministry of Agriculture
MoFA	Ministry of Foreign Affairs
MoE	Ministry of Environment
National RIS3 strategy	Research and Innovation Strategy for Smart Specialization
NCI	Normalised citation index
NRDIP 2021+	National Research, Development and Innovation Policy of the Czech Republic 2021+
NPOR	National Priorities of Oriented Research, Experimental Development and Innovation
NPU I	National Sustainability Programme I
NPU II	National Sustainability Programme II
OECD	Organization for Economic Cooperation and Development
OP	Operational Programme
OP JAC	Operational Programme John Amos Comenius
OP EIC	Operational Programme Enterprise and Innovation for Competitiveness
OP TAK	Operational Programme Technology and Applications for Competitiveness
OP R&DfI	Operational Programme Research and Development for Innovation

OP RDE	Operational Programme Research, Development and Education
UN	United Nations
PCT	Patent Cooperation Treaty
RDI Council	Research, Development and Innovation Council
SDGs	Sustainable Development Goals
GPD	Grant Projects Group
SII	Summary Innovation Index
SWG GRI	Standing Working Group on Gender in Research and Innovation
TA CR	Technology Agency of the Czech Republic
IPO	Industrial Property Office
OG CR	Office of the Government of the Czech Republic
ÚV ČR - RRP	Office of the Government of the Czech Republic – Unit of Cross-cutting Agendas
ÚV ČR - RVVI	Office of the Government of the Czech Republic – RDI Council Department
R&D	Research and development
RDI	Research, development and innovation
VR	Virtual Reality
WoS	Web of Science database
RDI Act	Act No. 130/2002 Coll., on support for research, experimental development and innovation from public finances and amending certain acts, as amended

9 Glossary

Applied research	Theoretical and experimental work focusing on the acquisition of new knowledge and skills for the development of new or significantly improved products, processes or services (Act on RDI Support).
Intellectual property	Intellectual property is defined in Article 2 of the Convention establishing the World Intellectual Property Organization signed in Stockholm on 14 July 1967. This convention understands intellectual property to mean rights relating to literary, artistic and scientific works, performances of performing artists, phonograms, and broadcasts, inventions in all fields of human endeavour, scientific discoveries, industrial designs, trademarks, service marks, and commercial names and designations, protection against unfair competition, and all other rights resulting from intellectual activity in the industrial, scientific, literary or artistic fields. The Agreement on Trade-related Aspects of Intellectual Property Rights (TRIPS) from 1994 takes into account developments in this area and includes the topography of semi-conductor products in intellectual property.
Experimental development	The acquisition, combination, formation and use of existing scientific, technological, commercial and other relevant knowledge and skills to design new or significantly improved products, processes or services.
Gender	Social expectations regarding the roles and behaviour of women and men.
Innovation	Putting into practice new or significantly improved products, processes or services. Differentiated between: • process innovation, meaning the implementation of a new or significantly improved production or delivery method, including significant changes in techniques, equipment or software; • organisational innovation, meaning the implementation of a new organisational method in an enterprise's business practices, workplace organisation or external relations.
RDI application culture	The creation of an environment (processes, plans, methodologies etc.) in an institution for the practical application of RDI outputs.
Small and medium-sized enterprise	An enterprise satisfying the conditions in Annex I of Commission Regulation (EU) No 651/2014 of 17 June 2014.
Commission Regulation (EU) No 651/2014 of 17 June 2014 (General Block Exemption Regulation, or GBER)	Commission Regulation (EU) No 651/2014 of 17 June 2014 declaring certain categories of aid compatible with the internal market in application of Articles 107 and 108 of the Treaty. As the Regulation is generally binding on all EU Member States, the terms defined in the Regulation are also binding. The terms defined in the RDI Act are applicable to the Czech Republic.
Oriented research	Research focusing on finding solutions to specific social and economic goals. *NB: The term "oriented research" comprises applied research and also that fundamental research which is oriented towards achieving entirely specific results over a longer period of time.*

