

National Strategy for Research, Development and Innovation 2030



Funded by the
European Union
NextGenerationEU



ÚRAD VLÁDY
SLOVENSKEJ REPUBLIKY

PLÁN [OBNOVY]

Table of contents

INTRODUCTION	4
Investments in research, development and innovation will improve the quality of life in Slovakia	4
Slovakia needs vision and continuity for research, development and innovation	6
In this strategy, we address three core, interlinked areas.	7
The success of the strategy will be evaluated by indicators of change.	7
The next steps of the National Strategy	8
1. INVESTMENTS IN A HIGH QUALITY SYSTEM	9
<i>In addition to the necessary increased investments in research, development and innovation, we need to change the way we invest in them.</i>	9
1.1 COORDINATION OF ACTIVITIES AND COMPETENCES	11
<i>In order to avoid supporting dispersed initiatives with similar objectives or a low impact, we need to improve the coordination of activities and define the competences of individual actors involved.</i>	11
<i>1.1.1 Consolidated management: make changes to management with the objective of better coordinating policies and strategy implementation</i>	11
<i>1.1.2 Predictable interdepartmental funding: create an interdepartmental budget programme to allow predictable funding planning and more efficient investment impact measurement</i>	15
<i>1.1.3 Regional interconnection: unite regional initiatives that address local problems and contribute to the research and innovation ecosystem across Slovakia</i>	15
1.2 SIMPLIFICATION OF PROCESSES	18
<i>If we want to improve the quality of the outputs of our researchers and innovators, we need to create environments and processes that facilitate their work rather than hinder it.</i>	18
<i>1.2.1 A researcher and innovator, not an accountant: simplify the implementation of grant calls to reduce the amount of bureaucratic burden and increase time for creativity and research</i>	18
<i>1.2.2 Removing obstacles: create a trust-based regulatory environment that stimulates innovation and entrepreneurship</i>	21
<i>1.2.3 Connecting knowledge: use legislative changes to promote collaboration between researchers and the private sector in order to transfer technology and knowledge across the ecosystem</i>	23
<i>1.2.4. Open data and open science: make public administration and research data available as a source for innovation</i>	25
1.3 ADEQUATE FINANCING	27
<i>If we want to develop a knowledge-based economy, we need to increase the amount of funding for research and innovation, and at the same time make this increase under a condition of reforms that will help transform investments into real results.</i>	27
<i>1.3.1 Budget increase: bring the research and development spending of both the public and private sectors closer to the EU average</i>	27

1.3.2 Institutional funding reforms: connect institutional funding with reforms that will help transform investments into higher quality outputs of universities, the Slovak Academy of Science and other organizations in the ecosystem	30
1.3.3 Competitive funding reforms: gradually and regularly increase grant funding in order to support academic and industrial research, development and innovation	31
1.3.4 Quality infrastructure: build top research and technological infrastructure that boosts the origination and development of new ideas and knowledge	33
1.3.5 Financing of companies: increase the availability of risk capital and the system support for innovative businesses	34
1.3.6 European Union funding: support researchers and innovators in participating in European programmes	36
1.3.7 Public procurement of innovation: increase the percentage of public funds spent on purchasing innovative solutions and improve public services through them	37
2. CONCENTRATION OF TALENT	38
<i>The research and innovation ecosystem will prosper only if it is filled with high-quality and strategically important talent from Slovakia and abroad.</i>	38
2.1 SUPPORTING YOUNG PEOPLE	40
<i>To fulfil the country's innovation potential, we need more young people with knowledge, skills and motivation to work in research, development and innovation.</i>	40
2.1.1 Skills for research and innovation: increase the emphasis on creating initiative, entrepreneurship and skills of the new economy across the entire education system	40
2.1.2 Interest in research and innovation: support opportunities and initiatives that propagate research and innovation and motivate residents to study and build careers in these fields	41
2.2 ATTRACTING AND DEVELOPING EXPERIENCED TALENT	43
<i>If we want to increase the level and quality of the research and innovation ecosystem, we must be able to attract and retain top professionals.</i>	43
2.2.1 Quality research community: attract more excellent researchers by creating a diverse environment where people want to work, grow and develop	43
2.2.2 Ebb and flow of talent: create programmes that can motivate foreign graduates to stay in Slovakia and attract talent from abroad to return back home	44
2.2.3 Lifelong learning: create programmes that can motivate residents to be lifelong learners of strategically important skills that are or will be in short supply	45
2.3 QUALITY OF LIFE	47
<i>If we want to attract the best talent, we need to increase the quality of life in Slovak cities, and by doing so also increase their attractiveness and competitiveness in the Central European region</i>	47
3. DIRECTION OF RESOURCES AND EFFORT	49
<i>If we want to transform into an innovative country, we must clearly define the areas of research, development and innovation in which we have the ambition and potential to excel.</i>	49
3.1 MANAGEMENT THROUGH MISSIONS: CONTINUOUSLY DEVELOP SLOVAKIA'S SMART SPECIALISATION THROUGH MISSIONS THAT UNITE ALL INTERESTED ACTORS OF THE ECOSYSTEM UNDER A COMMON VISION OF THE SOLUTION	50
3.2 PRIMARY RESEARCH: CONTINUOUS SUPPORT OF GROUNDBREAKING PRIMARY RESEARCH AS A PREREQUISITE FOR INNOVATIVE SOLUTIONS IN THE FUTURE	52
3.3 VALUE CHAINS: REORIENTATION OF THE ECONOMY TO ACTIVITIES WITH HIGHER ADDED VALUE THAT CAN INCREASE THE PREPAREDNESS AND ATTRACTIVENESS OF SLOVAKIA FOR FOREIGN INVESTMENTS AND COOPERATION	54
3.4 IDENTIFYING FOCUS POINTS OF QUALITY: DEVELOPING THE AREAS WITH THE HIGHEST REAL POTENTIAL FOR SLOVAKIA THROUGH INTERNATIONAL TRANSFORMATION AND INNOVATION CONSORTIA	56
3.5 SOCIAL INNOVATION: CREATING THE CONDITIONS AND INITIATING SOCIAL INNOVATIONS TO ADDRESS COMPLEX PROBLEMS WITH	57

HIGH SOCIETAL IMPACT	57
FULFILLING THIS STRATEGY WILL INCREASE THE QUALITY OF LIFE FOR ALL OF US	58
LIST OF FIGURES	60
LIST OF TABLES	60
LIST OF CHARTS	60

Executive Summary

Introduction

We are in a crucial period of our country's existence. We must respond to several challenges that are unprecedented in both extent and frequency. The Covid-19 pandemic has revealed the fragility of global supply chains, and a war conflict in a neighbouring country has awakened Europe to the reality that energy autonomy is no longer a choice, but a matter of national security. At the same time, the planet reminds us more frequently than ever that our industry, transport and agriculture are reaching their limits. We live in an era in which technological development, the advent of robotics and artificial intelligence can be instruments of progress, but also a source of inequality and a gaping divide between digitally proficient elites and the rest of the world. The next decade will fundamentally change economic and social conditions not only in our country, but worldwide.

The national strategy for research, development and innovation is about taking these challenges as a historic opportunity to transform Slovakia into a modern country based on the principles of the knowledge economy. We are faced with the question of how we will use our resources, abilities and strengths for the benefit of ourselves, our children and society as a whole. The document in your hands offers part of the answer to this question. We do have something to build on. Despite several significant problems, we belong to a successful and rich part of the world. The basis for further growth is our effort to expand our economy's narrow value chain focus and to address the associated vulnerability to changes in supply chains, energy prices, customer preferences and technology. We will only achieve this by making a conscious decision to integrate research and innovation across all sectors of our economy and society.

The basic building block of this strategy is trust. By systematically increasing trust across the innovation ecosystem, we can move innovation from the margins to the centre of the Slovak economy. Our main goal is to support researchers, innovators and entrepreneurs¹ by building a predictable system that responds to their needs, makes their work simpler and creates space for excellence and positive economic and social impacts. This strategy is characterized by an emphasis on restoring trust not only towards the state and its institutions and vice versa, but also among ecosystem actors. Only an environment in which we do not have a priori doubts about the integrity and competence of others can be a breeding ground for open dialogue and cooperation that leads to quality research and breakthrough innovations. The vision of this strategy is therefore **a Slovakia that believes in itself.**

Investments in research, development and innovation will improve the quality of life in Slovakia

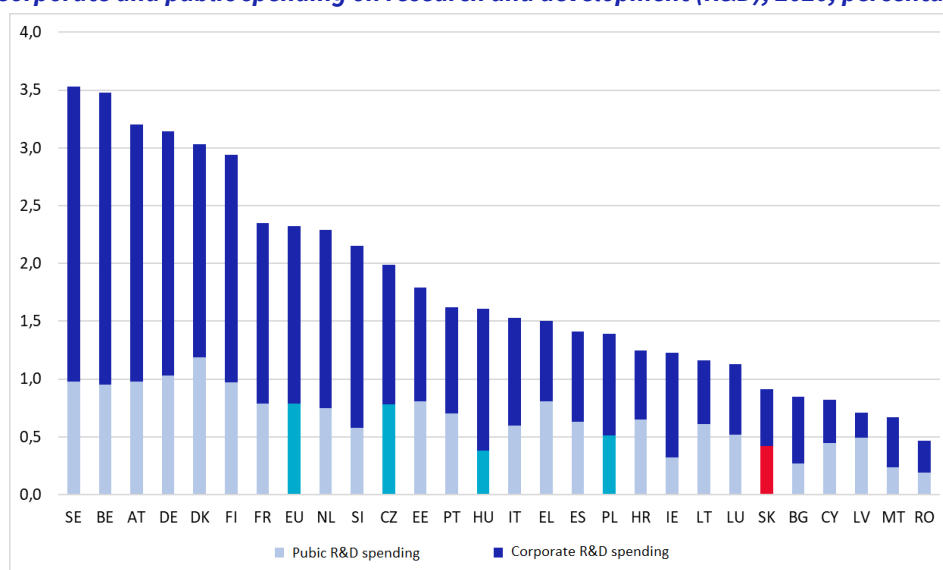
Investments in research, development and innovation are the most effective way to increase the long-term competitiveness of the economy and the quality of life in Slovakia.² At the beginning of the millennium, Slovakia was catching up with Western European economies thanks to the investments of highly productive companies from abroad that were looking for cost efficiency. More than twenty years have passed since the success of this growth model, and its potential is

almost exhausted. Continuing to head in the same direction limits the possibilities for improving the quality of life and deviates us from the more demanding work of a real transformation of our economy.³ Slovakia needs to stand on both feet: systematically support foreign investments with higher added value and develop the productivity of domestic companies through investments in research, development and innovation.

Innovations will help us better respond to future challenges. Slovakia is part of the global ecosystem and cannot isolate itself from the impact of upcoming social, technological and environmental challenges. We need to strengthen tools to resist shocks, such as the adverse consequences of climate change, the energy and food crisis, epidemics and military conflicts. At the same time, we must respond to megatrends such as urbanization, decarbonisation, digitalisation, industrial transformation and exponential technological, demographic and social changes in the context of our country's possibilities. The complexity and speed of change requires flexibility, the ability to make decisions based on facts, as well as new institutions that support innovation and continuously improve themselves.

However, Slovakia has fallen behind significantly in research, development and innovation. Slovakia's performance in the field of research, development and innovation and the volume of public and private investments in this sector have been at the tail end of political priorities for a long time. It is high time to reverse this situation. Within the framework of the European assessment of innovation performance, Slovakia is in the last group of the so-called emerging innovators, and our relative position is getting worse every year. The current results in the field of research and innovation can be mainly attributed to unpredictable, insufficient and unstable funding, fragmentation of the management of research and innovation policy, and the persistent leakage of talent from the country. EU structural funds – one of the main sources of competitive funding for research, development and innovation – have a limited impact on the performance of the Slovak innovation ecosystem. Another reason for this is the high administrative burden for grant recipients and insufficient training of employees by agencies.⁴

Chart 1- Corporate and public spending on research and development (R&D), 2020, percentage of GDP



Slovakia needs vision and continuity for research, development and innovation

Today, Slovakia does not have a comprehensive vision or defined long-term strategic objectives that would determine policies and investments in the field of research, development and innovation.⁵ Policies and decisions in the field of research and innovation are undermined by frequent changes in priorities, missing or non-conceptual investments, fragmentation of rules and approaches, and insufficient implementation. The Slovak Republic has several documents focused on this area, but their strategic vision and direction are only marginally connected, fragmenting the expected results of targeted changes. The key problem is the absence of an owner of the theme of the development of the research and innovation ecosystem, as well as the non-existent framework for creating and evaluating policies and measuring their results. Without a clear objective and a strategy to achieve it, we risk the resources spent on research, development and innovation not turning into the desired economic and social development for Slovakia. One of the important analytical starting points of this strategy that identified the mentioned problems and challenges is the Research and Innovation Strategy for Smart Specialisation of the Slovak Republic for the years 2021-2027 (hereinafter referred to as the Smart Specialisation Strategy or RIS3).⁶

Even a high-quality strategic document is not a guarantee of the change we necessarily need. In recent decades, several strategic documents for the development of research, development and innovation have been created that were not implemented in practice. Achieving results in this area requires long-term targeted efforts, continuity of policies across policy cycles and simplification of management in this area. Since we are starting from an environment of lower average trust and professionalism, we also have to adapt public policy instruments to this. Decision-making should be robust, transparent and use foreign expertise as much as possible.

The National Strategy for Research, Development and Innovation currently does not specify national research priorities for two reasons. The first is the recently approved Smart Specialisation Strategy. RIS3 defines the areas in which resources for applied research and innovation should be concentrated in the coming years. Five domains of smart specialisation were created in close cooperation with researchers, innovators and entrepreneurs as part of the Entrepreneurial Discovery Process (EDP). Designing new domains outside of this process would not be considered legitimate or constructive due to the aforementioned need to focus on agreed objectives instead of constantly changing priorities. Equally important reasons are the absence of high-quality and objective data on the global potential of Slovak research, its connection to domestic and regional value chains, as well as the lack of capacity of research and public institutions to predict fundamental technological and social trends. The ambition of this strategy and the reforms associated with it focus on starting to systematically collect and analyze data for the purpose of setting national research priorities and specifying already existing domains of specialization.

In this strategy, we address three core, interlinked areas.

The first area of change is to invest in a quality system. In addition to the inevitable increase in funds for research, development and innovation, we must change the system of how they are redistributed and drawn. The main objectives of this area therefore address more effective coordination, clarification of competences and simplification of processes. Subsequently, it will be possible to set up adequate funding for research, development and innovation from various sources under the condition that necessary reforms are implemented.

The second area addresses talent. The research and innovation ecosystem will thrive only if it is filled with high-quality and strategically important talent from Slovakia and abroad. The main objectives in the three areas address the development of domestic talent, the attraction and retention of existing talent and talent from abroad, as well as the targeted improvement of the quality of life and work in Slovak cities, where the vast majority of resources for research and innovation are concentrated.

The third area represents a complex framework for prioritization in support of research, development and innovation in Slovakia. Slovakia is a small, strongly industrialized country that does not have a sufficient concentration of talent and resources to focus on everything. Therefore, the country has to choose several areas for development. The objective of the strategy is to set up a robust mechanism that will ultimately help to identify a specific and clear direction for Slovakia. This mechanism has four components: 1) Slovakia will follow up on the RIS3 entrepreneurial discovery process that took place in 2020-21 and develop it into a concept, so-called missions. Through these missions, we will set the framework for solving complex problems thanks to targeted investments in research and innovation. 2) By piloting and developing the concept of transformation and innovation consortia, we identify partnerships with the highest potential for the creation of a functional innovation ecosystem. 3) By mapping domestic value chains, we identify new parts of the economy that can complement the already existing industrial base. 4) By using the tools of social innovation, we will be able to respond better to important social problems.

The success of the strategy will be evaluated by indicators of change.

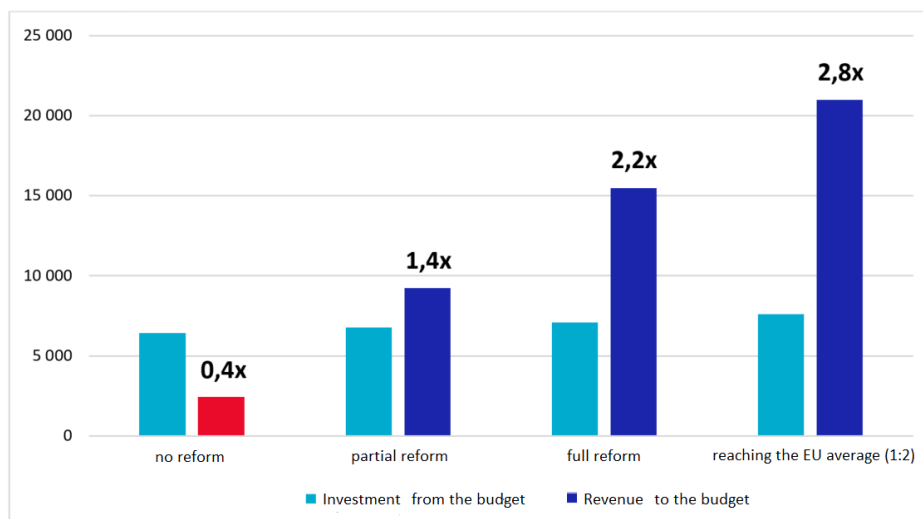
A Slovakia that believes in itself will accelerate economic growth, create better job opportunities and achieve a higher quality of life for all its inhabitants.

By 2030, Slovakia will:

- advance in the ranking of the European Innovation Scoreboard by **10 rungs**;
- increase private expenditures on research and development to **1.2% of GDP** from today's 0.5% of GDP;
- invest at least **2% of GDP** in research and development.

Chart 2 - Return on investment in research, development and innovation

Cumulative investments from the state budget and revenues to the state budget for 25 years discounted at a rate of 5% according to the UHP methodology for RDI in million euro.



Source: GDP growth forecast according to the IFP macroeconomic forecast (September 2022) and the EC forecast, own processing.

The investment in supporting research, development and innovation will pay us back with interest in the long term. The financial resources we invest in research and innovation can be multiplied up to 2.2 times. Slovakia can reinvest these new resources in research, development and innovation or in other areas of the country's development. The expected return is conditional on the reforms that the strategy proposes to initiate. However, without the implementation of at least part of the proposed reforms, this investment may end up in a loss for the state.

The next steps of the National Strategy

The National Research, Development and Innovation Strategy 2030 will be updated in three-year cycles. The first update of the strategy, the action plan and measurable indicators will take place at the end of 2025. Regular reviews of the success of strategy implementation and readiness for political, economic and social changes will ensure that planned reforms and investments are always ready for acute problems and challenges society faces.

Monitoring and evaluating the performance of the tasks carried out in line with the National Strategy that result from the action plan will be presented annually to the government. By the end of the second quarter of each year, the entities involved in the implementation of the strategy will submit information on the performance of tasks. The processing and evaluation of tasks will take place at the Government Office of the Slovak Republic, which will subsequently prepare a comprehensive report on the implementation of the National Strategy.

Newly created departments as well as those with increased capacity will be evaluated in 2026 at the latest based on the fulfilment of output indicators, but mainly based on the result indicators from Annex no. 3. The results can serve as a basis for the next revision of the National Strategy.

1. Investments in a high quality system

In addition to the necessary increased investments in research, development and innovation, we need to change the way we invest in them.

An increase of resources for research, development and innovation can bring more than double the amount of the initial investment to the national budget, but only in a transparent and efficient system. Neither financial nor societal returns can be expected if there is a failure of governance at state level. Focusing on streamlining the system of public support for research and innovation is therefore a natural first objective of this strategy. We need a clear commitment to consolidate support and separate the design and measurement of public policies from their implementation. Only in this way can we ensure the transparency and efficiency of financing, without which quality research is hardly ever carried out. Coordination of activities across institutions and regions of Slovakia is an automatic part of our objective to make competences transparent and clear.

In this system, it will be obvious that our priority is its end user. We cannot afford to create unnecessary barriers for people whose creative work is supposed to be the engine of our economy. Our objective is to continuously reduce the bureaucratic burden, open government data and make processes simple. In parallel with a significant increase in funding, we will implement a reform that directs public and private resources to truly excellent primary and applied research, development and innovations.

Table 1 – Main objectives

Chapter name	Objective in 2030
1.1 Coordination of activities and competences	
1.1.1 Consolidated management	Grant and service support for research, development and innovation will be consolidated into one agency (by the end of 2025).
1.1.2 Predictable interdepartmental funding	100% of public expenditure on research, development and innovation support will be included in the interdepartmental budget programme.
1.1.3 Regional interconnection	The share of SMEs implementing process innovations will reach 40%.
1.2 Simplification of processes	
1.2.1 A researcher and innovator, not an accountant	"Time to grant" will always be a maximum of 7 months, of which the time for a decision is a maximum of 5 months.
	The recipient's project administration costs will not exceed 10% of the grant funds.
1.2.2. Removing obstacles	The share of SMEs implementing product innovations will reach 40%.
1.2.3. Connecting knowledge	The number of PCT patent applications per 1 billion EUR of GDP will increase to 1.5 ⁷
	The volume of research and development expenditure in the public sector financed from private sector resources will reach 0.05% of GDP.
1.2.4 Open data	In the European Open Data Maturity index, Slovakia will advance from the "beginner" category to the "trend setter" category.
1.3 Adequate financing	
1.3.1 Increased budget for research and development	Public expenditure on research and development from the state budget will reach 0.67% of GDP.
1.3.2 Institutional funding reforms	The share of Slovak publications that are among the 10% most cited will reach 8%.