Enterprise	Any entity carrying on economic activity, regardless of its legal form. These entities mainly include self-employed persons and family firms carrying on trades or other business and companies or associations ordinarily carrying on economic activity.
Pre-seed and seed financing	Pre-seed funding covers the proof-of-concept phase of development; it is relatively risky and therefore hard to obtain. Pre-seed funding is necessary for getting through the "valley of death". Seed funding provides the capital necessary for getting a business underway, i.e. for putting a defined (final) product on the market. The entrepreneur has everything he needs (a business plan, marketing study etc.), except money.
Industrial property	According to the Paris Convention for the Protection of Industrial Property, industrial property covers inventions, utility models, industrial designs or models, factory and trade names, service marks, commercial names and information on or designations of the provenance of goods. Industrial property rights are established by formal means, i.e. by filing an application, and are granted by the relevant authority.
Industrial research	Planned research or critical investigations aimed at acquiring new knowledge and skills to be used to develop new products, processes or services or to make a significant improvement to existing products, processes or services. It includes the creation of components of complex systems and can include the construction of prototypes in a laboratory environment or in an environment with simulation interfaces with existing systems and the creation of pilot lines, should this be necessary for the purposes of industrial research, in particular for the purpose of validating generic technologies (Regulation, Framework). *NB: The Regulation, which does not define the term "applied research", introduces a "new" term> industrial research. Section 13(f) of Act No. 2/1969 Coll., on the establishment of ministries and other central organs of state administration of the Czech Republic, provides that the Ministry of Industry and Trade is the central organ of state administration for industrial research, among other things. This term was not defined in the RDI Act, however. The understanding of the term "industry" has fundamentally changed since 1969, however. This term is understood much more broadly in the present day.*
Framework (Communication from the Commission – Framework for State aid for RDI (2014/C 198/01))	Interpretation issued by the European Commission stating how the European Commission will proceed in the case of the notification of national programmes whether they satisfy the conditions of Commission Regulation (EU) No 651/2014 of 17 June 2014.
Results Information Register (RIR)	One part (data area) of the research, development and innovation information system (RDI IS) in which information about the results of research and development projects and publicly funded research plans is gathered. The RIR database is used both for the purposes of assessing the results of special-purpose and institutionally funded RDI and for informing the research and general public about the results of publicly funded RDI; it also gives providers information about how active project teams funded by the providers are.
Risk capital (venture capital)	Private capital to fund the founding, development or acquisition of a company with rapid growth potential. The

	investor acquires a stake in the chosen enterprise by injecting capital into it.
Spin-off	A company that separates from its parent company or organisation and becomes independent. Spin-offs usually take with them intellectual property, technology or an existing product from the parent firm and transforms it into new products or services.
Start-up	A company that has been founded or is being founded but has not begun the commercial sale of its products or services and makes no profit. Funding is linked to the commercialisation of a product developed in the previous phase.
Technology transfer	The process of conveying findings that enables product and services innovation and, as a rule, takes place between two entities: the technology provider and the technology recipient.
Science	Science as a whole is a systematic method for the rational exploration of reality, focusing on the reliability of results and often on the possibilities of application and prediction (applied science). Scientific knowledge can cover abstract structures and relationships, objects and processes of animate and inanimate nature or human society, culture and thinking.
Large enterprise	An enterprise that does not fit the definition of small and medium-sized enterprises.
RDI result	a) In fundamental research, as a rule new knowledge about the fundamental principles of phenomena, processes or observable reality, which knowledge is published in the manner that is customary in the given scientific field; b) in applied research, as a rule new knowledge and skills to be used in the development of products, processes or services, knowledge and skills put to use as results that are protected under intellectual property legislation or used by the expert public or other users, or knowledge and skills for the purposes of the provider and used in the provider's work, provided they were generated in the course of the execution of a public contract; c) in development, designs of new or significantly improved products, processes or services; d) in innovation, new or significantly improved products, processes and services put into practice. *NB: Results are the direct and immediate consequences of a project and of the implementation of outputs. They do not tell us "what" but "why" a project provides specific outputs. Certified methodologies, software or political recommendations are only means for achieving goals, in other words for achieving positive changes or specific effects. It should be possible to assess and quantity these changes and effects as "project results". Unlike project outputs, project results have a measurable value and are used for qualitative assessment of the project.*
R&D output	The direct upshot of work done as part of a project. It tells us what the project's main products or services are. It is any medium (research report, prototype, application) whose use leads to desirable and positive changes. R&D outputs are not used for qualitative assessment of projects.
Research	Research is often described as active, long-lasting and systematic process of investigation with a view to discovering, interpreting or reworking facts. This intellectual process generates a large quantity of theories, laws and descriptions

	of behaviour and makes it possible to use them in practice. The word “research” can be used to mean a whole collection of information about a given subject and is often linked to science and scientific methods.
Fundamental research	Theoretical or experimental work undertaken primarily to acquire new knowledge of the underlying foundations of phenomena and observable facts, without any particular application or use in view.

Source: Applicable national legislation, OECD methodology (Frascati manual), EU legislation, Wikipedia, departmental sources, conceptual and strategic materials, own definitions for the purposes of NRDIP 2021+.