	The number of international joint publications per 1 million inhabitants will reach 1900 per year.
	The number of joint public-private publications per 1 million inhabitants will reach 200 per year.
1.3.3 Competitive funding reforms	The share of Slovak publications that are among the 10% most cited will reach 8%.
	The number of international joint publications per 1 million inhabitants will reach 1900 per year.
	The number of joint public-private publications per 1 million inhabitants will reach 200 per year.
	Private research and development expenditure will reach 1.2% of GDP.
1.3.4 Quality infrastructure	The share of Slovak publications that are among the 10% most cited will reach 8%.
	The number of international joint publications per 1 million inhabitants will reach 1900 per year.
	The number of joint public-private publications per 1 million inhabitants will reach 200 per year.
	Private research and development expenditure will reach 1.2% of GDP.
	The volume of public research and development expenditure financed by the private sector will reach 0.05% of GDP.
1.3.5 Financing of companies	Private research and development expenditure will reach 1.2% of GDP.
	Expenditure on risk capital will reach 0.15% of GDP.
	Innovation expenditure (excluding R&D expenditure) will reach 1.5% of sales.
1.3.6 European Union funding	Resources for research and development investment from the European Commission or other international organizations will reach 0.15% of GDP.
1.3.7 Public procurement of innovations	7% of the investment in the total public procurement budget will be used to obtain innovative solutions.

Source: own processing, more detailed specification of indicators and their baseline values are given in Appendix 3: Comparative tables of measurable indicators

The most important changes by 2025:

- an interdepartmental budget programme for research, development and innovation that increases annually by an average of 14% from the state budget,
- a uniform methodology for grant funding in research, development and innovation, regardless of the source of funding,
- a new law on support for research, development and innovation to replace existing legislation,
- consolidation of implementation capacities for research, development and innovation support,
- one integrated portal for the state support of research, development and innovation.

1.1 Coordination of activities and competences

In order to avoid supporting dispersed initiatives with similar objectives or a low impact, we need to improve the coordination of activities and define the competences of individual actors involved.

1.1.1 Consolidated management: make changes to management with the objective of better coordinating policies and strategy implementation⁸

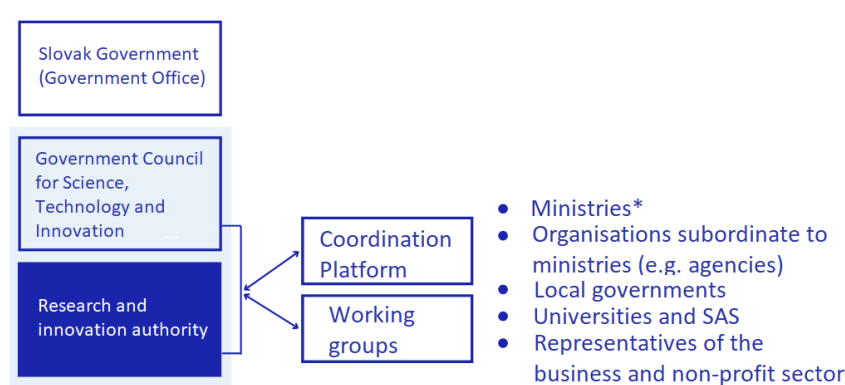
The objective of the strategy is to increase the level of coordination and simplify the complex system of research, development and innovation management. The Slovak system of support for research, development and innovation is fragmented among many departments. Its management is primarily the responsibility of the Ministry of Education and the Ministry of Economy and the organizations within their jurisdiction. These include the Research and Development Agency (SRDA); the Research Agency (VA); the Cultural and Educational Grant Agency of the Ministry of Education, Science, Research and Sports of the Slovak Republic (KEGA); the Research and Educational Grant Agency of the Ministry of Education, Science, Research and Sports of the Slovak Republic (VEGA); the Slovak Centre for Scientific and Technological Information (SCSTI); the Slovak Innovation and Energy Agency (SIEA); the Slovak Investment and Trade Development Agency (SARIO) and the membership of the Ministry of Economy of the Slovak Republic in the Slovak Business Agency (SBA). Innovative companies are supported through financial instruments by Slovak Investment Holding (SIH), which falls under the Ministry of Finance of the Slovak Republic. The private sector is also supported by the Slovak Guarantee and Development Bank (SGDB). Several other ministries also get a research budget and their own institutes and agencies.⁹ The Ministry of Investments, Regional Development and Informatization of the Slovak Republic (MIRDI SR) is also involved in management, which, as the governing body for the Slovakia 2021-2027 Programme, also sets the use of EU funds in research and innovation. Until the summer of 2022, it was also responsible for the management of the Slovak Government Council for Science, Technology and Innovations (hereinafter "Government Council" or SGCSTI) and the management and implementation of RIS3.¹⁰

Based on the recommendations of the European Commission, the Recovery and Resilience Plan has created a strong reform push to consolidate the governance of research and innovation policies and to strengthen implementation capacities.¹¹ The first steps towards the necessary change have already been taken. The amendment to Act No. 172/2005 Coll. on the organization of state support for research and development and on the amendment of Act no. 575/2001 Coll. on the organization of government activities and the central state administration, as amended from April 2022¹², enabled the transfer of the SGCSTI and the RIS3 agenda to the Slovak Government Office, where at the same time the executive branch of the Government Council was created. A related amendment to the Competence Act (Act No. 575/2001 Coll. on the organization of government activities and the organization of central government administration) imposes new coordination and strategic tasks on the Government Office in the field of research and innovation. The purpose of this change is to coordinate all public institutions with a research, development and

innovation overlap to fill in the gaps, unify the strategy, methodologies and priorities, and to consistently measure the impact of research and innovation policies. This change is also supported by foreign practice in the most advanced economies, where the interdepartmental research, development and innovation agenda tends to be covered by one or two ministries with a strong government council usually located at the centre of government power.

The Slovak Government Council for Science, Technology and Innovation (SGCSTI) meets and discusses all key decisions related to research and innovation and acts as the central coordinating and advisory body for research and innovation policies. Unlike its equivalents abroad, the Slovak Government Council used to duplicate the Government of the Slovak Republic in terms of its composition, as twelve ministers were members of it. The other members were nominated on the basis of their affiliation to predominantly public organizations, but also to selected business associations. Following the change in legislation that is already implemented, the Council will now be headed by the Prime Minister. Together with him, it includes four ministers responsible for different parts of the promotion and funding of research, development and innovation. The majority of the fifteen-member board is thus made up of renowned experts with international experience who are selected from nominations by an independent international committee. A coordination platform will be established under the Council of Government as an umbrella working and coordinating body that will be composed of representatives of the public and private sectors on a “quadruple helix” basis. There will also be a number of permanent and *ad hoc* thematic working groups under the Government Council, mainly dealing with interdepartmental issues such as the common budget programme for research, development and innovation, the setting up of grant support, access to research infrastructure and research priorities.

Figure 1 –Schematic diagram of the functioning of the reformed Government Council for Science, Technology and Innovation



Source: own processing

*Together with VAIA, they address the interdepartmental budget programme and the preliminary funding plan and assign thematic frameworks to agencies for planned schemes and services.

The policy objective is to increase coordination and simplify the complex system of managing research, development and innovation.

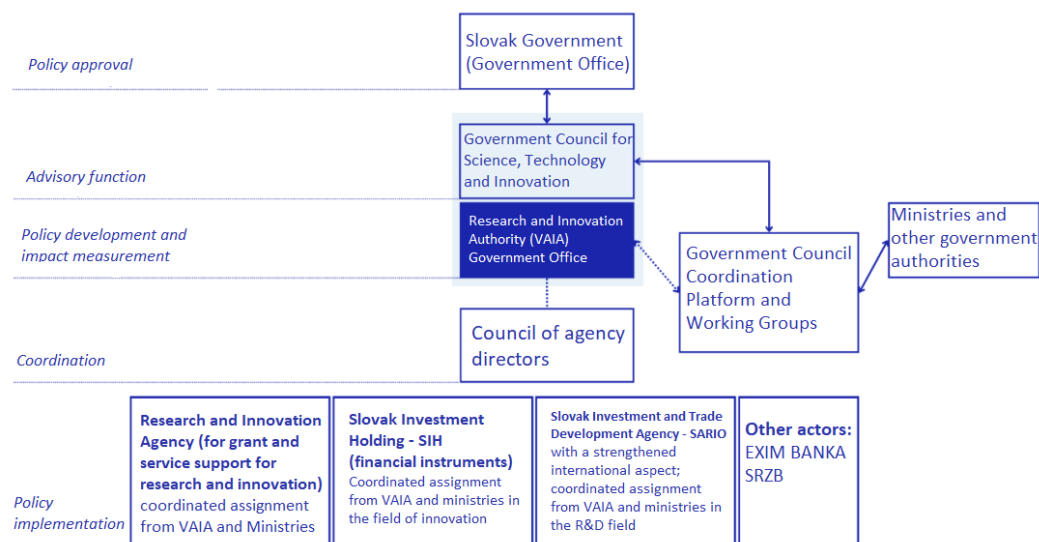
In comparison with the previous situation, the new Slovak Government Council for Science, Technology and Innovation has its own executive body based at the Slovak Government Office. The Research and Innovation Authority (VAIA) carries out tasks resulting from the decisions of the

Government Council and the Government of the Slovak Republic related to research and innovation, controls the implementation of this strategy and the Smart Specialisation Strategy, methodologically guides grant support for research and innovation, and designs analytical bases for the development of research and innovation policies. The collection of data will enable causal evaluation of the effectiveness of support measures. Based on the actual impacts, it will be possible to correct measures in the future. All analyses will be transparently published. Based on this strategy, the VAIA will work with the Ministry of Finance to develop a review of expenditure and competences and, on this basis, will propose further necessary changes to the management system in a two-step process.

The first step is to clearly define where the strategy is to be developed and the impact of individual instruments to be measured (the Government Office and ministries) and where the policies are to be implemented in practice (agencies). This basic managerial division is inconsistently applied in its current state. An example is the popularisation of science, where a subordinate organization, rather than a ministry, strategically covers the topic. On the contrary, various ministries and the Government Office directly provide financial support through grant schemes. This situation is highly unusual compared to foreign practice and does not lead to the desired results.

The second step of the revision is the proposal to consolidate implementing agencies, following the example of almost all more advanced countries. The current fragmentation of implementation that is carried out by several actors is inefficient and unclear. With the current fragmentation of agencies, their processes, IT systems and salary conditions, there is also a large differentiation in user experience and confusion on the client side, leading to sub-optimal¹³ results for the whole support system. This was also pointed out by the OECD's 2021 analysis of Slovakia's (non-)use of EU Structural Funds for research and innovation.¹⁴ A better redistribution of competences will ensure streamlining of processes and may save public finances. This does not mean that all current grant schemes in individual ministries will be abolished, only that their implementation will be gradually moved to the level of agencies. The target state after the completion of the process is shown in Figure 2.

Figure 2 – Schematic diagram of the target organization for the management of research, development and innovation



Source: own processing

In the final governance model that we will develop into over the next few years, we propose three main implementation entities. Their management will be coordinated at the strategic level through a regular joint committee - the Council of Agency Directors - under the Government's Council for Science, Technology and Innovation.

The first entity will administer all resources from grant funding for research, development and innovation and provide services to researchers and companies that make sense to offer at the national level. It mainly concerns certain consulting services, shared access to databases, expert advice in technology transfer, and so on. Consolidation means linking the grant activities of SRDA, RA, SIEA, SBA and SAIA, as well as the support and advisory activities of SCSTI.

The second entity will cover all financial instruments for research and innovation. Slovak Investment Holding (SIH) will take responsibility for this common agenda.

The third entity will be dedicated to actively attracting high value-added investments, supporting the most innovative Slovak companies in expanding to foreign markets and developing small and medium-sized enterprises (SMEs). This role is currently partly performed by the executive agency of the Ministry of Economy of the Slovak Republic - the Slovak Investment and Trade Development Agency (SARIO). As part of the unified management of foreign policy, we will use existing and functioning models of sending experts from individual departments to selected embassies, which will deepen cooperation with the Ministry of Foreign and European Affairs of the Slovak Republic (MFEA SR), the Government Office of the Slovak Republic and individual embassies and departments. VAIA innovation experts will also be based at selected embassies of the Slovak Republic with the aim of developing bilateral cooperation in research and innovation. After consultation with the MFEA SR and the MIRD SR, VAIA and the ME SR (SARIO) will select experts directly in the respective countries. The experts will be subordinate to the relevant manager of the representative office of the Slovak Republic. The basis of functional cooperation is a clear setting of priorities, complementarity and a team approach to their fulfilment while respecting the uniform management of the Foreign Service. The activities of SARIO agency professionals and VAIA

innovation experts, including territorial deployment, will be regulated by interdepartmental cooperation agreements. The territorial distribution of seconded staff and measurable indicators of their work will be based on the mapping of the activities of external economic relations and economic diplomacy. It will also include inputs from VAIA and the ME SR (SARIO) in the field of research, development and innovation, and "business development".

These changes will be described in detail by the new law on research, development and innovation, which will be prepared by VAIA by the end of 2024.

1.1.2 Predictable interdepartmental funding: create an interdepartmental budget programme to allow predictable funding planning and more efficient investment impact measurement ¹⁵

An essential part of harmonising the management of research, development and innovation is the overview of financial resources and the results achieved.¹⁶ Currently, resources in this area are extremely fragmented, opaque and do not meet common measurable indicators. In such a situation, even the Ministry of Finance of the Slovak Republic cannot evaluate their effectiveness against the result indicators or the adequacy of the volume of resources in comparison with abroad or other areas of the budget.

The goal is therefore to make the budget for research, development and innovation more transparent and centrally prepared. VAIA, in discussion with the concerned budget chapter managers, will draft the first interdepartmental budget programme for 2024-2026 in 2023, which will ensure the uniform and coordinated planning of R&D&I funding across the different budget chapters. The results of the above-mentioned review of R&D&I expenditure will be the starting point. The interdepartmental budget programme will replace the existing National Programme for the Development of Science and Technology under Act No 172/2005 Coll.

A common budget will mean a stronger voice to advocate investment in research, development and innovation. It will allow for greater predictability and coordinated planning in terms of time and themes. Following the example of the Czech Republic, where this model has so far proved successful, the budget will be presented in advance of other budget chapters from 2024 onwards due to its interdepartmental and transformative role. Through programme budgeting, the state can better monitor research and innovation spending and subsequently measure its impact on economic growth.

1.1.3 Regional interconnection: unite regional initiatives that address local problems and contribute to the research and innovation ecosystem across Slovakia

The fragmentation of research, development and innovation policy-making has also been reflected at the regional level, where several initiatives of different ministries and agencies are now operating with little coordination between them. Many of them offer similar or complementary services. For example, there are regional National Entrepreneurship Centres of the SBA, centres of the Ministry of Investment, Regional Development and Informatization of the Slovak

Republic (MIRDI SR), regional centres of the Recovery and Resilience Plan, and regional offices of the Slovak Innovation and Energy Agency in various regions.

In addition to these activities, the MIRDI SR plans to invest EUR 80 million through the Slovakia Programme 2021-2027 in new Intersectoral Innovation Partnerships (IIP), which should increase the absorptive capacity of regions and support the so-called innovation from below. Within the Catching-Up Regions Initiative, the World Bank has identified the potential to support the regional innovation ecosystem by creating innovation hubs in the Banská Bystrica and Košice regions. EU funds support regional cultural and creative centres (CCCs) under the Ministry of Culture of the Slovak Republic. The Recovery and Resilience Plan will support three centres for the integration of foreigners in three major cities in Slovakia. The forthcoming Action Plan for Smart Cities and Regions contains measures to support activities for piloting and the experimental introduction of innovative solutions into the local self-government environment.

In addition to these public initiatives, local innovation and cultural centres have also been established by universities and university science parks. Alongside them - sometimes integrated and sometimes not - there are many private initiatives, clusters, accelerators and shared offices that fulfil the need of local innovators to meet and develop innovations in a specific region.¹⁷

The policy aims to support local and regional initiatives that demonstrate the ability to work together, physically and programatically connect, and achieve results and financial sustainability over time.¹⁸

The first step is to functionally link the state's diverse regional activities and present a clear plan for cross-connecting or complementing existing public and private initiatives. This will take place over the next three years. Since each region has different needs, it is not appropriate for the centres and consortia operating in them to have the same structure and activities. This will be reflected in the conditions for the accreditation of such and similar centres. For example, a centre in a town such as Lučenec, where there is no university, may have a need for different types of activities and support than a centre in Martin. We will support targeted linking and cooperation towards financial sustainability in the regions with funds earmarked for Intersectoral Innovation Partnerships from the Slovakia 2021-2027 Programme. This will be based on a methodology developed in cooperation with VAIA at the Government Office and the MIRDI SR, which will be financing the centres. A specific approach is required for territories defined in the Just Transition Plan and territories facing serious socio-economic challenges resulting from the transition to climate neutrality, whether due to the closure of coal mines or technological changes in industries with intensive production of greenhouse gas emissions leading to decarbonization.

In addition to cross-connection, we propose competitively supporting private platforms that are able to demonstrate three key attributes of success at the regional level: (1) a vision to increase the region's absorptive capacity and innovation outputs based on the specific needs of the region's private sector, (2) a clear plan for cross-connecting or complementing with public activities, and (3) a convincing plan for achieving financial sustainability and multi-source financing.¹⁹ The state will support these entities in the initial stages. Gradually, they should be able to demonstrate their

added value to the business community in particular and to attract private funding. The centres need to be able to prove that they build onto functional existing activities and cross-connections and that further support can qualitatively advance these connections. It will also be an advantage for centres to be able to demonstrate how they collaborate or learn from other similar entities in the country or abroad. The state will then gradually decrease funding for entities that are not able to cross-connect and bring value to the local ecosystem under the portfolio approach.

Activities in this area will be conceived in synergy with the Action Plan of Smart Cities and Regions at the MIRD SR.

1.2 Simplification of processes

If we want to improve the quality of the outputs of our researchers and innovators, we need to create environments and processes that facilitate their work rather than hinder it.

1.2.1 A researcher and innovator, not an accountant: simplify the implementation of grant calls to reduce the amount of bureaucratic burden and increase time for creativity and research²⁰

The system of grant support for research, development and innovation requires fundamental changes in terms of user-friendliness for the end beneficiaries. For a researcher or a company applying for public grant funding, it is irrelevant from which sources the state offers support. Today, however, different types of sources (EU Structural Funds, Recovery and Resilience Plan, state budget) have different rules and agencies to support R&D&I. Mixing different sources within the budgets of some ministries and other entities providing support for R&D&I has created a confusing system. Both funding from the budget and relatively large allocations from the EU Structural Funds have stagnated. In addition to known cases of suspected corruption and substandard behaviour in the assessment of funding applications, calls for European funds have been cancelled and uncoordinated.²¹ In addition, R&D funding from 'Eurofunds' is associated with an excessive level of administration for both the provider and the recipients.

Although the Research and Development Agency (SRDA) is funded from the more flexible state budget, funding has been fluctuating and insufficient for a long time. One year, the agency even cancelled a general call and has not opened calls for its applied research programmes for a long time. In the context of a small country where researchers in the field know each other personally, the SRDA boards created potential conflicts of interest and community pressure to reduce the quality of project evaluation. Even when conflicts of interest are eliminated in accordance with the law, in practice changes in project scoring frustrate researchers and deepen their distrust of government institutions.²² In addition, researchers are at a disadvantage in the earlier stages of their careers compared to more professionally experienced principal investigators due to how selection rules are set and a lack of funding. The involvement of high quality international experts is essential to improving the quality of the evaluation process. However, our agencies do not have experience, motivational resources or staff with sufficient language skills.²³

A lack of administrative staff in ministries and agencies combined with high bureaucratic burdens reduces the potential for quality management of research, development and innovation projects. The work of agencies is also hampered by conflicting views of regulatory authorities. The task of the supervisory authorities is to work on harmonizing their decision-making practice and minimizing the level of uncertainty among recipients, despite the fact that, according to the jurisprudence of the Court of Justice, supervisory authorities can decide differently on the same matter.²⁴ The use of EC rules on reducing the audit burden,²⁵ the use of simplified reporting of expenses as well as the emphasis on performance audits instead of formal control and reporting offer opportunities to reduce the overall administrative burden.

The management of grant support is also negatively affected by employing the use of formal monitoring instead of substantively controlling the achievement of set milestones. Due to the tangle of domestic rules beyond the requirements of the European Commission, project managers focus primarily on checking work reports and dealing with crisis situations. Last but not least, there is not a unified information system for administrative control and the submission of applications. There are currently too many of them, and they are diverse, complex and user-unfriendly. They lack features that could simplify working with them, such as the automated checking of applicants by linking the information system to the national reference registers, an English-language version and data collection for analytical purposes.²⁶

The policy aims to create a grant funding system that is simple, transparent, predictable and results-oriented. Such a system will significantly reduce the burden on researchers and companies at all stages of the process and allow them to focus on results: excellent research that will transform Slovakia into an innovation-driven country. The reform of these processes will follow the recommendations of the OECD and the Value for Money Department (VfM) to simplify grant processes from all types of funding.^{27, 28}

First, an interdepartmental budget programme will ensure financial continuity, coordination and possible follow-up funding for individual calls. The resources of the programme should cover all the needs identified *ex ante* in adequate volumes and across the innovation cycle from basic research all the way to commercialisation. The above-mentioned integration of certain agencies and their subsequent mutual coordination aims to bring a higher quality of services provided at the implementation level. Together with the interdepartmental budget programme, a Preliminary Financing Plan for Research, Development and Innovation, which will integrate all sources of funding, will be approved by the SGCSTI.

Second, VAIA will ensure greater transparency in the project selection process. For this purpose, it will prepare a uniform binding methodology for all types of challenges in research, development and innovation and will propose amendments to the legislation so that this methodology can be applied in practice. The methodology will standardise the format of calls and simplify processes along the lines of the EU Framework Programme for Research and Innovation.²⁹ Schemes in which the amount of grant support³⁰ for projects exceeds 200,000 euros will be mandatorily evaluated by international experts, and the projects will be submitted in English, to which we will adapt the information system as well. For this purpose, VAIA will create or otherwise ensure a database of foreign evaluators of grants in the field of research, development and innovation. The project evaluation scale will have fewer steps, as too fine scales, according to research, underestimate innovative projects.³¹

Third, VAIA will begin to actively remove barriers for researchers and companies. It will revise the need to certify eligibility to conduct research and development as a condition for applying for public R&D funding. It will also analyze ways to open up public funding to organizations which, according to today's application practice, show the characteristics of a firm in difficulty, all the while respecting common EU rules. This would make it possible, for example, to fund research at Slovak research hospitals from public resources. VAIA will push for other major and minor measures that

will simplify life for beneficiaries and eliminate the so-called "gold plating" beyond EU rules. It will analyze the possibilities of the widest possible use of simplified reporting of expenses and the use of the flat-rate expenses system, the so-called "lump sums". It will communicate regularly with beneficiaries to gather information on unreasonable and unjustified administrative burdens and bureaucracy.

Fourth, VAIA will prepare an analysis of the application practice of financial and administrative controls, in particular the cost of controls in relation to the volume of funds controlled. Its goal is to identify an economically effective gradation of the scope and number of controls of projects and beneficiaries with regard to ensuring the prevention of corruption, fraud and conflicts of interest. This need is based on the assumption that the transaction costs associated with the administration and follow-up of calls are disproportionately high in relation to the amount of financial support and the amount of resources potentially saved from identified reporting errors. A negative example is the dozens of pages of documents submitted even when accounting for relatively small amounts of funding and the identified 'irregularities' in the tens of euros. If this assumption is confirmed, VAIA will, in cooperation with control authorities including the Supreme Control Office of the Slovak Republic and the Ministry of Finance of the Slovak Republic, propose the necessary amendments to laws and related methodologies while also relying on the experience of audit authorities and the possibilities already offered by the existing legal framework that were consistent with the conditions set by EU legislation. Grant schemes with lower allocations will have correspondingly simpler evaluations and controls. At the same time, VAIA will actively work with audit and inspection bodies to adopt the established practices of advanced economies so there is also domestic expertise for auditing research and innovation projects, which differ in some characteristics from other types of projects, such as large construction and other investments.

Fifth, VAIA will manage the only central publicly funded Slovak website with information on all types of support offered by the Slovak government and the European Union for research and innovation. The portal will respect the design rules of government websites and pay attention to the user experience, taking into account the needs of the end users. As a result, it will not be necessary to search for grants and different types of financial support on different web portals. In the second step, it will link with existing national³² and international registries, as well as new and improved modules for application management, evaluation and grant monitoring. The automatization of some processes will reduce the administrative burden on both the funder and the beneficiary. The final objective is to provide one single functional information system for grant funding from all sources with the gradual consolidation of the individual grant agencies.

The final intervention is to improve the overall quality of services provided by grant agencies. In collaboration with government departments and non-profit organizations focused on greater transparency of public institutions, VAIA will initiate a change in the way agency management is selected. Successful candidates should be experienced research and innovation managers that are selected in a transparent selection process with public interviews. This change will be one of the steps in the gradual consolidation of grant agencies. The aim will be to select candidates who demonstrate the ability to implement reform and development plans based on the OECD

recommendations and this strategy. Among other things, it is necessary to increase language and professional skills and reduce staff fluctuation in these agencies. In addition, an expert analytical team will be created within VAIA to systematically collect and evaluate data on the performance of the agencies. This will ensure progressive improvement of grant schemes and better use of public funds.

1.2.2 Removing obstacles: create a trust-based regulatory environment that stimulates innovation and entrepreneurship

Business associations see the increasing administrative, regulatory and tax burden as a key economic policy challenge.³³ Frequent legislative changes increase business uncertainty and the complicity of the legal framework, which directly reduces the competitiveness of the economy. This is also indicated by international rankings in which we lag behind in the quality of institutions, law enforcement, legal certainty and the efficiency of business.³⁴

A friendly regulatory environment is a factor that is all the more important for entrepreneurs if their business model is based on the innovation process, i.e. the transformation of an innovative idea into an original product or service. According to innovation ecosystem actors and business law experts, innovation regulation today lags behind the needs of the market.³⁵ This is not about keeping the speed of regulation in line with the latest trends, where, naturally, due to the uncertainty and novelty of products and services, regulators in advanced countries are also lagging behind.³⁶ Slovakia is currently lacking even basic frameworks. This reduces the ability of the domestic economy to innovate and retain promising companies, as many entrepreneurs prefer to set up companies in a friendlier environment abroad.³⁷

The objective of the policies is, in the first step, to remove the main regulatory barriers and to increase the incentives of start-up and established companies to create innovative products and services in Slovakia.

In cooperation with the Ministry of Economy of the Slovak Republic, we will extend the package of measures to improve the business environment to include specific requirements of innovative companies in order to increase their international competitiveness. In the case of young innovative firms starting to develop a product or service, rewarding employees solely in terms of salaries can place high demands on their cash flows and thus represent a competitive disadvantage compared to established businesses. Relaxing the conditions for employees to be able to participate in the ownership of the company can have positive effects not only on cash flows but also on employee motivation in terms of loyalty to the objective pursued by the innovative company.

Partial measures to improve the business environment will later be accompanied by the recodification of the company law, which is being prepared by the Ministry of Justice of the Slovak Republic. This recodification will bring more flexibility to corporate governance processes, including their digitalisation, taking into account means against the concealment of companies' economic backgrounds. Attention will also be paid to the currently narrow and closed shareholder structure of companies and the costs of them opening up to other potential investors. The importance of share capital as a creditor protection tool will also be reassessed. These adjustments will allow

young innovative companies easier access to private venture capital investment through the issuance of securities.

The Ministry of Justice of the Slovak Republic will also enable the registration of all changes at the corporate level in the Business Register of the Slovak Republic through external registration agents. This will eliminate delays associated with court caseloads. With fast and transparent registrations in the structure and ownership of the company, innovative companies will gain faster access to finance in case of obtaining an investment. The Ministry of Justice will also further build on the ongoing processes of the pilot project of digitalising the Business Register, which will enable the establishment of a limited liability company (s.r.o.) from the comfort of home through an electronic form for the creation of a memorandum of association. These processes will be further extended to include a client centre for legal and technical support in setting up a limited liability company online. The Ministry of Justice of the Slovak Republic will gradually extend the pilot project for the establishment of limited liability companies to include possible changes in the registered data in the online environment and integration with the relevant reference registers, enabling the use of the data available in the public administration systems.

In cooperation with the sector of innovative companies and experts in labour relations, we will look for solutions that will take into consideration the specifics of the functioning of the so-called distributed teams and will lower the costs of legal advisory for companies. Innovative solutions in practice are usually built by distributed teams. In addition to their own employees, they also cooperate with external suppliers of innovative solutions, who usually do business on the basis of a trade licence. These suppliers are experienced professionals who enter into a business relationship with the company voluntarily, prefer self-employment to employment and do not need to protect the weaker party as in the case of employment contracts. In practice, however, these relationships suffer from legal uncertainty because innovative firms provide their contractors with benefits such as a workplace in an office or food and drink, which may be perceived as features of an employment relationship. In order to retain talented professionals, this situation forces innovative firms to spend considerable legal costs to ensure that these commercial relationships between the firm and its contractors comply with the current legislation.

We will support the motivation of companies and entrepreneurs to innovate in cooperation with the Ministry of Finance by modifying tax legislation. By clarifying deductible costs, we will increase the legal certainty of the use of super deduction and reduce the administrative costs associated with it. Companies in loss will also be able to claim the super deduction as a tax credit up to a certain limit.^{38, 39} The state will therefore act as an investor of first instance and reduce the level of uncertainty in the initial phase of high-risk and high-potential research and development projects.⁴⁰ **We will gradually create an environment where institutions respond proactively to the changing needs of existing and new businesses across sectors in the economy.** The aim is to move regulators from reactively removing risks and creating excessive regulation to proactively simplifying the business environment and creating opportunities for innovation to be implemented in practice. In this spirit, the cooperation between the Ministry of Finance and the Ministry of Investment, Regional Development and Informatization of the Slovak Republic with the Fintech sector is an inspiration, resulting in specific proposals for the development of financial innovations.⁴¹ In

cooperation with the National Bank of Slovakia (NBS) and the Ministry of Finance of the Slovak Republic, we will introduce a pilot programme of agile regulation for the development of innovative solutions. The NBS is already using proactive regulation tools (innovation and legislative sandboxes, active cooperation with associations) for the financial innovation sector.⁴² We will extend these by measuring their impact on the implementation of innovations in practice. We will gradually extend the pilot programme to other regulators who will receive support for building proactive regulatory capacity, including through the technical assistance of experts from the European Commission (e.g. Jaspers) and the OECD.

1.2.3 Connecting knowledge: use legislative changes to promote collaboration between researchers and the private sector in order to transfer technology and knowledge across the ecosystem

The optimal use of research and development capacities and Slovakia reaching its potential requires effective cooperation between public research and development organizations⁴³ and businesses. However, public research and development organizations do not get along with the private sector to a large extent, which is also indicated by Slovak data in the European Innovation Performance Assessment. Their motivations, expectations from the cooperation, flexibility, time horizons, areas and objectives of research, development activities, and speed of response are rarely compatible. The volume of resources from contract research for public research and development organizations in Slovakia is substantially lower compared to institutions abroad and has been decreasing in the long term.^{44, 45} Public research and development organizations and the private sector have a long-term problem in establishing meaningful collaboration. This is one of the main reasons for low technology and knowledge transfer across the ecosystem.

The policies' objective is to help significantly increase knowledge and technology transfer from the research environment to practice and public-private cooperation.⁴⁶ This will require not only removing various legislative barriers, but also changing the motivations of individual actors so that researchers can do knowledge and technology transfer conveniently through a public research and development organization rather than through their own or foreign companies without the recognition of the role of a university or public research institution. The basic prerequisites for functional knowledge and technology transfer on the part of public R&D organizations are professionalisation, standardisation, openness, motivation and taking responsibility.

For closer cooperation between actors, especially between public research and development organizations and companies, we will free the hands of the public sector. Legislative changes will enable public research and development organizations to deal with intellectual property in an efficient way. A new concept for the management of research infrastructure will encourage the shared use of existing and new infrastructure with private companies. The Transformation and Innovation Consortia, funded by the Recovery and Resilience Plan and implemented by VAIA, aims to better interconnect the public research and private sectors (see also section 3.4).

We will further support the building of a professional environment and competences for technology transfer (TT) directly in public research and development organizations. We also want

to facilitate their efficient and productive functioning by education, gaining experience from abroad and motivating them to comply with standards of good practice for functional technology transfer and intellectual property management, which should be objectively and easily certified. The basic standard should include at least: 1) an innovation management system in an established position (at least implemented internal regulations, a functioning TT office, a trained responsible person), 2) a published and updated portfolio of areas offered for TT (at least in terms of: level of readiness, definition of the technical sector, examples of commercial application, form of cooperation, use of tags). In addition to existing partners (e.g. SCSTI), the Industrial Property Office of the Slovak Republic, experienced foreign partners (e.g. WIPO) and experts from the private and public sectors will play a more important role in technology transfer education, following the example of other similar offices.⁴⁷

Greater collaboration with the private sector must pay off for public research and development organizations in the future, through contract or collaborative research, licensing and transfer of intellectual property rights, their own spin-off projects or expert advisory services. We want to initiate and stimulate collaboration by rewarding this activity more financially, e.g. through performance contracts, the next round of the Institutional Research Excellence Assessment (VER 2027), various types of matching or through the aforementioned certification.⁴⁸

Motivation towards technology transfer must be ensured at all levels: institutional (e.g. university, faculty, etc.), investment (e.g. special fund, science park, research institute, research team, spin-off company) and individual (researchers involved). This multi-level approach should also guide the redistribution of revenues from the licensing and sale of intellectual property rights with specific coefficients and ratios to meet the requirement of fairness and transparency.⁴⁹

Decisions on the terms and conditions of the transfer of intellectual property rights will be based solely on the autonomous decision of the institution. Even if we remove legislative barriers, introduce standards, educate experts and set up incentive mechanisms, every technology transfer project in its commercialisation phase depends on the competence and decisiveness of managers who, within public research and development organizations, must take responsibility and make the appropriate decisions to conclude a contract regarding intellectual property rights. Therefore, in particular, when it concerns decisions on the selection of a partner company, the remuneration for licensing or the transfer of intellectual property rights, we will encourage measures leading to the effective application of internal control and approval processes, including collective decision-making and the competence of the supervisory board of public research and development organizations or the board of directors of a university, without the need for a tendering procedure, a commercial tender or an expert evaluation.

Rules and conditions for a functional technology transfer process should not restrict open access to research, knowledge and expertise, or access to intellectual property rights. However, this process should be clearly managed for technologies with commercial potential. In line with the above principle of taking responsibility, public research and development organizations could also choose to provide free or public access to a specific technology (e.g. under Easy Access⁵⁰), i.e. apply a similar principle to Open Access for scientific publications (see section 1.2.4 for more details).

1.2.4. Open data and open science: make public administration and research data available as a source for innovation

Making public institutions' data more accessible enables more innovation and less corruption through greater transparency and public supervision. At the same time, it decreases the cost to the state for quality decision-making.^{51, 52, 53} The public administration in Slovakia has a wealth of data at its disposal. Not only is sharing it common with the private sector, but also among government departments. If data is already available, it is often "scattered" on the institutions' websites or available in a form that is not practical or easily usable (e.g. pdf format).

Open data has not previously been a government priority. In the Open Data Maturity Index, which is published annually by the European Commission, Slovakia ranked last among EU countries for 2021.⁵⁴ We are particularly lagging behind in the use of already published data and measuring its impact in practice. Slovakia has only implemented the European Open Data Directive from 2019 into domestic legislation with effect from August 2022.⁵⁵

In the meanwhile, the European Union is working on further major steps in the data sector with innovation potential. In response to the pandemic, which highlighted the complicated rules and procedures for sharing health data across Member States, a pilot proposal for a Regulation of the European Parliament and of the Council on a European Health Data Space has been prepared. This regulation will allow the health data to be used to its full potential. Health data will be available as so-called secondary data, where it will not be possible to identify a specific individual.⁵⁶ The European Parliament and the Council's proposal for a Regulation on European Data Governance will remove the obstacles posed by the General Data Protection Regulation (GDPR), which significantly restricts the use of data in practice. This will give research and development organizations⁵⁷ and innovators access to high quality health data, which is key for a more resilient healthcare system.⁵⁸ This pilot project will gradually be extended to other sectors such as agriculture, finance and energy, among others.⁵⁹ While, for example, the Czech Republic has already developed a plan on how to implement the regulation, Slovakia has not actively started working on this area yet.⁶⁰

The policies aim to significantly accelerate the opening up of public data for innovative solutions in a variety of areas.

The main player in the field of open data is the MIRD SR. The amendment to the Freedom of Information Act^{61, 62} obliges public authorities to publish information according to the principle: "What is not confidential is open," in a computer processable format and catalogued on the central open data website data.gov.sk. The Open Data legislation is complemented by the Open Government Initiative's Open Government Action Plan for 2022-2024, which aims to initiate an interactive process of improving the government's data and services by measuring the impact of the use of open data in practice. During 2023, a new Data Act⁶³ will enter into force and take effect, creating general conditions for the provision of data for analytical and research and development purposes by public authorities. The implementation of the legal requirements for the open data of public authorities and the Data Act will be supported by the Data Office Department at the MIRD SR.

SR.⁶⁴ It will continue to provide advisory services and develop methodologies. Legislative tools will be complemented by awareness raising and the involvement of universities, the non-profit sector and companies in the open data project. Their successful involvement in the project will also require their own capacities, such as the position of a data curator, who will be the coordinating point for private and academic sector cooperation with the MIRDl SR Data Office. State and public administration bodies will initiate events such as data hackathons.

In order to meet the requirements of the European data space,⁶⁵ the Ministry of Health of the Slovak Republic, as the agenda holder, will create conditions and a plan for the implementation of the changes resulting from the above obligations. The aim is to involve relevant healthcare organizations in the systematic implementation of these requirements by the regulation's effective date.⁶⁶ The successful linking of health data will create a pathway to reform access to other types of data in a similar way.

The Ministry of Education will prepare and present a new Action Plan for Open Science that reflects international trends. This will fundamentally change publishing standards globally and will have significant implications for Slovakia as well. The Action Plan will emphasise the publication of FAIR⁶⁷ research data.

1.3 Adequate financing⁶⁸

If we want to develop a knowledge-based economy, we need to increase the amount of funding for research and innovation, and at the same time make this increase under a condition of reforms that will help transform investments into real results.

1.3.1 Budget increase: bring the research and development spending of both the public and private sectors closer to the EU average

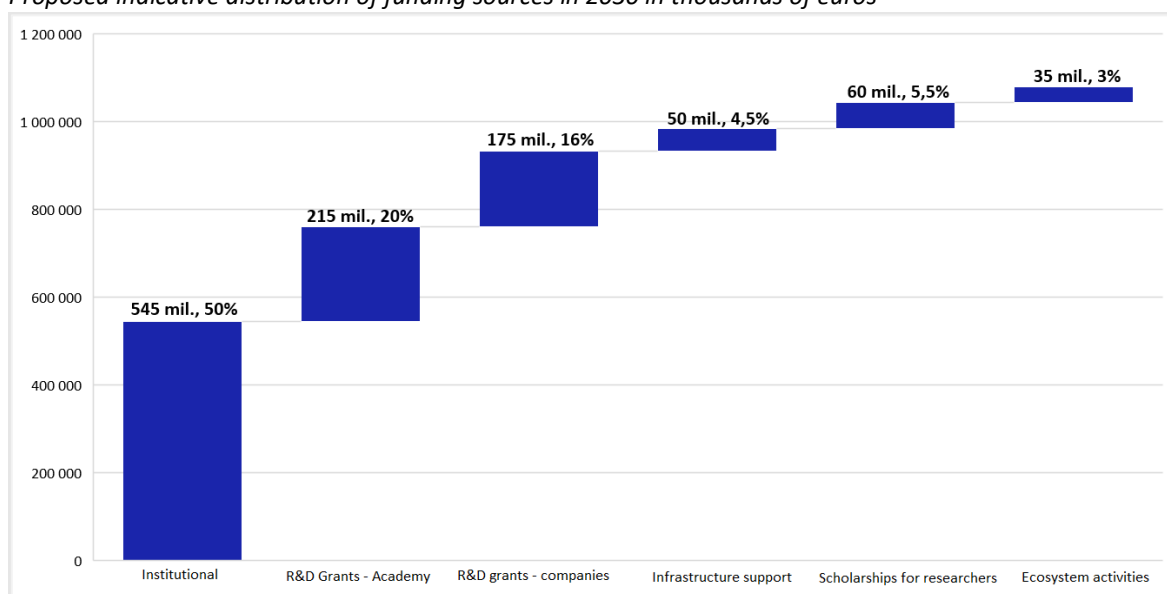
Slovakia invested a total of 0.91% of GDP in research and development in 2020 (GERD)⁶⁹, of which private sector spending represents the majority (0.49% of GDP), with the rest coming from universities and other public research and development organizations (0.42% of GDP).⁷⁰ The instability of public funding - the lack of continuity for existing calls (departmental calls by the Ministry of Health, Ministry of Science and Technology), the cancellation of calls for long-term strategic research and a failure to ensure the sustainability of built research infrastructure (e.g. science parks) - also contributes to low research and development expenditure. For comparison, EU spending that year amounted to 2.32% of GDP, of which private sector spending was 1.53% of GDP.⁷¹

The policy aims to achieve total expenditure (GERD) on research and development of 2% of GDP by 2030, with 1.2% of GDP being private expenditure. Given our baseline, this is a very ambitious target. In 2020 it would warrant a 10th-11th position among EU countries,⁷² and in 2030 we expect it to be about 13th. The overall strategy target for the European Innovation Scoreboard indicator is similarly set. The Czech Republic had already reached an identical level of investment in research in 2020.⁷³

The government budget expenditure on research and development (GBARD)⁷⁴ reached 0.42% of GDP in 2020. This is a different concept that measures government expenditure regardless of the recipient's use of research and development, i.e. also expenditure on various ecosystem services (e.g. memberships in international organizations, etc.). Over the last decade, this public investment in research and development has been around 0.4% of GDP. In comparison, in the EU this investment reached 0.77% of GDP in 2020, and only three countries in the EU invest at least 1% of GDP from budget resources.⁷⁵

Chart 3 – Indicative plan for the distribution of funds for research and development

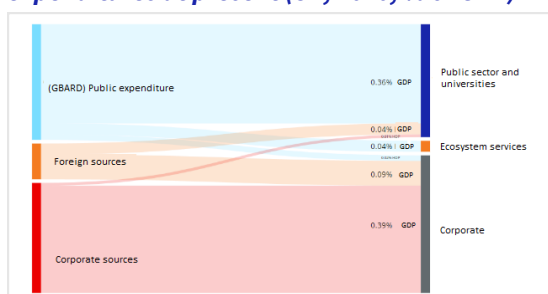
Proposed indicative distribution of funding sources in 2030 in thousands of euros



Source: own processing

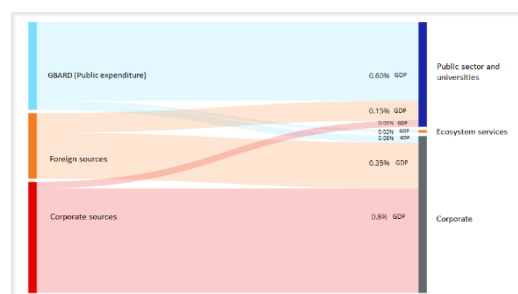
Slovakia will therefore gradually increase investment in research and development from the state budget to reach 0.67% of GDP in 2030. The present EU average is 0.77% of GDP. State budget expenditure (GBARD) will grow slower (from 0.42% of GDP in 2020 to 0.67% of GDP in 2030) than public sector R&D expenditure (GERD; from 0.42% of GDP to 0.8% of GDP). This is because, in addition to resources from the state budget, public research and development organizations are expected to substantially increase the resources obtained from abroad, from the Slovakia 2021-2027 Programme and from private sources. The same applies to private business entities. As a result, they will achieve the same efficiency in obtaining other resources as the same institutions in the Czech Republic. This target represents an average 14% increase in the state budget for research, development and innovation starting in 2024 to reach an indicative EUR 1.1 billion in 2030 under current GDP growth and inflation assumptions.

Figure 3 – How financial resources are transformed into research and development expenditures at present (SR, 2020, % of GDP)



Source: Eurostat, own processing

Figure 4 – Expected flow of funds from resources to R&D expenditure in 2030 (SR, 2030, % of GDP)



Source: Eurostat, own processing

Note: The left axis shows R&D expenditure by funding source [rd_e_gerdfund], while for public expenditure we use the more accurate GBARD statistics of recorded budget expenditure [gba_fundmod], which also includes expenditure on ecosystem services. On the right

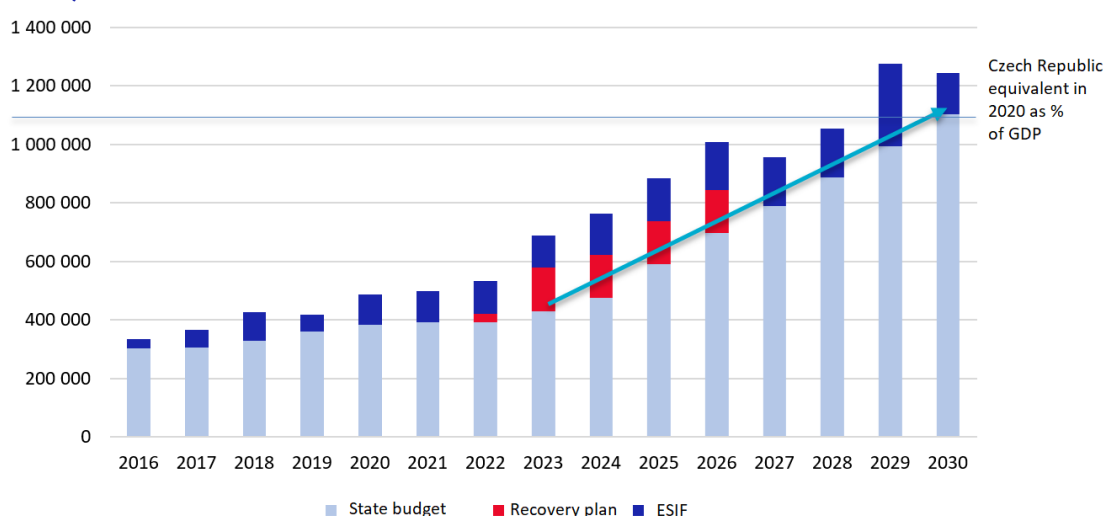
axis is expenditure on research and development by sector of use [rd_e_gerdtot] plus expenditure on ecosystem services, which is not included in the statistics on total expenditure on research and development by sector of use.

State budget increases will be conditioned by the reforms of the Recovery and Resilience Plan and the National Strategy for Research, Development and Innovation 2030. This will consider the possible different evolution of macroeconomic indicators compared to the September 2022 assumptions on which this strategy is based. This will also ensure pressure on the reform process and increase the efficiency of the funds invested.

The research and development budget is divided into institutional funding, competitive funding, infrastructure funding, funding for excellent researchers and funding for the supporting environment. The budget for each area will not grow evenly. For institutional funding, we expect constant growth in expenditure at a rate of 5-10% per year to ensure stability in funding and planning of public research and development organizations. Growth will partly depend on the outputs achieved through performance contracts. The budget for competitive funding for primary research and funding for the supporting environment will grow at a similar rate of 5-10% per year. Support for research and innovation businesses will increase much more significantly. Strong and systematic funding for infrastructure and excellent researchers (e.g. for young researchers) will be completely new elements, which until now have been *de facto* missing or completely negligible in Slovakia, even though they are common instruments in advanced innovation economies.

The innovation ecosystem support also includes other innovation spending in addition to research and development (e.g. digitization of enterprises, process innovation, technology dissemination) and spending on talent development apart from research and development. These expenditures are a part of the strategy presented (in addition to R&D expenditure). The analytical challenge for the future is to better map and systematize these expenditures.

Chart 4 – Planned increase in public budget expenditures on research and development (GBARD indicator) in thousands of euros



Source: Eurostat, Macroeconomic Forecast of the Ministry of Finance of the Slovak Republic (September 2022), calculations of the Slovak Government Office

1.3.2 Institutional funding reforms: connect institutional funding with reforms that will help transform investments into higher quality outputs of universities, the Slovak Academy of Science and other organizations in the ecosystem

Increased public investment in research, development and innovation only makes sense if it is accompanied by continuous quality improvements. It is worth investing in a system that can absorb these investments and transform them into both greater and better quality outputs. Universities and public research institutions are currently undergoing governance reforms based on the changes initiated by the Recovery and Resilience Plan. Their aim is to create an environment in which the very best get the resources invested.⁷⁶ At the same time, the reforms are intended to motivate research and development organizations to support and target the development of excellence in strategic areas.

The advantage of institutional funding is the ability to efficiently distribute resources not only to excellent but also to a critical mass of above-average and promising researchers and departments, as long as it is performance oriented and promotes quality. Research shows that grant funding does not necessarily generate a more efficient distribution of support than institutional funding based on previous performance.⁷⁷ On the other hand, the constant competition for grants drains a lot of resources for preparation, evaluation, monitoring and controlling. The proper setting of incentives in institutional funding combined with greater public supervision through boards of directors will contribute to avoiding the disproportionate redistribution of state subsidies from high quality to low quality departments within public universities and the public research institutions of the Slovak Academy of Sciences, which would limit the development of the whole institution in the long-term.

One of the most important changes is the introduction of long-term measurement of the quality of research carried out by universities and public research institutions by international panels of experts based on the evaluation of the quality of outputs from research and development activities (so-called verification of excellence in research - VER). Results will form a significant and stable part of institutional funding. In the case of funding public research institutions, the results from VER will be complemented by an institutional evaluation organised by SAV. The Ministry of Education continuing the reform of universities and private and other research and development organizations will also be included in the VER assessment on a voluntary basis in the next rounds if they would like to receive institutional funding from the interdepartmental budget programme. In the future, in addition to measuring quality, VER will also monitor the societal and commercial impact of research and the quality of the environment of the institutions themselves. Lessons learned from VER 2022 and collaborative outputs from multiple R&D organizations will be assessed in the new round to encourage mutual collaboration between organizations.

The second change on the way to developing excellence in strategic areas is the so-called performance contracts with universities and public research institutions. Performance contracts will be a new pillar of institutional funding for universities with stability over a three-year horizon. They will be negotiated individually with research and development organizations and in the case of universities will be based on a long-term plan for higher education. They will reward universities

for advances in quantitative indicators (in research, education and cooperation with practice), but also for introducing important qualitative systemic changes (e.g. in the areas of academic and research integrity, gender equality, favourable working conditions, diversity, inclusion and mobility of researchers and PhD students).⁷⁸

The third pillar of institutional funding continues to be variable components through the allocation of grants, which will be adjusted by the Ministry of Education according to the principles of the so-called responsible evaluation of science and research. This means careful and only complementary use of the best possible bibliometric indicators. There will be a shift in publication outputs from impact factor to better bibliometric indicators (e.g. standardised impact factor, AIS, citations) and a shift from patent applications to patents granted, preferably European or foreign patents.⁷⁹

All organizations in the ecosystem that successfully pass the Research Quality Assessment (VER) will be eligible to apply for institutional funding in the form of performance contracts as well as the variable component, in addition to long-term institutional funding (for 6 years).

The reforms of universities and the transformation of the Slovak Academy of Sciences that were made at the beginning of 2022 will have to be further fine-tuned and adapted to changing conditions after their evaluation. We will further support the continuation of governance reform by funding international internships and mentoring and training managers and administrative staff. The emphasis on long-term institutional research funding will be on international openness and removing negative effects that limit attractiveness for international talent. Reforms are expected in the gradual elimination of “academic inbreeding,”^{80,81} a high degree of transparency and international openness in selection procedures, the adoption and thorough implementation of the principles of research and academic integrity, and the systematic promotion of gender equality in all, but especially in STEM fields (science, technology, engineering, mathematics). These steps have the potential to improve the quality of governance and further improve the overall standard of universities and public research institutions.

1.3.3 Competitive funding reforms: gradually and regularly increase grant funding in order to support academic and industrial research, development and innovation

Grant funding for research and development in Slovakia suffers from financial malnutrition, unpredictability, irregularity and bureaucratic burden. The volume of competitive funding in Slovakia has been stagnant for a long time. As of 2018, the SRDA budget was at around EUR 40 million per year. Since 2010, with a few exceptions, €33 million has been allocated to the general call, or €250,000 per project.⁸² The value of these projects has declined significantly in real terms, and the competition for these funds is turning into a “fight for crumbs”. Calls for proposals from the European Structural and Investment Funds are announced in a very unpredictable manner, burdened with increased bureaucracy or cancelled. Moreover, the volume of resources in the last programming period (2014-2020) decreased (to EUR 1.1 billion - priority axes 9 and 10 of the Integrated Infrastructure Operational Programme) compared to the previous period (2007-2013; EUR 1.2 billion - Research and Development Operational Programme). In the new Programme period 2021-2027, the volume of resources for research and development is again expected to be

lower (€973 million - specific objective 1.1 of the Slovakia 2021-2027 Programme). Other types of calls are relatively small and are more like microgrants (e.g. VEGA/KEGA calls) or very specific, e.g. bilateral calls.

The policy aims to increase the volume, guarantee the predictability of support and reduce the bureaucratic burden of competitive funding for R&D. Simplifying support and reducing the bureaucratic burden of grant funding are the subject of section 1.2.1 above.

A necessary step is a gradual and regular increase in state budget spending on grant support for research, development and innovation. This will grow at a similar pace to the institutional funding of universities and public research institutions. This gradual increase is justified by the gradual start of multi-year projects as well as by the financial support that the sector will receive from the Recovery and Resilience Plan in the calls announced in early 2023. The increase in resources is also important in terms of retaining the people who will be attracted to Slovakia through schemes to attract excellent researchers and will need suitable grant schemes that they can subsequently apply to. In addition to general calls, the SRDA will periodically launch thematic calls in priority areas. Both types of calls will focus on both basic and applied research. We will consolidate the position of smaller grants for young researchers (PhD students and fresh PhD post-docs) to fully launch their own research, initially through the Recovery and Resilience Plan and subsequently through funding from the state budget.

We will significantly increase our support for research at higher stages of technological readiness to support innovative companies. We will configure grant support following the European Innovation Council (EIC) Horizon Europe schemes. Grants will be targeted primarily at small and medium-sized enterprises (SMEs) at low stages of technology readiness in consortia with public research and development organizations. For large companies, we will provide grant support for research in partnership with SMEs or other research and development organizations, following the example of other successful countries in the European Union. Successful projects up to technology readiness level 8 will be supported.

Table 2 – Indicative overview of funding for research, development and innovation

TRL 1	2	3	4	5	6	7	8	TRL 9					
Grant funding					Financial instruments								
<ul style="list-style-type: none">• General calls (including interdisciplinary projects) - regular, predictable<ul style="list-style-type: none">• Larger grants• International cooperation support• Specific calls - programs (linked to RIS3 and missions) - regular, topics predictable well in advance, ad hoc calls exceptionally• Calls for excellent researchers and MSCA holders (and their teams) of any nationality who work/will work at a Slovak VV institution, for R2-4 several years, generous amount<ul style="list-style-type: none">• For stays abroad for doctoral students (R1)• For post-doctoral students (R2)• For independent and senior researchers (R3 and R4)• For ERC and MSCA grant finalists• Link to the European Research Area<ul style="list-style-type: none">• Support for ERA grant finalists					<ul style="list-style-type: none">• National "EIC" = grant + equity financing• IPCEI support• Proof-of-concept vouchers: 15 to 50 thousand euro grants for patent, legal and other needs to start commercialization. Regular, predictable, simple.• Pre-seed fund: 100 to 500 thousand euro per project, total allocation approx. 10 to 20 mil. euro; strong involvement of angel investors and incubators• Seed funds: 0.5 to 2 mil. euro per project, total allocation of 80 to 160 mil. euro; funds realized in cooperation with private investors (principle of alignment of motivations)• Patient capital, de-risking investments that private funds do not finance• Equity, quasi-equity and revenue-based financing• Infrastructure financing, access to research infrastructures					<ul style="list-style-type: none">• Growth/venture fund: 2 to 8 mil. euro per project; total allocation of 120 to 240 mil. euro; co-investing with foreign VC funds• Patient capital, scaling deep-tech firms• Following-on funding/scale up fund: format of functioning investment funds for projects of strategic importance in accordance with identified "missions"• Link to investment aid• Vouchers• Loan instruments			

Source: own processing; TRL = technology readiness level)

1.3.4 Quality infrastructure: build top research and technological infrastructure that boosts the origination and development of new ideas and knowledge

Systematic funding of research infrastructure has been without clear rules and concepts for a long time. In some areas we have a large investment debt or the infrastructure is becoming outdated. A specific case is Bratislava, which has only been able to invest in research infrastructure to a limited extent through the European Structural and Investment Funds despite the fact that more than 50% of Slovakia's research capacity is concentrated there.⁸³

On the contrary, some laboratories, mainly thanks to the EU Structural Funds, have received higher-level equipment than quality universities abroad. However, not all of this equipment is being used effectively. The state and the beneficiary institutions have not taken into account the costs of operation, technical support and repairs, and have not legally addressed the possibility of sharing this infrastructure with the private sector. The state is paying for access or memberships to the shared European infrastructure, and Slovak researchers have the possibility to use it. However, the Ministry of Education does not currently have the dedicated capacity to actively focus on the shared infrastructure and assess the contribution of individual infrastructures and the extent of their use, or to address the aforementioned problem of shared infrastructure for public-private cooperation.

There is currently no space in the system for long-term strategic planning for the kind of infrastructure that public research and development organizations need at a given time. Universities and the Slovak Academy of Sciences are thus forced to raise funds for large infrastructure projects either on the basis of a top-down bid or by pushing their proposals to high level officials or politicians. There is no specialized body to assess the need for new infrastructure in the context of possible synergies with existing facilities at other institutions and in relation to memberships in foreign shared infrastructures.

The policy aims to set up a systematic national approach to mapping, sharing and developing research and innovation infrastructure.

In the first place, VAIA together with the Ministry of Education, Science, Research and Sport of the Slovak Republic and other partners will create a concept of access to and management of shared research infrastructure. The concept will map and publish existing research infrastructure. The list of research infrastructure will be published and regularly updated on the VAIA information portal. The mapping will also include intellectual and other non-material property within the terms of the European Cloud Initiative for Open Science. The second part of the concept will set the conditions for using the infrastructure in such a way that collaboration with companies and other institutions on new and existing infrastructure is facilitated and encouraged to the maximum extent possible.⁸⁴

The Ministry of Education will create an office for research infrastructures and launch the first schemes to support national research infrastructures and activities within the framework of membership in European ESFRI infrastructures. The office will work in accordance with the instructions of the working group on research infrastructures set up under the Government Council

for Science, Technology and Innovation and the concept of shared infrastructure access and management.

In the medium term,⁸⁵ after a thorough analysis, a financial mechanism will be set up for financing all large-scale research and innovation infrastructures as well as innovative strategic research projects. The mechanism will evaluate and compare different types of investments in a standardised way, from investments in equipment and laboratories, large projects such as campuses, science centres and parks, all the way to strategic private sector investments that have the potential to cultivate the innovation ecosystem in Slovakia (e.g. IPCEI projects and investments in "strategic autonomy"). The aim will be to evaluate the different types of investments based on their relative added value for the entire innovation ecosystem, their mutual synergies and their ability to fulfil the defined missions. Depending on the type of projects, it will combine grant funding and financial instruments. An important aspect of the support for the infrastructure of equipment will be the consistent setup of funding for long-term sustainability and technical support.

1.3.5 Financing of companies: increase the availability of risk capital and the system support for innovative businesses

The sub-optimal development of the venture capital market is a significant obstacle to building an innovation economy.⁸⁶ The lack of private resources allocated in investment funds focused on highly innovative risky projects with the potential to break into global markets is a structural feature of an economy that has so far generated a limited amount of this kind of private investment capital. The number of transactions and the volume of venture capital resources in private funds are still insufficient for high-risk investments with a high potential for economic profitability.⁸⁷ This gap is not yet sufficiently filled by Slovak Investment Holding (SIH), whose capitalization is limited to ensure financing of innovative projects. The SIH also requires a private co-investor for its own investment decisions, which partly reduces its investment risks and its insufficient capitalisation for the development of the innovation economy.

The potential of the tax system to support innovative firms is not being fully used. The super-deduction for research and development and the super depreciation from investments in technologies supporting transformation based on the Industry 4.0 concept can't be used by young innovative companies that need it the most because these companies are not yet generating sufficient revenues and profits. In international comparison, Slovakia has an excessive taxation of capital income at a rate of 33% on investments in domestic companies and cryptocurrencies, which reduces the availability of venture capital from private investors.

The objective of the policy is to adjust the regulatory environment to have a positive impact on the volume of private resources in the domestic venture capital market for innovative companies.

The Slovak Ministry of Finance will support investments by domestic investors into innovative companies through an amendment to the Income Tax Act in the form of capital income exemption. The amendment will also increase Slovakia's competitiveness in the region to the level of the Czech Republic, where capital income is tax exempt and therefore is a frequent destination for Slovak entrepreneurs looking for an investor. The adjustment of the super deduction for

research and development will also increase resources, especially for small and medium-sized enterprises.⁸⁸ Its application will also be available for loss-making companies as a tax credit capped at a certain nominal value. The Labour Department will also contribute to the increase of resources in the domestic capital market through an amendment of the regulation for the limitation and risk spreading of pension funds in the second and third pillars, allowing the redirection of part of the pension fund resources to alternative assets.

The second pillar of company support is to provide relevant financial and systemic support for all phases of company development, primarily in strategic sectors. Following the best practice abroad,⁸⁹ in cooperation with SIH⁹⁰ and the innovation ecosystem, we will further develop companies' access to state financial support for research, development and innovation. The aim is a funding system that responds proactively to market needs⁹¹ and provides sufficient funding at every stage of a project, from so-called "proof-of-concept" grants, through to initial and growth capital and resources for scaling up companies with the potential to be successful in global markets.

According to discussions with innovation ecosystem actors, the financial gap today is most evident at the initial and riskiest stage of the business lifecycle, the so-called "pre-seed". Increasing the amount of capital in this critical pre-seed phase will provide resources from the Recovery and Resilience Plan and the Slovakia 2021-2027 Programme, which will intensify the cooperation between SIH and primarily the so-called angel investors and their associated platforms through co-investments. The subsequent stages of the innovative companies' lifecycle will be supported by additional instruments focusing on the "seed" and growth phases, combining public and private resources. In addition to direct investments in innovative firms, we will also support the systematic financing of ecosystem activities (incubators, accelerators, *co-working* centres), enabling the interconnection of innovation ecosystem actors (see more in chapter 1.1.3).

Increasing venture capital resources will be complemented by developing SIH management processes. The management of SIH and other public financial institutions will be recruited through transparent selection procedures with public interviews of candidates. We will evaluate the available methodology for selecting financial intermediaries in cooperation with technical assistance from the European Investment Fund or the OECD. The selection criteria are important for the selection of administrators who will be making decisions about the allocation of public resources. It is necessary to assess demonstrable experience and performance in asset management, knowledge of the specificities of investing in high-risk technology firms, the ability to mobilise private resources, and the alignment of the incentives of the managers with the public interest in increasing the number and quality of highly innovative firms. Proactive market financing will be based on deep market gap analyses to ensure that private investment is not squeezed out, but is mobilised instead.

At the non-technology company level, VAIA will map and evaluate existing support in accordance with market needs, in particular, the service and some forms of financial support provided by National Entrepreneurship Centres. Subsequently, in cooperation with local centres and the sector, we will create pilot projects to support product and process innovation through mini-grants or vouchers in order to increase the added value of non-technological production and services.

Depending on the specific needs of the companies and the region, these will allow small and medium-sized enterprises to experiment or enhance their business approaches (regional support is also the subject of chapter 1.1.3).

1.3.6 European Union funding: support researchers and innovators in participating in European programmes

Slovakia lags significantly behind in participation in the EU Framework Programmes for Research, Development and Innovation. In Horizon 2020, according to the number of applications submitted as well as the number of projects that were participated in, we were ranked 22nd among EU countries.⁹² If we convert our participation into the number of researchers, we are the second worst country. We are also significantly below the Horizon 2020 average in terms of success in obtaining funding.⁹³ We are particularly lagging behind in key areas that could bring us more funding or participation in more strategic projects (e.g. ERC, EIC, Spreading Excellence and Widening Participation, MSCA). Slovakia ranked among the countries with the highest percentage of non-eligible applications in Horizon 2020, with a percentage of almost 2% (1.75% so far in the new 2021-2027 period).

Despite some efforts, there is relatively limited and, in particular, fragmented support for participation in the Framework Programme. Support exists mainly through national contact points, the Liaison Office for Research and Development in Brussels and some calls that have been launched in five different ministries and agencies.^{94, 95}

The policy aims to increase the participation of researchers and innovators in the EU Framework Programmes for Research and Innovation, as well as in other programmes and initiatives in the European Research Area.

The first key area is supporting public research and development organizations and companies to participate in Horizon Europe.⁹⁶ The Framework Programmes are exceptionally competitive instrument, and only the best teams usually succeed. Without sufficient national support at various levels, we cannot expect a rapid increase in our participation. We must look at our participation not only in terms of supporting researchers and innovators, but also in terms of the financial benefits for the ecosystem and the state. Based on the experience of other countries and from the previous period, we will develop a system that provides support at several levels: (1) project preparation, (2) funding for high quality but unsupported projects (e.g. Seal of Excellence or single-participant projects), (3) if necessary, the co-financing of projects, (4) support for applicants with the potential to succeed (e.g. in the ERC). Our aim is to send a clear signal that research and development organizations will be supported even if they do not succeed in Horizon Europe.

We will increase our focus on supporting the research and funding areas that can bring us more added value (e.g. widening participation, ERC, EIC, MSCA, etc.). In line with the European Commission's recommended synergies, we will support alternative and combined project funding, European Partnerships (in priority areas), cumulative funding, and the transfer of funds from the Slovakia 2021-2027 Programme to Horizon Europe. We will also investigate possibilities to additionally financially reward successful project participants (matching grants). Participation

support in Horizon Europe should be simple, accessible and focused in one place, so we will strengthen the role of the national contact points in project preparation support. We will support the participation of the SR in its membership of those European Partnerships that are in line with national priorities and require the participation of public institutions in the capacity of grant agencies or ministries (co-funded European Partnerships). At the same time, we will develop functional instruments to support the participation of Slovak entities in other types of European partnerships that are in line with national priorities (jointly programmed and institutionalised, including EIT Knowledge and Innovation Communities). We will also focus on progressively increasing the remuneration of researchers participating in international projects through the better use of the instruments that the Horizon Europe programme makes available under its rules.⁹⁷

1.3.7 Public procurement of innovation: increase the percentage of public funds spent on purchasing innovative solutions and improve public services through them

The state is the largest Slovak purchaser, but it is currently using this potential mainly to procure conservative solutions in order to find the most cost-effective offer. Only 3.6% of the public procurement budget⁹⁸ is used for the purchase of innovative solutions (PPI - public procurement of innovative solutions), while the recommended ambition of the European Union is 17%.⁹⁹ In this area, it is in the worst group within the EU.¹⁰⁰ Public procurement of innovative solutions is a win-win situation because it helps the state improve services with more efficient and sustainable solutions. Additionally, it gives innovative companies the space to experiment and pilot their products on the market. Currently, public procurement of innovative solutions is not fully used, as Slovakia has no clear targets or action plan to achieve them.¹⁰¹ Qualitative interviews with the Public Procurement Office (PPO) revealed that the biggest barriers to the use of public procurement for innovative solutions are the fear of an increased risk of failure associated with the procurement of innovations, frequent amendments in laws, a too narrowly defined focus of calls and a lack of staff trained in the public procurement of innovative solutions.

The policy aims to significantly increase the financial resources invested in the public procurement of innovative solutions.

In the first step, VAIA and the PPO will prepare an action plan of the objectives and a strategy of how to achieve them. The OECD study also proposes specific ways to start testing PPI in the field of EU Structural Funds.

In the second step, we will be supporting quality capacity building in PPI. No European Union country is yet close to the target of procuring 17% of its public procurement budget with innovative solutions, but Slovakia can learn from the better ones. That is why we will make resources available for longer internships abroad and for mentoring experts in this field. Employees of the Public Procurement Office and employees of state and public administration bodies, including municipalities and public research and development organizations, will be able to apply for these internships. Working together, VAIA and the PPO will ensure the regular networking of experts in the field in order to gradually adjust the Slovak application practices. These activities will support the educational activities and ambitions of the PPO in the field of PPI. One effective way to achieve rapid changes in application practices and knowledge sharing might be to increase the labour

mobility of experts in the field of PPI. Following the example of Austria, VAIA will consider incorporating aspects of innovative public procurement into a common platform for sharing the supply and demand of innovative solutions and, in its later action plans, include an award for the most innovative solution in public procurement.¹⁰²

2. Concentration of talent

The research and innovation ecosystem will prosper only if it is filled with high-quality and strategically important talent from Slovakia and abroad.

Even a well-functioning and efficient system is doomed to failure without high-quality talent.

Having enough high-quality people in strategically important areas of the research and innovation ecosystem is a key prerequisite for the success of an innovation economy.¹⁰³ However, Slovakia is losing existing talent year after year. The first wave of brain drain starts after high school. We are losing our best high school graduates.¹⁰⁴ Consequently, in the second wave we lose fresh university graduates, while in the third wave there are professionals who are unable to fulfil their potential in Slovakia.¹⁰⁵ We can only prevent this drain by creating a motivating and stimulating environment that is worth living and working in. At the same time, we lack a proactive approach in attracting foreign talent, which has the potential to compensate for the lack of domestic workforce and bring the diversity necessary for innovation. To attract talent from abroad, we need to implement legislative and non-legislative measures that will improve the perception of Slovakia by that group of people from their very first contact with our country. Only in this way will we be able to retain, but also attract, the talent on which Slovakia's future depends.

We need to start with targeted and long-term talent cultivation. Change must therefore come from the ground up - literally. This strategy is proposing a change of approach in the education and support of young people on a number of fronts, starting with primary education. The aim of this effort is to bring the Slovak education system closer to the standards that today's best Slovak students seek abroad. This builds on the qualitative shift in education already in progress as part of the Slovak curriculum reform. At the same time, we will focus on motivating and developing existing talent by creating an attractive grant environment and lifelong learning programmes. We see the completion of these efforts in the creation of a prestigious institute that will support the highest quality researchers, encourage their networking and provide them with a recognisable platform.

The effect of these objectives is going to be limited if we fail to develop the environment where people live. Targeted and systemic support for quality development by cities and municipalities is a key aspect of the country's attractiveness to both domestic and top international talent. Our objectives have their limits in this respect. If Slovakia is to compete with neighbouring countries on the market for quality labour, local governments and the state must work together. We therefore propose specific activities aimed at increasing the attractiveness and competitiveness of Slovak cities in Central Europe. Our comprehensive approach to attracting global talent and motivating Slovak talent to return from abroad can therefore be a real success.

Table 3 – Main objectives

Chapter name	Objective in 2030
2.1 Supporting young people	
2.1.1 Skills for research and innovation	PISA Global Competence Assessment scores will rise to at least the average level of OECD countries.
2.1.2 Interest in research and innovation	Foreign PhD students will reach 25% of all PhD students in Slovakia. The share of students in STEM fields in higher education will increase to 27%.
2.2 Attracting and developing experienced talent	
2.2.1 Quality research community	The share of Slovak publications that are among the 10% most cited will reach 8%.
2.2.2 The ebb and flow of talent	The number of highly qualified workers from abroad will increase by 25000.
2.2.3 Lifelong learning	The share of people participating in lifelong learning will reach 7%. The share of people with at least basic digital skills will reach 80%.
2.3 Quality of life	
2.3 Quality of life	At least one Slovak city will rank in the top 50 in the world for quality of life according to the Economist Intelligence Unit

Source: own processing, more detailed specification of indicators and their baseline values are given in Appendix 3: Comparative tables of measurable indicators

The most important changes by 2025:

- Institute for Research Excellence
- An inflow of highly qualified talent from abroad

2.1 Supporting young people

To fulfil the country's innovation potential, we need more young people with knowledge, skills and motivation to work in research, development and innovation.

2.1.1 Skills for research and innovation: increase the emphasis on creating initiative, entrepreneurship and skills of the new economy across the entire education system

The initiative and adaptability of people in all sectors of our economy is a prerequisite for fulfilling the country's innovation-based potential. Their development, from the state's perspective, starts in kindergarten, continues through to the end of formal education in universities, and then continues with robust lifelong learning. The skills we need to strengthen are, among others, adaptability, the ability to work across disciplines in a team and the abilities to experiment, have initiative and keep improving even after inevitable failures.¹⁰⁶ In the case of PhD students, academic writing, science communication, pedagogy and project management skills need to be developed.

Slovakia is in the process of curriculum reform for primary and pre-primary education, which should lead to a greater emphasis on independent work, initiative, critical thinking and cooperation. Currently, however, schools in Slovakia understand the development of initiative in a much narrower context, and therefore the curriculum is designed to focus on the process of business activities rather than on entrepreneurship and initiative itself.¹⁰⁷ A striking fact is that 58% of primary school principals do not consider entrepreneurial skills and the promotion of entrepreneurial thinking to be important.¹⁰⁸

Entrepreneurship and initiative are even less supported after entering university. Only 11% of university students develop these areas.¹⁰⁹ The way universities teach often encourages conservative rather than developmental ways of thinking.¹¹⁰ This also contributes to the fact that very few new fast-growing technology companies or so-called startups are being created in Slovakia. In European terms, Slovakia ranks 21st with 75 startups per million inhabitants, which is low in comparison with, for example, Austria (145 startups) and Estonia (865 startups).¹¹¹

PhD students are a special group. Not all universities offer them formal training for a quality research and innovation career. According to the analysis of the This Makes Sense project, at universities there are already a number of such training initiatives that they can further scale up.¹¹²

Act No.269/2018 Coll. on Quality Assurance in Higher Education gave universities the flexibility to create and change study programmes if their internal quality assurance system complies with the standards issued by the Slovak Accreditation Agency for Higher Education (hereinafter referred to as the Accreditation Agency). Standards, requirements and the overall process of evaluation of higher education programmes will be subject to reform. Harmonisation with international standards is essential.

The aim of the policy is to guide students to be proactive, improve their skills for a research and innovation-based economy, and contribute to a higher quality of PhD studies.

In the field of primary and secondary education, we will follow up on the ongoing changes in primary education. We will focus on continuously improving the quality of education in schools and supporting teachers on the basis of established curricular and support documents.¹¹³ We will prepare follow-up changes to the content and forms of education for secondary schools. In order to support the desired changes in education, a scheme will be created to test, pilot and support the significant expansion of proven innovative educational projects that support the development of 21st century competencies in both students and teachers. The design of the Slovak programmes will appropriately complement and reflect the setup of similar tools to support entrepreneurship under Erasmus+ as proposed by the new European Innovation Programme.¹¹⁴

The Ministry of Education, Science, Research and Sport will financially support universities in testing the implementation and scaling up of innovative practices, developing programmes promoting interdisciplinarity, initiative and entrepreneurialism, and in creating joint doctoral courses in academic and pedagogical skills. Based on the reforms from the Recovery and Resilience Plan, the Ministry of Education will conclude performance contracts with universities, which will provide long-term financial motivation for universities to implement qualitative changes in study programmes at all levels of education. More innovative and higher quality education will also be professionally supported by the Accreditation Agency through assessment standards. The Accreditation Agency will open its selection process to higher education experts from abroad for part or all of the executive board. They will not only bring the necessary experience with innovative study programmes, but will also have sufficient distance from established systems in Slovakia. Similar to the Slovak Government Council for Science, Technology and Innovation, the Accreditation Agency will leave the selection of new members to respected foreign education experts.

2.1.2 Interest in research and innovation: support opportunities and initiatives that propagate research and innovation and motivate residents to study and build careers in these fields

According to the Eurobarometer on Science and Technology 2021, Slovak citizens are less interested in science and technology than the average European Union citizen. Only 23% of young people aged 15-24 are very interested in new research and technological discoveries. The European Union average is 38% of young people. By contrast, middle-aged people are just above the EU average on this subject.¹¹⁵ For this reason, the popularization of science aims to create an interest among young people to study science, search for jobs in research and development, and actively work on innovations in their professions. Accessible ways of sharing scientific knowledge and the latest research with the public reinforce the legitimacy of public resources, strengthen trust in research and development organizations, increase the ability to use the latest knowledge in their own lives and, indirectly, promote attitudes towards lifelong learning.¹¹⁶

Currently, popularization activities in Slovakia are primarily concentrated in big cities. Regions are often forgotten in popularization activities, resulting in less interest in science in small towns and

villages, where research infrastructure is absent (i.e. neither universities nor larger research and development organizations are located there).¹¹⁷ Science experience centres, such as Steel Park in Košice and Aurelium in Bratislava, cover popularization activities. However, there are only a few such centres. They are often underfunded and their cooperation with research and development organizations is limited.¹¹⁸ Apart from that, the obligation to share and popularise the outputs of research and development activities is anchored in the grant schemes.¹¹⁹

The aim of popularization policies is to increase the accessibility of research and innovation in all parts of Slovakia.

The Slovak Ministry of Education, Science, Research and Sport will support a portfolio of private and public popularization projects that have a mainly regional reach (e.g. podcasts, web magazines and other creative media). The Ministry of Education and Science will then analyze and identify the most appropriate popularization methods for further scaling up. The identified methods will help researchers popularize their outputs in a more professional and accessible way across the Slovak Republic. One of the tested approaches may be the linking of scientific activity with art, which can contribute to better memorability of new knowledge and attract a wider community to research and innovation. The availability of popularization activities in the regions can draw attention to scientific and technological advances and increase girls' interest in STEM fields.¹²⁰

The creation of experience centres for research and innovation, following models from abroad, and the transformation of libraries into smart laboratories will bring research literally within reach of the public. The Ministry of Education (MESSR SR) will turn 50 libraries into smart laboratories, following the example of the collaboration in the Interreg project (FatLabNet).¹²¹ In addition to libraries, the Ministry of Education and Science will announce a public tender for the creation of a modern experience centre. Such centres will need to be well-designed and experientially designed, as well as able to demonstrate a strategy for financial sustainability and social impact. It was also decided that the strategy should support the interactive popularization of science on the basis of a public opinion poll conducted by the SCSTI, which shows a strong preference of the population.¹²² Creating attractive forms for popularizing research and innovation in cities and regions will contribute to the formation of a society that has a positive attitude towards new knowledge and innovation.

2.2 Attracting and developing experienced talent

If we want to increase the level and quality of the research and innovation ecosystem, we must be able to attract and retain top professionals.

2.2.1 Quality research community: attract more excellent researchers by creating a diverse environment where people want to work, grow and develop

To achieve excellence, we need a sufficient number of promising high quality researchers. And they in turn need a stimulating working environment for their work. Innovations and high quality research projects emerge in a diverse and dynamic environment, mixing different disciplines and opinion flows.¹²³ While environments based on an opinion-homogeneous academic community can create an illusion of safety in sharing ideas, the closed nature and lack of external stimulus make people stagnant, less innovative and slower to progress.¹²⁴ It is difficult to attract quality people from abroad to such an environment as it does not sufficiently develop PhD students and post-docs. Many Slovak public research and development organizations are examples of homogeneous environments.¹²⁵ This is reflected in the low amount of resources received in the budget, the number of participations in Horizon 2020 projects (long-term below the EU average), and the share of top 10% of highly-cited publications compared to other European countries.^{126, 127, 128}

The aim of the policy is to make the research environment in Slovakia more attractive and increase the number of excellent researchers from Slovakia and abroad.

We are building on the already planned grant schemes from the Recovery and Resilience Plan, which will support researchers from PhD students to experienced research group investigators. We will set up these grant schemes to be as flexible as possible in terms of their transferability between Slovak institutions (both public and private). The grant schemes, following the European Research Council (ERC) and ERA Chair model, will be open to researchers from Slovakia and abroad and will allow funding of the main investigator's salary, their own quality team and research expenses for five years. We anticipate that grants will be given to both Slovak and foreign ERC grant finalists who have not received funding from the European Commission, as long as they are based in Slovakia. It will also be possible to add additional funding ("top up") to ERC grants under the planned schemes to allow some researchers to transfer these grants to Slovakia. Schemes that end up being funded by the Recovery and Resilience Plan will then start to be funded from other sources. It is expected that researchers who receive such grants will be sufficiently prepared to successfully apply for an ERC grant after the end of their Slovak grant.

Generous research funding must also be supported by building a strong research community. Community is one of the most important aspects of how internationally excellent researchers choose their location. That is why, in addition to grant funding, we are proposing the creation of a new institute. The role of the institute will be to bring together and develop excellent researchers to serve as members of the institute for the duration of their grant. The aim is not to compete with universities, the Slovak Academy of Sciences or other relevant institutions, but on the contrary, to facilitate the development of a quality research environment at these institutions. This means that

the starting point for these researchers will be at universities, the Slovak Academy of Sciences and other public and private institutions or private companies with a strong research background. The institute will regularly network members, support their collaboration and develop their skills towards world-class research. The institute will also take care of developing and networking PhD students and post-docs, whom individual members will compulsorily recruit into their teams, and later link each new cohort of members to its *alumni* community.

The institute will, in addition to its direct work with members, collect suggestions for facilitating the inflow and integration of foreign researchers to Slovakia. In this respect, it will actively work on searching for talent with the Talent Development Unit in the Government Office, which aims to systematically remove barriers for talent inflow. The institute will also actively collaborate with the National Horizon Office at the SCSTI and help co-create quality programmes to increase the receipt of ERC grants. One of the institute's measurable indicators will be the percentage of members who have subsequently been awarded one of the prestigious European grants. The aim of the institute will be to become a brand of research quality at the European and later the global level. Funding for the institute and its associated grants will have a separate sub-programme in the interdepartmental budget programme. The exact specifics of the institute's operation, management, competences and formal establishment will be the subject of a feasibility study in 2023. The institute will operate with minimal infrastructure in the first years. If the concept proves successful, consideration will be given to transforming it into a fully-fledged institution.¹²⁹

2.2.2 Ebb and flow of talent: create programmes that can motivate foreign graduates to stay in Slovakia and attract talent from abroad to return back home

Between the years 2000 and 2015, up to 2.5% of the population left Slovakia to live abroad. The highest outflow of graduates occurred in medical and technical faculties, and today there is a shortage of graduates in key areas of our economy.¹³⁰ The most common destinations for Slovak university students in 2020 were the Czech Republic (21,633), the United Kingdom (1,946) and Hungary (1,765).¹³¹ Not all Slovak citizens living abroad want to return, but many are interested in staying in touch with Slovakia or spending longer periods of time here (e.g. for a sabbatical).¹³²

Employing foreign workers in Slovakia is time-consuming and financially demanding for companies, research and development organizations and the state. However, interviews with Slovak companies, research and development organizations, and representatives of chambers of commerce and employers show that actors in the field of research and innovation are very interested in increasing diversity and employing experts and researchers from abroad, including from outside the EU.¹³³ The long process of granting residence permits to foreigners from outside the European Economic Area deprives the state budget of approximately €257 per month in net taxes per person. Reducing the waiting time to the minimum would mean tax revenue for the State of approximately EUR 1,542 per year for each applicant.¹³⁴ Possible changes to the residence permit procedure will be proposed in cooperation with the Ministry of the Interior. The negative social stigma associated with minorities and foreigners in Slovakia is another obstacle.¹³⁵

Potentially the easiest group of foreign experts is the foreign students in Slovakia. The number of foreign students in Slovakia is rising, and there are approximately 12,000 students currently studying in Slovakia.¹³⁶ They already represent an integrated and highly skilled research workforce.

Neither state institutions nor universities currently have targeted policies towards the long-term settlement of these professionals in Slovakia.¹³⁷ A policy that would have a positive impact on the process of entering the workforce for foreign students after secondary or university education would be to give them free access to the Slovak labour market after successfully completing studies at a school located in Slovakia.¹³⁸

The policy aims for proactive cooperation based on creating optimal conditions for attracting and retaining talented people coming from abroad (including Slovak citizens).

Following the measures of the Recovery and Resilience Plan and the Slovakia 2021-2027 Programme, a special unit will be formed under the responsibility of the Government Office that will gradually improve the user experience of talented people from abroad and their family members. The first phase will therefore focus in particular on highly skilled foreign workers, foreign founders of innovative companies, Slovak citizens living abroad and foreign students and researchers in Slovakia. In the long term, the unit will target all foreign and domestic workers with the required qualifications and experience.

With regard to foreign talent, the unit, together with partners in the state and public administration, will actively reduce barriers for the entry of foreign talent into the Slovak labour market and ensure conditions for integration. Activities in this direction are linked to four priorities with an emphasis on user experience: (1) building a positive image of foreign talent among the domestic population and vice versa; (2) proactive and targeted recruitment of talent into priority areas of the Slovak economy from a number of identified countries; (3) facilitating the administration associated with arrival in the country and cross-border cooperation; and (4) ensuring relevant integration and support during the first years after arrival. The first changes in this area will be launching a series of programmes for working with Slovak talent abroad and foreign students in Slovakia, creating a clear strategy of the most important countries with which Slovakia wants to enter into a so-called talent partnership, in addition to legislative changes to simplify the arrival of foreign talent to Slovakia.

2.2.3 Lifelong learning: create programmes that can motivate residents to be lifelong learners of strategically important skills that are or will be in short supply

For the sustainable development of the Slovak economy, it is essential that the skills and knowledge of employable citizens are above the EU average.¹³⁹ Critical thinking, creativity, an entrepreneurial mindset and digital skills are strategically important. These skills are needed to initiate and implement innovations, create complex products and services, and effectively manage innovation processes in companies. Higher levels of digital skills will ensure better readiness for further education and participation in the functioning of the state (e-government, e-health). They are emphasized in the Lifelong Learning and Counselling Strategy 2021-2030, the OECD Skills Strategy for the Slovak Republic, the National Programme for Active Ageing 2021-2030 and strategic initiatives of the European Commission such as the Digital Compass.^{140, 141, 142, 143}

There are a number of barriers to increasing skills, such as inflexible working hours, a lack of support from employers and supervisors, and a lack of motivation for further education among the majority

of the population.¹⁴⁴ Therefore, it is crucial to start creating a culture of natural need for lifelong learning among adult citizens.¹⁴⁵

In contrast to other countries, lifelong learning is not a Slovak priority. For example, a dedicated department for lifelong learning has been closed at the Ministry of Education and the adopted strategy does not count on any state budget resources, only funds from the Slovakia 2021-2027 Programme.

The policy aims to significantly increase the number of citizens who are developing their skills to work in the knowledge economy.

The Ministry of Education will enhance the institutional framework for the management of lifelong learning. The Ministry will adequately ensure staffing and funding for the development and coordination of lifelong learning policies in close coordination with other ministries, analytical units, the Alliance of Sector Councils, and the Talent Development and Integration Unit at the Government Office, and will be the coordinating and implementing unit for the Lifelong Learning and Counselling Strategy 2021-2030.

In terms of the development of the innovation ecosystem, the development of the digital skills of ordinary users, as well as developers and engineers, is particularly important. The number and quality of information technology professionals are important for the development of the IT sector and the emergence of excellent startups, i.e. companies with very high innovation activity. The development of digital skills helps introduce digital innovations in companies and increases demand by the population for innovative digital solutions.

For the development of the innovation ecosystem, there are other key skills that are also important. There are specific groups that we are actively investing in developing under this strategy, such as professionals in the areas of technology transfer (chapter 1.2.3), public procurement of innovative solutions (chapter 1.3.7), and managerial and administrative capacity in research and innovation. Lifelong learning will also play a key role in the framework of the missions and smart specialisation.

Universities also need to become much more involved in lifelong learning. The Ministry of Education will therefore support the provision of lifelong learning courses and short tertiary programmes in universities through legislative changes, performance contracts and support development programmes. To unblock the supply side, an amendment to the Higher Education Act will define the previously unrecognised concept of 'short tertiary education' and the way it is provided. On the demand side, an amendment to other laws will recognize this education as sufficient for certain professions or for entry into selected tariff classes for public employees.

Detailed measures to stimulate both the demand and supply of lifelong learning are covered in other strategic materials - the Lifelong Learning and Counselling Strategy Action Plan 2021-2030, the National Programme for Active Ageing 2021-2030, and the upcoming Digital Skills Strategy and Action Plan, in the implementation of which VAIA will actively cooperate.

2.3 Quality of life

If we want to attract the best talent, we need to increase the quality of life in Slovak cities, and by doing so also increase their attractiveness and competitiveness in the Central European region

Cities are becoming more and more important organizational centres of economic activity,¹⁴⁶ but currently Slovak cities are lagging behind in quality of life assessments compared to cities in the Czech Republic, Hungary and Austria. This is particularly noticeable when comparing the capital cities in the prestigious index, where Bratislava is the only capital of any of these countries to score below average.¹⁴⁷ The social dynamics of cities create an attractive environment for talent, the associated knowledge and creative capital.¹⁴⁸ It is therefore evident that supporting cities in attracting and retaining a highly skilled workforce is essential to the transformation of our economy.¹⁴⁹

However, the centralized financing of cities reduces the incentive to use the potential of the managed territory and the responsibility for public spending.¹⁵⁰ For cities to fulfil their role for the benefit of the Slovak economy, they must have administrative, legal, financial, personnel and remuneration sovereignty. Greater independence of cities and municipalities will increase Slovakia's competitiveness on the European market and the level of adaptation to global changes and trends. According to OECD surveys, Slovakia could benefit from significant "triple bottom" development of up to 10% of GDP if urban development areas/regions could decide on their own specializations in the economy, education and innovation.¹⁵¹

The aim of the policy is to systematically support Slovak municipalities and cities in their ambition to increase their competitiveness on a regional and global scale.

Cities are seen as key partners in increasing the attractiveness of our country, but also as important players in the innovation ecosystem. VAIA will therefore automatically involve regional cities, higher territorial units and relevant representatives of Slovak cities and municipalities in the process of identifying priority areas of interest for the Slovak economy. An important role will be played by linking the priority areas to the activities of cities that have applied and been selected as participants in the EU Mission for Climate Neutral and Smart Cities 2030 and the EU Climate Change Adaptation Mission.¹⁵²

For increasing the attractiveness of the country, it is also important to highlight the importance of the cultural and creative industries, which have a strong presence in Slovakia. It is worth mentioning the success of Creative Industry Košice, which has become the first ever regional EIT centre in Slovakia in the field of culture and creativity. Deeper involvement of the cultural and creative industries in the activities of the innovation ecosystem is an important part of the future direction of the Slovak economy. However, the development of the cultural environment is also an essential factor for attracting quality talent. There is a proven preference for cities where there are plenty of opportunities for stimulating leisure activities. It is essential to motivate cities and higher territorial units to attract a quality workforce and students from abroad by developing quality

cultural facilities and services. This often underestimated aspect of quality of life is crucial if we want to be competitive in the Central European region. Therefore, we will develop an analysis that will assess the current and potential opportunities in creating conditions for the development of the cultural and creative industries, including the motivational factors for the presence of quality and talented workers from abroad. We believe that we need to strengthen the cooperation between the state and local governments in attracting talent through improving the quality of life and accessibility of services for everyone. It is also important to highlight the measures already ongoing in the Recovery and Resilience Plan that are also making a major contribution to increasing the attractiveness of Slovak cities. An example is the measure aimed at increasing the capacity of kindergartens under Component 6 of the Recovery and Resilience Plan. Increasing the quality of life in cities is also synergistically supported by the Slovakia 2021-2027 Programme, which, through the territorial implementation instrument for integrated territorial investments, allocates resources to support cross-sectoral cooperation in the field of research, development and innovation, in addition to increasing research and innovation capacities in enterprises, building smart cities and strengthening local competitiveness and economic growth.¹⁵³

VAIA will actively collaborate with other public administration actors to improve the conditions for the development of innovation ecosystem in cities. Together with the Slovak Ministry of Education, Science, Research and Sport and the Slovak Ministry of the Environment, we will unify the criteria for qualitative and ecological parameters of buildings and premises used for research and development and innovation activities. We will reflect sensitively on the issue of urban planning - and therefore the location of these places in the city - with the intention of increasing their positive societal impact in cities. We will also prepare, in cooperation with the Slovak Public Procurement Office, a manual for public-private partnerships. The manual will be tailored to the staff of municipalities and public research and development organizations. Using examples of good practice, the manual will not only guide users through the practicalities of public-private partnerships, but also through specific ways to achieve synergies between research and the surrounding urban infrastructure – whether green, cultural or industrial. The emerging research and development infrastructure should build on the ecological, cultural and economic needs of its surroundings. This will achieve a deeper integration of often disconnected sectors into the physical structure of the city.

3. Direction of resources and effort

If we want to transform into an innovative country, we must clearly define the areas of research, development and innovation in which we have the ambition and potential to excel.

If we are really going to use our country's potential, we need to become an innovative country with clear priorities and a professional approach to the complex trends of this century. Alongside an efficient system and a quality workforce, we must also define where we direct our financial and human resources. Our goal is to become a country based on innovation. Rather than underperforming in a large number of areas, it is more important to focus on those areas where we have real potential to be successful international players and where there is already potential for national and international research collaboration with the private sector. Therefore, as early as 2023, VAIA will allocate the capacity to set strategic priorities on the basis of which both financial and non-financial forms of support for research and innovation will be provided.

The National Strategy provides a plan to define the key areas in which we have the potential to be a strong global player. We are not starting from scratch. VAIA will build on the identification of strengths in the Research and Innovation Strategy for Smart Specialisation of the Slovak Republic for 2021-2027, which will be complemented by mapping value chains and relationships between companies. In-depth diagnostics of the economy in the context of international trends will be the foundation stone for a pilot programme of so-called missions that will use innovation to achieve clear, ambitious goals. Identifying the strengths of the research and innovation ecosystem will also be provided by the transformation and innovation consortia implemented under Component 9 of the Recovery Plan. These will demonstrate the ability of relevant actors to come together to address specific challenges and build centres of research and innovation excellence. The identification of key research priorities will subsequently be reflected in the systemic support and funding of activities, including social innovation.

The most important changes by 2025:

- Application of the mission approach in funding priority research areas
- Establishment of at least two functional transformation and innovation consortia

3.1 Management through missions: Continuously develop Slovakia's smart specialisation through missions that unite all interested actors of the ecosystem under a common vision of the solution

Slovakia needs to focus its limited research and innovation resources and talent efforts on a few clearly defined priorities. This specialisation for the support of research, development and innovation was defined in 2021 by the Research and Innovation Strategy for Smart Specialisation of the Slovak Republic 2021-2027.¹⁵⁴ This was prepared by the Ministry of Investment, Regional Development and Informatization of the Slovak Republic together with ecosystem actors based on the need to prioritize funding for research, development and innovation from the Slovakia 2021-2027 Programme. The emphasis of the Smart Specialisation Strategy is on applied research. The content priorities of the strategy also serve for financing research from the state budget.

The Smart Specialisation Strategy defines five domains of support: a) innovative industry for the 21st century; b) mobility for the 21st century; c) the digital transformation of Slovakia; d) a healthy society; e) healthy food and a healthy environment. These domains respond to the identified potential through the so-called Entrepreneurial Discovery Process (EDP), and the areas of support are further defined in the EDP Summary Report.¹⁵⁵ As part of the business discovery process, groups of experts from research and practice identified potential for further development in defined areas. However, the business discovery process is continuous. Since the approval of the strategy, VAIA will build on the initial process and establish working groups of experts with international expertise in the domains under the Slovak Government Council for Science, Technology and Innovation. These groups will further develop and fine-tune the areas of support in the individual domains based on the latest technological and economic trends and knowledge.

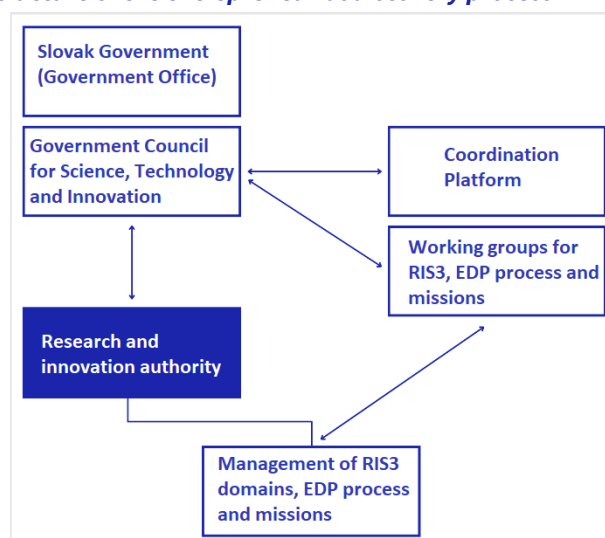
The policy aims to further develop Slovakia's smart specialisation through the concept of missions. It is based on the idea that society should use innovation to achieve clear, ambitious goals.¹⁵⁶ While the smart specialisation domains define priorities for national and regional innovation, the missions provide a framework for guiding them to respond to specific problems. The concept of missions is becoming an increasingly important tool for societal change in the European Union. Already today, Slovakia is actively involved in addressing some European missions, for example, in the context of the European Climate Neutral and Smart Cities Mission and the Climate Change Adaptation Mission.¹⁵⁷ We will build on the European missions and Slovak domains of smart specialisation with national missions that will strategically guide and coordinate resources and efforts to maximize Slovakia's potential.

When defining national missions, we will closely follow the already existing outputs of the business discovery process. From 2023 onwards, VAIA will lead a process of progressive mission identification in collaboration with a wide range of actors across disciplines and sectors, extending the existing concept of domain platforms. This will not only include traditional actors associated with the research, development and innovation environment, but also representatives of cultural

and creative industries, local governments and the citizens' sector.¹⁵⁸ These participatively created missions will then serve as a framework for providing part of the financial and non-financial support for applied and primary research. VAIA will be the umbrella for the coordination of the activities of each mission to connect researchers, innovators, companies, public institutions and other relevant actors who share the goal of addressing specific societal problems.

Successful implementation will bring solutions to key challenges, but also strengthen confidence in the integrity and competence of the state. Missions require building agile state capacity across responsible ministries, institutional flexibility arising from the presence of experts in the field, ecosystem mapping, data-driven decision-making and continuous monitoring. It is also essential to develop a working culture in which mistakes are seen as opportunities for process improvement or for changing the direction of a project. The main challenge for the continuous EDP and the Slovak missions will be to remove departmentalism, to introduce and streamline collaboration across public sector institutions ("whole-government-approach"), and to intensify cooperation with the private sector. By setting missions, such an 'entrepreneurial state' (i.e. an agile, entrepreneurial state) acts as the main procurer and facilitator of innovative change. It supports the innovation economy directly and proactively and is not afraid to build new markets.¹⁵⁹

Figure 5 – Governance structure of the entrepreneurial discovery process



Source: own processing

We will propose clear governance for the missions and a map of possible solution areas and link them to important horizontal processes such as grant funding for research, development and innovation from all funding sources, regulatory sandboxes, Slovak Investment Holding (SIH) investments, public procurement of innovative solutions, public data opening, the use of social innovation tools and other means of active stimulation to solve specific problems.

3.2 Primary research: continuous support of groundbreaking primary research as a prerequisite for innovative solutions in the future

The support of primary research is as important for the transformation of Slovakia into a knowledge-based economy as clear prioritisation. Primary research not only pushes the boundaries of knowledge, but is a necessary prerequisite for high-quality applied research, experimental development and innovation. While the conditions for funding applied research are determined by the Research and Innovation Strategy for Smart Specialisation of the Slovak Republic 2021-2027, funding conditions and priorities for primary research in Slovakia have long been absent. We will change this situation by clearly anchoring support for primary research in the R&D and innovation policy, which will be continuously designed by VAIA in interdisciplinary cooperation with relevant actors.

The aim of the policy is to enable ground-breaking primary research in Slovak conditions and to support primary research themes in areas that are a priority for Slovakia.

The starting point for this policy is stable, predictable and transparent funding for science and research from public sources. This will be achieved by the gradual increase in institutional funding from the national budget proposed in this strategy. The increase in institutional funding will be made conditional on an independent and transparent assessment of the research organizations' quality through periodic scientific performance evaluation.

Figure 6 – Primary research funding model



Source: own processing

Competitive grant funding for primary research will be set in line with best practices in comparable countries. The resulting Primary Research Grant Programme should mainly support three types of research projects. The first are grants to support and sustain excellent teams performing above the European average in their field. The second type is open calls for primary research in all fields, with possible consideration of cost-effectiveness, the potential scientific contribution of the project and possible future societal and economic applications. The third is grants linked to national research priorities resulting from predefined missions, including topics specifically relevant to Slovakia. This form of support enables the submission of a research project proposal that responds to a specific need and creates the prospect of later practical cooperation and application of new knowledge. The expectation of these research projects is not to fulfil specific objectives, but to broaden the support for research and to find ways to use its knowledge

effectively. A key attribute of this funding will be the emphasis on supporting primary research across all disciplines, including the social sciences and humanities, and projects at the cross-over of disciplines. Significant support will be provided for research and projects addressing problems that no one can solve for Slovakia.

3.3 Value chains: reorientation of the economy to activities with higher added value that can increase the preparedness and attractiveness of Slovakia for foreign investments and cooperation

The absence of a strategic orientation for our economy is running up against its limits. Foreign direct investment has significantly transformed the Slovak economy, creating a mainly manufacturing-oriented sector made up of a few key firms, which have a large number of domestic suppliers tied to them.^{160, 161} This sector has benefited for a long time from a relatively cheap and skilled labour force, whose potential is gradually being exhausted thanks to nominal wage growth. **The absence of strategic orientation, systemic support and low investment in R&D and innovation contribute to the weak innovation potential of the economy.** Globally, we are an economy with a low value-added share in export. Multinational companies generally do not perceive Slovakia as a destination for their science and research centres.

Maintaining and strengthening the position of the Slovak economy in global competition and increasing its economic performance and quality of life of the population require increasing the focus of the domestic economy on processes and outputs with higher added value.¹⁶² We will achieve this mainly by supporting and motivating companies to gradually move towards the production of more complex and innovative products and services. In order to have effective and targeted policies to increase added value, the state needs to identify the relationships and barriers in the ecosystem of domestic companies and their linkages to international value chains whose development is determined by global trends.

The policies aim to increase productivity and the share of value added in gross output in industry and to make companies in these sectors more ready for strategic foreign investment and cooperation.

VAIA, in cooperation with the executive agency of the Ministry of Economy (SARIO), will map important corporate value chains that are the backbone of the domestic economy and employment, along with the ecosystem of research and innovation activities. Based on this analysis, it will develop a strategy to remove barriers and develop sectors by policies to increase the level of skills, better knowledge transfer from the research sphere to companies and actively attract specific foreign investment in key areas for the future of the Slovak economy. These strategic priorities and the targeted development of value chains will gradually be reflected in specific public policy instruments. We will increase SARIO's capacity to proactively attract foreign investment and the SME development agenda, following the example of investment agencies abroad. In cooperation with the Ministries of Economy and Finance, we will adjust the existing investment aid instrument to reflect the country's strategic priorities and orientation towards higher added value through R&D and innovation, investment in workforce skills development and development of foreign-domestic company connections. Depending on the results of the value chain mapping,

other policies may include, for example, thematically oriented future transformation and innovation consortia or a super-deduction of Industry 4.0 spending.

3.4 Identifying focus points of quality: developing the areas with the highest real potential for Slovakia through international transformation and innovation consortia

A small and open economy like Slovakia does not have sufficient financial and human capacity to devote to a wide range of research areas in applied research. For the transformation of the Slovak economy into a knowledge-based economy, it is therefore necessary to identify strategic priorities that build on the previous objectives of the Smart Specialisation Strategy with a higher level of specificity.¹⁶³ We will therefore develop some of its domains through the definition of missions that build on this strategy (section 3.1) and the mapping of value chains (section 3.3). Others will be identified on the basis of already existing research quality and collaboration. We need to find areas of applied research in which we have real potential to be among the successful international players and where there is already potential for collaboration between national and international research and the private sector.

The aim of establishing transformation and innovation consortia is to develop an inspiring innovation environment at the intersection of the research and business worlds. The Transformation and Innovation Consortia will be supported by Component 9 of the Recovery and Resilience Plan. A minimum of two consortia are foreseen. An international panel of experts will ensure their selection based on the quality of the proposal and the potential research, as well as commercial and societal impacts. The focus of the consortia will be defined directly by its members from the research and innovation system. Close cooperation between domestic actors and excellent partners from abroad are conditions for the implementation of the project. The international dimension of the consortia is expected to help the transfer of skills from abroad to the Slovak ecosystem. The consortia will also use existing research and innovation infrastructure such as science parks, incubators, research facilities and shared offices. We expect the consortia to also present a financial sustainability plan and gradually become strong players in research and innovation in Slovakia.

3.5 Social innovation: creating the conditions and initiating social innovations to address complex problems with high societal impact

In Slovakia we should also expect the state to proactively address complex issues with a high societal impact, for example, in the sectors of education, inclusion, generational poverty, population ageing and confidence building. Social innovation tools can help address such large-scale challenges where conventional tools fail. Their potential is underutilized in Slovakia. In public policy contexts, they are perceived as risky.

The state and society define social innovation unclearly, limiting its perception to a narrow range of topics. A more appropriate term for this type of innovation is 'societal innovation', which does not restrict its content to topics of a purely social nature.¹⁶⁴ For this reason, awareness of the possibilities of their use is also insufficient. Moreover, Slovakia does not have a system in place to identify, fund, test, scale up and subsequently integrate social innovations into established government policies and instruments.

The policy aims to create the conditions for the state to be ready to initiate and use social innovation in a broader social, cultural and inclusive context and to anchor its definition in a new law on research, development and innovation.

A prepared state will be able to respond to the changing social needs of the population in a more flexible way. When implementing social innovations, it is necessary to follow certain principles, such as regulating only key areas and leaving others to run their course, using existing tools and infrastructure, experimenting wisely, learning from failure, and actively increasing the demand for innovation from the side of the state.

The strengthening and further development of the National Competence Centre for Social Innovation (hereafter referred to as the "Competence Centre") will ensure comprehensive expert coverage of the topic of social innovation. The Competence Centre will serve as a central point of contact for relevant stakeholders, experts, academia and local organizations for social innovation. It will actively use the expertise of its expert Supervisory Board composed of individuals and representatives of organizations with expertise in addressing societal challenges through social innovation. The infrastructure of the Competence Centre will ensure the effective use of appropriate social innovation tools. It will continue to regularly map social innovators and social innovations that have proven to be effective. Through a permanent grant scheme, it will accompany social innovations throughout their lifecycle, from testing and impact measurement to scaling and eventual internationalization.

Fulfilling this strategy will increase the quality of life for all of us

This strategy presents a vision to make Slovakia a better place for research, development and innovation - and ultimately a better place to live. We will achieve this by investing in a high quality system that allows us to make the most of the existing expertise and strengths of our economy. Our ambition is to enable talented researchers and innovators to continuously push the boundaries of scientific knowledge and to address today's and future global challenges through shared priorities. We want to achieve this ambition in collaboration with our partners through the tools identified in this strategy. To do this, however, we must first organize the current chaotic system and subsequently invest wisely in ideas, people and common problems.

The result of these efforts will be a new image of Slovakia in the world. The signal we send to foreign talent, companies and European partners about our efforts to change Slovakia can be the basis for an authentic Slovak brand, a country that has clear priorities, a functioning system and is attractive to live and work in. The world will believe this brand if it reflects the reality of change at home.

Slovakia must believe in itself. If we want to truly succeed in the world, we need to revive our reputation as a transforming economy and country, but this time with a strategic focus on research, development and innovation. This is how we can expand the narrow profile of our economy, reduce our vulnerability to unpredictable global trends and secure a better future for the next generation of Slovak citizens. A prerequisite for the fulfilment of this vision is the growth of trust: between people, the actors of the research and innovation ecosystem towards the state and, conversely, the state towards researchers and innovators. A trusting, collaborative and stimulating environment that is linked to the international context will give us the courage to face the most complex challenges of the 21st century.

List of figures

<i>Figure 1 –Schematic diagram of the functioning of the reformed Government Council for Science, Technology and Innovation</i>	12
<i>Figure 2 –Schematic diagram of the target organization for the management of research, development and innovation</i>	13
<i>Figure 3 –How financial resources are transformed into research and development expenditures at present (SR, 2020, % of GDP)</i>	28
<i>Figure 4 –Expected flow of funds from resources to R&D expenditure in 2030 (SR, 2030, % of GDP)</i>	28
<i>Figure 5 – Governance structure of the entrepreneurial discovery process</i>	51
<i>Figure 6 – Primary research funding model</i>	52

List of tables

<i>Tabul'ka 1 – Main objectives</i>	9
<i>Tabul'ka 2 – Indicative overview of funding for research, development and innovation</i>	32
<i>Tabul'ka 3 – Main objectives</i>	39

List of charts

<i>Chart 1- Corporate and public spending on research and development (R&D), 2020, percentage of GDP</i>	5
<i>Chart 2 – Return on investment in research, development and innovation</i>	7
<i>Chart 3 – Indicative plan for the distribution of funds for research and development</i>	28
<i>Chart 4 – Planned increase in public budget expenditures on research and development (GBARD indicator) in thousands of euros</i>	29

References

- 1 For the purpose of clarity, we will only use the generic masculine form in the Slovak version of this document.
- 2 OECD. (2015). The Impact of R&D Investment on Economic Performance: A Review of the Econometric Evidence. [https://one.oecd.org/document/DSTI/EAS/STP/NESTI\(2015\)8/en/pdf](https://one.oecd.org/document/DSTI/EAS/STP/NESTI(2015)8/en/pdf)
- 3 European Commission. (2015). Economic growth in Slovakia: Past successes and future challenges. https://ec.europa.eu/info/sites/default/files/file_import/eb008_en_2.pdf
- 4 OECD. (2021). Promoting research and innovation in the Slovak Republic through an effective use of European funds. <https://www.oecd.org/slovakia/promoting-research-and-innovation-in-the-slovak-republic-through-an-effective-use-of-european-funds-f0e9d786-en.htm>
- 5 The vision and objectives of the RDI policy in Slovakia are currently part of the RIS3 Strategy for the years 2021-2027, which, however, does not cover all aspects of RDI.
- 6 MIRD SR. (2021). Research and Innovation Strategy for the Smart Specialisation of the Slovak Republic. <https://www.mirri.gov.sk/wp-content/uploads/2018/10/Strategia-vyskumu-a-inovaciei-pre-inteligentnu-specializaciu.pdf>
- 7 As part of the reforms of the VVI system, VAIA will start collecting data that will allow the effectiveness of technology transfer to be measured better than with the number of PCT patent applications. An example of such metrics is: (1) "License success rate", which is the ratio of the number of licenses granted to the number of notifications about the creation of intellectual property objects. (2) "Patent success rate", which is the ratio of the number of filed patent applications over the number of notifications on the creation of intellectual property. This metric should be combined with "transfer success", which is expressed as the number of patent licenses over the number of filed patent applications.
- 8 Section 1.1.1 and relevant parts of Annex 1 fulfil Reform 1 Component 9 of the Recovery and Resilience Plan: pillar 1 "supra-departmental strategy and coordination" and pillar 3 "consolidation of grant agencies within ministries."
- 9 These include, in particular, the Ministry of Defense of the Slovak Republic, the Ministry of Health of the Slovak Republic, the Ministry of the Environment of the Slovak Republic, the Ministry of Agriculture and Rural Development of the Slovak Republic.
- 10 MIRD SR. (2020) Supporting the transformation of the Slovak economy by increasing its innovation performance. <https://www.mirri.gov.sk/wp-content/uploads/2021/03/RTDI-in-Slovakia-AS-IS-report.pdf>
- 11 Ibid.
- 12 Act 172/2005 Coll. on the organization of state support for research and development, further on in the document we refer to it as Act 172/2005 Coll.
- 13 Explanation: less than the best standard or quality
- 14 OECD. (2021). Promoting research and innovation in the Slovak Republic through an effective use of European funds. pp. 50-57. <https://www.oecd.org/slovakia/promoting-research-and-innovation-in-the-slovak-republic-through-an-effective-use-of-european-funds-f0e9d786-en.htm>
- 15 Section 1.1.2 and relevant parts of Annex 1 fulfil Reform 1 Component 9 of the Recovery and Resilience Plan: pillar 5 "unified system of institutional evaluation and institutional funding of research and development."
- 16 MIDRI SR. (2020) Supporting the transformation of the Slovak economy by increasing its innovation performance. <https://www.mirri.gov.sk/wp-content/uploads/2021/03/RTDI-in-Slovakia-AS-IS-report.pdf>
- 17 Ibid.

18 The policies are based on the "lessons learned" from the World Bank's paper, The World Bank (2021). Slovakia Catching-up regions: Linking Industry and R&D in the Banská Bystrica Self-Governing Region (BBSK). <https://bit.ly/3WeMMRj>

19 Ibid.

20 Section 1.2.1 and relevant parts of Annex 1 fulfil Reform 1 Component 9 of the Recovery and Resilience Plan: pillar 2 "setting effective cross-sectional standards of support instruments", pillar 4 "application of principles of good governance and efficiency" and pillar 5 "a unified system of institutional evaluation and institutional financing for research and development."

21 MIRII SR. (2021). Research and Innovation Strategy for the Smart Specialisation of the Slovak Republic. <https://www.mirri.gov.sk/wp-content/uploads/2018/10/Strategia-vyskumu-a-inovacii-pre-inteligentnu-specializaciu.pdf>;

OECD (2021). Promoting research and innovation in the Slovak Republic through an effective use of European funds. p.84-88. <https://www.oecd.org/slovakia/promoting-research-and-innovation-in-the-slovak-republic-through-an-effective-use-of-european-funds-f0e9d786-en.htm>;

VfM. (2022). Principles of grant support for research, development and innovation: Description of good practice. <https://www.mfsr.sk/files/archiv/50/Pricipy-podpory-vyskumu-vyvoja-a-inovacii.pdf>;

The Supreme Audit Office of the Slovak Republic. (2021). Report on the result of the inspection 2021: Allocation of funds for research and development projects. <https://www.nku.gov.sk/documents/10157/265201/96766-0-110.pdf>;

European Commission. (2020). Country report Slovakia 2020.

https://www.partnerskadohoda.gov.sk/data/files/3569_2020-european_semester_country-report-slovakia_en.pdf;

MIRDI SR (2020) Supporting the transformation of the Slovak economy by increasing its innovation performance.

<https://www.mirri.gov.sk/wp-content/uploads/2021/03/RTDI-in-Slovakia-AS-IS-report.pdf>

22 The Supreme Audit Office of the Slovak Republic. (2021). Report on the result of the inspection 2021: Allocation of funds for research and development projects <https://www.nku.gov.sk/documents/10157/265201/96766-0-110.pdf>

23 VfM. (2022). Principles of grant support for research, development and innovation.

<https://www.mfsr.sk/files/archiv/50/Pricipy-podpory-vyskumu-vyvoja-a-inovacii.pdf>

24 The Court of Justice has ruled on this question to the effect that EU legislation, subject to compliance with the principle of proportionality, does not preclude national authorities protecting the EU's financial interests from assessing the same circumstances differently in a procurement procedure (judgment dated 31.3.2022 - Case C-195/21: paragraphs 64, 70).

25 For example, use and respect of Article 80 "Single Audit Arrangements" of Regulation 1060/2021 (which also regulates the circumstances in which multiple audits of the same operation may be carried out), Regulation (EU) 2021/241 of the European Parliament and of the Council of 12 February 2021.

26 OECD. (2021). Promoting research and innovation in the Slovak Republic through an effective use of European funds. <https://www.oecd.org/slovakia/promoting-research-and-innovation-in-the-slovak-republic-through-an-effective-use-of-european-funds-f0e9d786-en.htm><https://bit.ly/3E5E2qd>

27 VfM. (2022). Principles of grant support for research, development and innovation.

<https://www.mfsr.sk/files/archiv/50/Pricipy-podpory-vyskumu-vyvoja-a-inovacii.pdf>

28 OECD. (2021). Promoting research and innovation in the Slovak Republic through an effective use of European funds. pp. 50-57. <https://www.oecd.org/slovakia/promoting-research-and-innovation-in-the-slovak-republic-through-an-effective-use-of-european-funds-f0e9d786-en.htm><https://bit.ly/3E5E2qd>

29 The EU's current framework programme is Horizon Europe

30 Part of the project is financed from public resources

31 Langfeld, L. (2001). The decision-making constraints and processes of grant peer review, and their effects on the review outcome. pp. 820-841.

32 Business Register of the Slovak Republic, Registers providing information on the contracting and disbursement of funds from grants or calls.

33 PWC. (2018). Paying Taxes 2019 study: the Baltic countries lead the ranking in Central and Eastern Europe, Slovakia has lost its position as the V4 leader in the ranking. <https://www.pwc.com/sk/sk/aktualne-spravy/studia-paying-taxes-2019.html>; PAS. (2021) Despite dissatisfaction with the enforceability of the law, entrepreneurs do not use arbitration. <https://www.alianciapas.sk/2021/04/07/aj-napriek-nespokojnosti-s-vymozitelnostou-prava-podnikatelia-rozhodcovske-konanie-nevyuzivaju/>

34 World Bank. (2019). GCI 4.0: Global Competitiveness Index 4.0 [Data set]. https://tcdata360.worldbank.org/indicators/h9de5a263?country=SVK&indicator=41472&viz=line_chart&years=2017,2019; IMD. (2019). IMD WORLD DIGITAL COMPETITIVENESS RANKING DIGITAL COMPETITIVENESS RANKING 2019. <https://www.imd.org/globalassets/wcc/docs/release-2019/digital/imd-world-digital-competitiveness-rankings-2019.pdf>

35 VAIA Interviews. (2022)

36 UK Government - Department for Business, Energy & Industrial Strategy. (2022). Closing the gap. Getting from principles to practices for innovation friendly regulation. <https://www.gov.uk/government/publications/closing-the-gap-getting-from-principles-to-practice-for-innovation-friendly-regulation/closing-the-gap-getting-from-principles-to-practices-for-innovation-friendly-regulation>; Európska komisia (2017). The precautionary principle. Decision-making under uncertainty. <https://op.europa.eu/en/publication-detail/-/publication/1c737cfe-beb8-11e7-a7f8-01aa75ed71a1>

37 ME SR. (2022). Proposal of measures called "Kilečko 3". <https://www.economy.gov.sk/index.php/podnikatelske-prostredie/opatrenia-na-zlepsenie-podnikatelskeho-prostredia/kilecko-3>

38 Today, only companies with a positive tax base can claim the super deduction for research and development. This measure also responds to the European Commission's recommendations to support start-ups.

39 European Commission. (2018). Boosting the Slovak start-up ecosystem: Progress assessment. <https://ec.europa.eu/research-and-innovation/sites/default/files/rio/report/Progress%2520report%2520-%2520Boosting%2520the%2520slovak%2520start-up%2520system.pdf>

40 Mazucatto, M. (2017). Mission-Oriented Innovation Policy: Challenges and Opportunities. <https://bit.ly/3LR8Lcj>; Toto opatrenie reaguje aj na odporúčania Európskej komisie pre podporu startupov: <https://bit.ly/3LSSJ1K>

41 Action Plan for the Digital Transformation of Slovakia 2023 – 2026 contains specific measures for the development of financial innovation.

42 An example is the Slovak FinTech Association and the Fintech & Insurtech Association of Slovakia, as well as the NBS as a partner of the Finweek conference.

43 Public research and development organizations in the document mean all organizations included in Act No. 172/2005 on the Organization of State Support for Research and Development and on amending the Act No. 575/2001 Coll. on the Organization of the Activity of the Government and on the Organization of the Central State Administration, as amended, § 7,

- a) the public sector, which consists of the Slovak Academy of Sciences and legal entities carrying out research and development that were established by central state administration bodies
- b) the public research institution sector, consisting of public research institutions
- c) the higher education sector, which consists of public universities and state universities

44 In the case of the Slovak Technical University, it accounts for 3 times less total projected revenues than in the case of the Technical University of Denmark, and more than 2 times less of the total revenues than the Czech Technical

University in the neighbouring Czech Republic. STU observed an 11.6% decline in 2020 in contract research resources, showing that the lack of cooperation and trust between the private sector and universities persists.

45 CTU. (2018). ANNUAL ECONOMIC REPORT 2017. <https://www.cvut.cz/sites/default/files/content/1b496deb-48b6-4f9c-9a6b-ffd06cb3e3ce/cs/20190717-vyrocnni-zprava-o-hospodareni-za-rok-2017.pdf>;

DTU. (2020). EXTRACT OF FINANCIAL STATEMENTS. https://www.dtu.dk/-media/dtudk/om_dtu/organisation/dtus_strategier_og_politikker/aarsrapporter/financial-statements-2020.pdf?la=da&hash=FFB14C0ED52D4B2B3E7B9E8021000062B231398D; STU. (2021). Správa o činnosti STU za rok 2020. https://www.stuba.sk/buxus/docs/stu/informacie_o_stu/organy_akademicke_samospravne/zasadnutia_vedenie/07_Sprava_o_cinnosti_STU_za_rok_2020-2021-04-12.pdf

46 The need to improve technology transfer is based on the "lessons learned" from the World Bank's paper, The World Bank (2021). Slovakia Catching-up regions: Linking Industry and R&D in the Banská Bystrica Self-Governing Region (BBSK). <https://bit.ly/3WeMMRj>

47 E.g. Slovak Bar Association, Slovak Chamber of Patent Attorneys, and experts from law faculties of universities

48 More information on performance contracts, the evaluation of VER research excellence and matching is available in the chapter on research, development and innovation funding (1.3).

49 In this regard, according to WIPO, it is a generally recognized standard.

50 Conduct Science. (2022). Easy Access IP: Conduct Science. <https://conductscience.com/tech-transfer/easy-access-ip/>

51 Open Government Partnership Blog. (2012). Open data and economic growth: which link, if any? <https://www.opengovpartnership.org/stories/open-data-and-economic-growth-which-link-if-any/>

52 World Bank. (2019). Starting an Open Data Initiative. <https://bit.ly/3Bf7OHj>

53 MIRD SR. (2020) Supporting the transformation of the Slovak economy by increasing its innovation performance. <https://www.mirri.gov.sk/wp-content/uploads/2021/03/RTDI-in-Slovakia-AS-IS-report.pdf>

54 European Commission. (2021). Open Data Maturity Report 2021. https://data.europa.eu/sites/default/files/landscaping_insight_report_n7_2021.pdf

55 Act No. 251/2022 Coll. amending Act No. 211/2000 Coll. on Free Access to Information and on Amendments and Additions to Certain Acts (The Freedom of Information Act), as amended.

56 European Commission. (2022). Proposal for a REGULATION OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL on the European Health Data Space. https://eur-lex.europa.eu/resource.html?uri=cellar:dbfd8974-cb79-11ec-b6f4-01aa75ed71a1.0020.02/DOC_1&format=PDF

57 R&D organizations in the document are all organizations included in Section 7 of Act No 172/2005 on the organization of state support for research and development and on supplementing Act No 575/2001 Coll. on the organization of government activities and the organization of the central state administration, as amended

- (a) the state sector, consisting of the Slovak Academy of Sciences and legal entities carrying out research and development that were established by the central state administration bodies
- (b) the public research institutions sector, consisting of public research institutions,
- (c) the higher education sector, which consists of public universities, state universities, private universities and universities' legal entities carrying out research and development,
- (d) the not-for-profit sector, consisting of civic associations, non-profit organizations and associations of legal entities carrying out research and development,
- (e) the business sector, consisting of entrepreneurs who, as part of their entrepreneurial activities, also carry out research and development.

58 European Commission. (2022). Proposal for a REGULATION OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL on European data governance (Data Governance Act). <https://eur-lex.europa.eu/legal-content/SK/TXT/PDF/?uri=CELEX:52020PC0767&from=EN>

59 European Commission. (2022). European Data Strategy. <https://ec.europa.eu/info/strategy/priorities-2019-2024/europe-fit-digital-age/european-data-strategy>

60 VAIA interviews. (2022)

61 211/2000 Coll.(on free access to information and on amendments and supplements to certain acts

62 The amendment also includes the transposition of the European Open Data Directive from 2019.

63 Data Act and Amendments to Certain Acts. (2022). MIRD SR. <https://www.slov-lex.sk/legislativne-procesy/SK/LP/2021/55>

64 MIRD SR - DataLab. (2022). OPEN DATA. <https://datalab.digital/otvorene-udaje/>

65 European Commission. (2022). Proposal for a REGULATION OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL on the European Health Data Space. https://eur-lex.europa.eu/resource.html?uri=cellar:dbfd8974-cb79-11ec-b6f4-01aa75ed71a1.0020.02/DOC_1&format=PDF

66 European Commission. (2022). Proposal for a REGULATION OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL on the European Health Data Space. https://eur-lex.europa.eu/resource.html?uri=cellar:dbfd8974-cb79-11ec-b6f4-01aa75ed71a1.0020.02/DOC_1&format=PDF

67 FAIR data principles are key principles for open, accessible research data. Research data that meet these criteria must be traceable, accessible, interoperable and reusable, especially for automated machine processing, evaluation and extraction.

68 Section 1.3 and relevant parts of Annex 1 fulfill Reform 1 Component 9 of the Recovery and Resilience Plan: pillar 5 "a unified system of institutional evaluation and institutional funding of research and development."

69 Total expenditure on research and development ("Gross domestic expenditure on R&D") [rd_e_gerdtot].

70 Total expenditure on research and development by sector of use [rd_e_gerdtot]. For expenditure by funding source [rd_e_gerdfund], the ratio between public and private sources is similar. The business sector mainly uses its own resources (0.39% of GDP), partially resources from foreign companies (0.08% of GDP) and only minimal resources come from the government (0.02% of GDP). The public sector (including universities) mainly uses public budget resources (0.36% of GDP), partly resources from the EC and international organizations, including European structural and investment funds (0.05% of GDP), and only minimal resources come from companies (0.01% of GDP).

71 Total expenditure on research and development ("Gross domestic expenditure on R&D") [rd_e_gerdtot].

72 Although the EU average is 2.3% of GDP, this average is distorted by large economies. The average of EU countries (arithmetic average) is 1.78% of GDP (total expenditure) or 1.13% of GDP (private business expenditure).

73 Eurostat. (2022). GERD by sector of performance and source of funds [Data Table]. <https://bit.ly/3cFpFNm>

74 Government budget allocations for research and development, in Slovakia also referred to as Science and Technology Expenditure.

75 Eurostat. (2022). GERD by sector of performance and source of funds [Data Table]. <https://bit.ly/3cFpFNm>

76 MIRD SR. (2020) Supporting the transformation of the Slovak economy by increasing its innovation performance. <https://www.mirri.gov.sk/wp-content/uploads/2021/03/RTDI-in-Slovakia-AS-IS-report.pdf>

77 Györfy, Herman a Szabo. (2020). Research funding: past performance is a stronger predictor of future scientific output than reviewer scores. <https://doi.org/10.1016/j.joi.2020.101050> ; Sandstrom a Van den Besselaar. (2018). Funding, evaluation, and the performance of national research systems. <https://doi.org/10.1016/j.joi.2018.01.007>

78 In 2021, the Center for Scientific and Technical Information of the Slovak Republic (SCSTI) created the Declaration on Strengthening the Culture of Scientific Integrity in Slovakia (SCSTI, 2021, Declaration on the Strengthening of the Culture of Scientific Integrity in Slovakia), which reports the insufficient assurance of scientific integrity in research institutions. That condition is the result of the absence of a comprehensively elaborated legal concept dealing with ethics and scientific integrity in Slovakia. Such a disarranged situation often causes problems in the involvement of Slovak researchers in the European Research Area (ERA), especially in projects under EU Framework Programmes (e.g. Horizon 2020) in which the solution of ethical issues and research integrity is given particular importance.

79 Even the AIS indicator is not suitable for evaluating all areas of research, but in general it is more suitable than the impact factor; IDEA – CERGE-EI. (2022). A Comparison of Journal Citation Indices. <https://idea-en.cerge-ei.cz/17-news/73-a-comparison-of-journal-citation-indices>

80 Academic "inbreeding" refers to the tendency of universities to employ their own graduates for academic positions. A high percentage of academic "inbreeding" is considered unfavorable for the academic environment, as it leads to a restriction of the flow of new ideas and a lower degree of research originality. For a detailed discussion on this topic, see:

Gorelova, O., Yudkevich, M. (2015). Academic Inbreeding: State of the Literature. In: Yudkevich, M., Altbach, P.G., Rumbley, L.E. (eds) Academic Inbreeding and Mobility in Higher Education. Palgrave Studies in Global Higher Education. Palgrave Macmillan, London. https://doi.org/10.1057/9781137461254_2

Hugo Horta, Maria Yudkevich. (2016). The role of academic inbreeding in developing higher education systems: Challenges and possible solutions, Technological Forecasting and Social Change, Volume 113, Part B, Pages 363-372, <https://doi.org/10.1016/j.techfore.2015.06.039>.

81 Vít Macháček a Martin Srholec (2020). Where do universities recruit researchers? <https://idea.cerge-ei.cz/files/RecruitingResearchers/>

82 SRDA. (2021). Annual activity report of the Research and Development Agency 2021. 2021. <https://www.apvv.sk/buxus/docs/agentura/vyroczne-spravy/apvv-vs-2021.pdf>

83 MIB. (2022). Bratislava 2030: City Development Programme 2022-2030. <https://bratislava2030.sk/wp-content/uploads/2022/06/B-Analyticka-cast-Bratislava-2030-1.pdf>

84 MIRD SR. (2020) Supporting the transformation of the Slovak economy by increasing its innovation performance. <https://www.mirri.gov.sk/wp-content/uploads/2021/03/RTDI-in-Slovakia-AS-IS-report.pdf>

85 We consider a period of 1 to 5 years as a medium-term horizon

86 VAIA interviews. (2022); Atomico (2021). State of European tech 2021 <https://bit.ly/3rQN9mY>

87 Atomico. (2021). State of European tech 2021 <https://bit.ly/3rQN9mY>; Dealroom (2021). The Lithuanian startup ecosystem – 2021. <https://bit.ly/3Cm91eV>

88 The management of the super-deduction for R&D expenses is also part of the measures of the regulatory environment in chapter 1.2.2.

89 EIF. (2022). Venture Capital. https://www.eif.org/what_we_do/equity/venture/index.htm; KfW. (2022). Business start-ups and expansions. (<https://www.kfw.de/inlandsfoerderung/Privatpersonen/Existenzgr%C3%BCndung/index-2.html>)

90 From the point of view of the National Strategy for VVI (Public Research Institutions), SIH (Slovak Investment Holding) is a key player for increasing the availability of risk capital at the level of innovative companies.

91 The inspiration comes from the Baltic countries, where the development of the startup environment supported by the implementation of business environment reforms has led to an almost 10-fold increase in the volume of venture capital in the period 2015-2021, which is currently mainly supplied by foreign investors.

92 Slovak organization for research and development activities, o.z. (2021). Slovakia in the European Research Area II: Analysis of Slovakia's participation in Horizon 2020. <https://www.sovva.sk/wp-content/uploads/2021/09/Slovensko-v-Euro%CC%81pskom-vy%CC%81skumnom-priestore-II-Analy%CC%81za-u%CC%81c%CC%8Casti-SR-v-Horizonte-2020.pdf>

93 Ibid.

94 The Research Agency supported co-financing and the Seal of Excellence for Teaming projects and matching grants, the Ministry of Economy supported the Seal of Excellence for the EIC. The SBA supported the Seal of Excellence for the SME Instrument Phase I and also consultations for projects in the EIC. SRDA announced two calls to support the preparation of projects in Horizon 2020 and Horizon Europe, together with a call to support projects that received the Seal of Excellence.

95 Slovak Research and Development Agency, o.z. (2021). Slovakia in the European Research Area II: Analysis of Slovakia's participation in Horizon 2020.. <https://www.sovva.sk/wp-content/uploads/2021/09/Slovensko-v-Euro%CC%81pskom-vy%CC%81skumnom-priestore-II-Analy%CC%81za-u%CC%81c%CC%8Casti-SR-v-Horizonte-2020.pdf>

96 Horizon Europe over the period of years 2021 and 2027 builds seamlessly on Horizon 2020.

97 Slovak Research and Development Agency, o.z. (2021). Conclusions, recommendations and proposals for legislative changes. https://www.sovva.sk/wp-content/uploads/2021/12/Zavery-a-odporucania_f.pdf.

98 The budget for public procurement can be defined as the sum of contracts for the supply of goods, contracts for the execution of construction works, contracts for providing services, competition for proposals, granting concessions for construction works, granting concessions for services and administration in public procurement pursuant to Act no. 343/2015 Coll. on public procurement and amending certain acts. Expenses for defense are not included in the given amount.

99 European Commision. (2016). THE STRATEGIC USE OF PUBLIC PROCUREMENT FOR INNOVATION IN THE DIGITAL ECONOMY. <https://op.europa.eu/sk/publication-detail/-/publication/7f5a67ae-8b8e-11eb-b85c-01aa75ed71a1>

100 Ibid.

101 Ibid.

102 European Commision. (2021). Guidance on Innovation Procurement. <https://ec.europa.eu/docsroom/documents/45975/attachments/1/translations/en/renditions/native>

103 Economist Intelligence Unit. (2009). Talent strategies for innovation. http://graphics.eiu.com/marketing/pdf/ontario_innovation.pdf

104 EPI. (2020). BRAIN DRAIN I: DON'T TAKE THAT TRAIN!! <https://www.minedu.sk/data/att/18017.pdf>

105 Institute for Financial Policy. (2017). Slovak brain drain: Analysis of the departure of Slovaks abroad since 2000. https://www.mfsr.sk/files/archiv/priloha-stranky/4938/60/2017_1_Odliv-mozgov-po-slovensky_20170109.pdf

106 Šikulová, I. and collective (2014). The Slovak economy: ten years of membership in the European Union Selected topics and issues. https://ekonom.sav.sk/uploads/journals/257_monografia_sikulova_a_kol.pdf

107 Entrepreneurs Association of Slovakia. (2020). INFOGRAPHIC: Entrepreneurship and entrepreneurial education. <https://www.zps.sk/novinky/2020/infografika-podnikavost-podnikatelske-vzdelavanie>

108 Ibid.

109 That Makes Sense. (2019). Analysis of findings on the state of education in Slovakia. <https://analyza.todarozum.sk/analyza-zisteni-o-stave-skolstva-na-slovensku.pdf>

110 Ibid.

111 Atomico. (2020). The State of European Tech 2020. <https://bit.ly/3zty9jE>

112 That Makes Sense. (2019). Analysis of findings on the state of education in Slovakia. <https://analyza.todarozum.sk/analyza-zisteni-o-stave-skolstva-na-slovensku.pdf>

113 Recovery and Resilience Plan. (2021) Component 7: Education for the 21st Century. https://www.planobnovy.sk/site/assets/files/1046/komponent_07_vzdelavanie-21-storocie_1.pdf

114 European Commission. (2022). The new European innovation agenda. <https://eur-lex.europa.eu/legal-content/SK/TXT/PDF/?uri=CELEX:52022DC0332&from=EN>

115 European Commision. (2021). Special Eurobarometer 516: European citizens' knowledge and attitudes towards science and technology. <https://europa.eu/eurobarometer/api/deliverable/download/file?deliverableId=76864>

116 Cary Funk et al. (2020). Science and Scientists Held in High Esteem Across Global Publics. <https://www.pewresearch.org/science/2020/09/29/science-and-scientists-held-in-high-esteem-across-global-publics/>; UNESCO (1992). Science and technology in developing countries. <https://unesdoc.unesco.org/ark:/48223/pf0000091813>

117 SCSTI. (2020). Public opinion survey POPULARIZATION OF RESEARCH AND DEVELOPMENT IN SLOVAKIA. <https://vedanadosah.cvtisr.sk/wp-content/uploads/2021/01/vyskumna-sprava-PopVaTII.pdf>

118 Ibid.

119 VAIA interviews with SCSTI management. (2022).

120 SCSTI. (2020). Public opinion survey POPULARIZATION OF RESEARCH AND DEVELOPMENT IN SLOVAKIA. <https://vedanadosah.cvtisr.sk/wp-content/uploads/2021/01/vyskumna-sprava-PopVaTII.pdf>

121 SCSTI. (2019). Smart Lab Library in the era of Industry 4.0: Do you know what Industry 4.0 is? If you do know, do your library visitors know it as well? <https://itlib.cvtisr.sk/wp-content/uploads/docs/21-smart.pdf>

122 SCSTI. (2020). Public opinion survey POPULARIZATION OF RESEARCH AND DEVELOPMENT IN SLOVAKIA <https://vedanadosah.cvtisr.sk/wp-content/uploads/2021/01/vyskumna-sprava-PopVaTII.pdf>

123 Paul Gompers a Silpa Kovvali. (2018). The Other Diversity Dividend. <https://hbr.org/2018/07/the-other-diversity-dividend>

124 Gorelova, O., & Yudkevich, M. (2015). Academic Inbreeding: State of the Literature. V: Yudkevich, M., Altbach, P.G., Rumbley, L.E. (eds) Academic Inbreeding and Mobility in Higher Education. Palgrave Studies in Global Higher Education. Palgrave Macmillan, London. https://doi.org/10.1057/9781137461254_2

125 Vít Macháček a Martin Srholec. (2020). Where do universities recruit researchers? <https://idea.cerge-ei.cz/files/RecruitingResearchers/>

126 European Commission. (2022). Slovakia Horizon 2020 country profile. <https://webgate.ec.europa.eu/dashboard/extensions/CountryProfile/CountryProfile.html?Country=SK>

127 CERGE-EI IDEA. (2021). An EU Comparison of 2015-2016 Academic Publication Output and its Citation Impact. https://ideaapps.cerge-ei.cz/EU_citations/

128 Vít Macháček a Martin Srholec. (2020). Where do universities recruit researchers? <https://idea.cerge-ei.cz/files/RecruitingResearchers/>

129 In setting up the concept of the institute, we got strongly inspired by the Czech proposal for a similar institution. Prof. Jungwirth (2014). Proposal for the establishment of a foundation: the Czech Institute of Science and Technology. https://jcmf.cz/sites/default/files/P-3_Navrh_na_zalozeni_CIST.pdf

130 Institute for Financial Policy. (2017). Slovak brain drain: Analysis of the departure of Slovaks abroad since 2000. https://www.mfsr.sk/files/archiv/priloha-stranky/4938/60/2017_1_Odliv-mozgov-po-slovensky_20170109.pdf

-
- 131 UNESCO Institute for Statistics. (2022). Global Flow of Tertiary-Level Students. <http://uis.unesco.org/en/uis-student-flow>
- 132 LEAF. (2018). LEAF survey of Slovaks living abroad 2018. <https://spap.leaf.sk/wp-content/uploads/sites/2/2019/03/spap-prieskum-2018-vysledky-1.pdf>.
- 133 VAIA interviews with representatives of digitally oriented companies. (2022).
- 134 IOM. (2021). Labour mobility scheme for Slovakia. <https://iom.sk/sk/publikacie/spolupraca-a-partnerstvo.html?download=374:iom/iom-srsp-schema-prac-mob-2021-sk.pdf>
- 135 CVEK. (2021). WE DON'T WANT STRANGERS, WE WILL PROTECT OUR OWN. http://cvek.sk/wp-content/uploads/2021/05/Cudzie_nehceme_Analyza_final_edited.pdf
- 136 SCSTI. (2016-2021). Statistical yearbook - universities. https://www.cvtisr.sk/cvti-sr-vedecka-kniznica/informacie-o-skolstve/statistiky/statisticka-rocenka-publikacia/statisticka-rocenka-vysoke-skoly.html?page_id=9596
- 137 EMA – Development and Mobility Agency. (2020). Non-public information
- 138 IOM. (2020). Who does not need a work permit or confirmation of the possibility to fill a vacant position?. <https://www.mic.iom.sk/sk/praca/kto-nepotrebuje-povolenie-na-zamestnanie-ani.html>
- 139 Šikulová, I. et al. (2014). The Slovak economy: ten years of membership in the European Union, Selected topics and issues. https://ekonom.sav.sk/uploads/journals/257_monografia_sikulova_a_kol.pdf
- 140 MESSR SR. (2021). The Strategy for Lifelong Learning and Counseling for the years 2021-2030. <https://www.minedu.sk/data/att/22182.pdf>
- 141 OECD. (2020). OECD Skills Strategy Slovak Republic Assessment and Recommendations. <https://www.oecd.org/publications/oecd-skills-strategy-slovak-republic-bb688e68-en.htm>
- 142 MLSAF SR. (2021). National Programmeme for Active Ageing 2021-2030 <https://www.employment.gov.sk/files/sk/ministerstvo/rada-vlady-slovenskej-republiky-prava-seniorov-prisposobovanie-verejnych-politik-procesu-starnutia-populacie/narodny-programme-aktivneho-starnutia-roky-2014-2020/narodny-programme-aktivneho-starnutia-roky-2021-2030.pdf>
- 143 European Commission. (2021). Europe's digital decade: digital targets for 2030. <https://bit.ly/3PQTVdh>
- 144 MESSR SR. (2021). Strategy for Lifelong Learning and Counseling for the years 2021-2030 <https://www.minedu.sk/data/att/22182.pdf>
- 145 The 2019 Labour Force Survey showed that only around 3.6% of Slovak employees were engaged in lifelong learning activities, which is 8 percentage points below the average of other EU countries. The exact result of the survey may be debatable due to the methodology and wording of the questions in each country, but the low level of engagement in lifelong learning activities in Slovakia is valid as a conclusion anyway.
- 146 Wolfe, D. A. (2014). Foreword to the Series. In J. L. GRANT (Ed.), *Seeking Talent for Creative Cities: The Social Dynamics of Innovation* (pp. ix–xiv). University of Toronto Press. <http://www.jstor.org/stable/10.3138/j.ctt5vkjkj>
- 147 Economist Intelligence Unit. (2022). The Global Liveability Index.
- 148 JACOBS J. (1961): *The Death and Life of Great American Cities*. New York: Random House.
- 149 JACOBS J. (1961): *The Death and Life of Great American Cities*. New York: Random House.
- 150 Nižňanský, V. (2020). Let's give cities back their rights, Communal Research and Advisory Center.
- 151 OECD. (2013). Fiscal Federalism and its Impact on Economic Activity, Public Investment and the Performance of Educational Systems. <https://doi.org/10.1787/5k4695840w7b-en>

152 We specifically highlight Bratislava and Košice, which have been selected as participating cities in the EU Mission for climate-neutral and smart cities by 2030.

153 Integrated territorial investments represent a decentralised mechanism for investment decision-making through territorial cooperation structures established by regional and local authorities that respond to the strategic challenges and needs of the territory in the sense of the principle of partnership and subsidiarity of the European cohesion policy.

154 MIRD SR. (2021). RESEARCH AND INNOVATION STRATEGY FOR SMART SPECIALISATION OF THE SLOVAK REPUBLIC 2021 - 2027. <https://www.mirri.gov.sk/wp-content/uploads/2018/10/Strategia-vyskumu-a-inovacii-pre-inteligentnu-specializaciu.pdf>

155 MIRD SR (2021). Summary report of the EDP to the strategy <https://www.mirri.gov.sk/wp-content/uploads/2022/06/Suhrnna-sprava-z-procesu-EDP.pdf>

156 OECD. (2021). Public Sector Innovation Facets MISSION-ORIENTED INNOVATION. <https://bit.ly/3oufLY>

157 European Commission. (2022). EU Missions in Horizon Europe. https://research-and-innovation.ec.europa.eu/funding/funding-opportunities/funding-programmes-and-open-calls/horizon-europe/eu-missions-horizon-europe_en

158 OECD. (2021). Public Sector Innovation Facets MISSION-ORIENTED INNOVATION. <https://bit.ly/3oufLY>

159 Mazzucato, M. (2021). Mission Economy: A Moonshot Guide to Changing Capitalism. Penguin Random House.; Mazzucato, M. (2015). The Entrepreneurial State: Debunking Public vs. Private Sector Myths (2). PublicAffairs.

160 MIRD SR. (2020). Supporting the transformation of the Slovak economy by increasing its innovation performance. <https://www.mirri.gov.sk/wp-content/uploads/2021/03/RTDI-in-Slovakia-AS-IS-report.pdf>

161 SARIO. (2022). Automobile industry. <https://bit.ly/3CAQH3g>

162 ISA. (2019). Report on productivity and competitiveness of Slovakia 2019.. https://www.vlada.gov.sk/data/files/7813_spra%CC%81va-o-produktivite-a-konkurencieschopnosti-slovenska-2019.pdf

163 MIRD SR. (2021). RESEARCH AND INNOVATION STRATEGY FOR SMART SPECIALISATION OF THE SLOVAK REPUBLIC 2021. <https://www.mirri.gov.sk/wp-content/uploads/2018/10/Strategia-vyskumu-a-inovacii-pre-inteligentnu-specializaciu.pdf>

164 This strategy is more closely identified with the concept of 'societal innovation'. However, the concept of 'social innovation' is so well established that we have decided to keep it. It is linked to several types of funding from the European Structural Funds and the Competence Centre for Social Innovation at the Ministry of Labour, Social Affairs and Family. However, in the new Act on Innovation, this type of innovation will need to be precisely named.