

20 AUGUST, 2021

Evaluation of Scale and Impact of European Union Funds' and other Investments in Education and Science Infrastructure

SUMMARY OF THE EVALUATION RESULTS



Creating the future of Lithuania

2014-2020 Operational Programme for the European Union Funds Investments in Lithuania



MINISTRY OF FINANCE
of the Republic of Lithuania

The service contract is financed from the European Social Fund, the services were commissioned by the Ministry of Finance of the Republic of

AIM, TASKS AND SCOPE OF THE

EVALUATION

The aim of the evaluation was to determine the scope and impact of European Union (EU) funds' and other investments in education, research, experimental development and innovation (*hereinafter - RDI*), and information technology (*hereinafter - IT*) infrastructure, as well as possible directions for future investments in this infrastructure.

In order to achieve the main aim of the evaluation, **three evaluation tasks** have been set:

- I. To assess the **sufficiency** and **relevance** of EU funds' and other investments in education, RDI and IT infrastructure;
- II. To assess the **efficiency** and **impact** of EU funds' and other investments in education, RDI and IT infrastructure;
- III. To provide **conclusions** and **recommendations** on the need for future investments in education, RDI and IT infrastructure, and the possibilities for more efficient use of this infrastructure.

The scope of the evaluation - investments from various funding sources aimed at development and renewal of education and RDI infrastructure, implemented in the period of 2004-2020. Three types of infrastructure were analyzed: (1) buildings and premises (construction, reconstruction, repair), (2) physical equipment (purchase of devices, furniture, other material supplies), (3) IT equipment (purchase of computer hardware, software).

STRUCTURE AND APPROACH OF THE EVALUATION

The evaluation consisted of two main parts:

- I. **Fiscal mapping of investments:** identification of investments in education and RDI (including IT) infrastructure, funded from various sources, implemented in Lithuania in the period of 2004-2020, determination of their scale;
- II. **Evaluation of investments:** evaluation of EU funds' investments in education and RDI (including IT) infrastructure, implemented in Lithuania in the period of 2004-2020, according to the criteria of relevance, sufficiency, efficiency and impact, and identification of possibilities for more efficient use of these investments in the future.

In order to identify interventions in education and RDI infrastructure, an inventory of all relevant investments has been carried out. Based on the analysis of documents, monitoring data and publicly available information, all relevant projects were selected and **categorized according to various characteristics:** area of investment, type of infrastructure financed, nature of the beneficiaries and county. In the case of investments in education infrastructure, relevant projects were additionally categorized according to the type of education, level of education and type of studies. In the case of investments in RDI infrastructure, relevant projects were additionally categorized according to the field of science or art.

Whilst analyzing the selected 2004-2020 EU funds' investments in education and RDI infrastructure, a **theory-based evaluation approach** was applied, providing a common framework for evaluating investments on the basis of relevance, sufficiency, efficiency and impact criteria. This approach is based on **the theory of change** - a flexible model of causal relations, used to determine the analyzed interventions, their products, intermediate and final goals, as well as preconditions for achieving these

goals. After evaluating the interventions on the basis of various criteria, the assumptions made were checked and the impact of the investments was assessed.

The **data required for the evaluation was collected** on the basis of analysis of documents, secondary sources, statistical data, monitoring data and publicly available information, 8 surveys and 20 semi-structured interviews with representatives of schools. The **data** collected during the evaluation **was analyzed** on the basis of intervention logic analysis, statistical analysis, meta-analysis and expert evaluation. The evaluation also encompassed a case study on the effectiveness, efficiency and impact of the implementation of the Integrated Science, Studies and Business Centers' (Valleys) Development Programmes. Its report is presented separately.

MAIN FINDINGS OF THE EVALUATION

THE SCOPE OF EU FUNDS' INVESTMENTS IN EDUCATION AND RDI INFRASTRUCTURE IN 2004-2020

In the period of 2004-2020, projects aimed at development and (or) renewal of education and RDI infrastructure were financed from five types of funding sources - EU Funds' operational programmes, public investment programmes (*hereinafter* - PIP), European Territorial Cooperation (*hereinafter* - ETC) programmes, European Economic Area (*hereinafter* - EEA) and Norway Grants, and EU sectoral programmes. In 2004-2020, the **total scope of investments in education and RDI infrastructure** amounted to **EUR 2.55 billion**, of which **EUR 1.42 billion** was allocated **for only education infrastructure, EUR 431.18 million - for only RDI infrastructure, and EUR 693.57 million - for complex university (studies' and RDI) infrastructure.**

The scope of the EU funds' investments in education infrastructure

In the period of 2004-2020, EUR 1.42 billion was allocated for development and (or) renewal of education infrastructure. More than half (about **EUR 877 million**) of these investments were financed from the **EU funds**, more than a third (about **EUR 523 million**) - from the **PIP funds**. The contribution of **ETC programmes, and the EEA and Norway Grants** (approximately **EUR 13 million** and **EUR 10 million**, respectively) constituted less than 1 percent of the total investments. More than half (about EUR 763 million) of all investments in education infrastructure was implemented during the 2007-2013 programming period, almost one-third (approximately EUR 445 million) of all investments - during the 2014-2020 programming period, up to one-fifth (around EUR 216 million) of all investments - in the 2004-2006 programming period.

In the period of 2004-2020, slightly less than half (about **EUR 634 million**) of all investments in education infrastructure was allocated for **general education** (*hereinafter* - GE) infrastructure. Almost one-sixth (over **EUR 231 million** and **EUR 234 million**, respectively) of all investments went to both **vocational education and training** (*hereinafter* - VET) and **higher education** (only studies') infrastructure. About **EUR 115 million** was allocated for **pre-school education** (*hereinafter* - PSE) infrastructure. Relatively smallest investments (approximately **EUR 42 million** and up to **EUR 11 million**, respectively) were made in **non-formal education of children** (*hereinafter* - NFE) and **adult education**. About **EUR 156 million** was allocated for **mixed** (encompassing more than one level of education) **infrastructure**. The largest share of non-EU funds' investments was allocated for GE and mixed infrastructure, while investments in other levels of education were mostly financed from the EU funds.

The scope of the investments in RDI infrastructure

In the period of 2004-2020, investments in RDI infrastructure consisted of two categories of investments - investments only in RDI infrastructure and investments in complex (studies' and RDI) university infrastructure. During the period of 2004-2020, **investments in both categories of RDI infrastructure** amounted to **EUR 1.13 billion**. More than three-fifths (**EUR 871.64 million**) of these investments were financed from the **EU funds**, over one-fifth (**EUR 248.14 million**) - from the **PIP funds**. The contributions from **the ETC programmes, the EEA and Norway Grants, and the EU sectoral programmes (EUR 1 million, EUR 0.81 million and EUR 3.16 million, respectively)** constituted less than 1 percent of the total investments. More than half (about EUR 618.36 million) of all investments in RDI infrastructure was implemented during the 2007-2013 programming period, over one-third (about EUR 393.21 million) of all investments - in the 2014-2020 programming period, about one-tenth (approximately EUR 118.43 million) of all investments - in the 2004-2006 programming period. During the analyzed period, except for 2004-2006, investments in RDI infrastructure were mostly financed from the EU funds.

In the period of 2004-2020, more than half (about **EUR 651.33 million**) of all investments in RDI infrastructure was allocated to **universities**. One-fifth (about **EUR 230.8 million**) of all investments went to **the private sector**. Relatively smallest investments (about **EUR 92.47 million**) were allocated to **research institutes**. Other RDI entities (clusters, associations, business incubators, operators of free economic zones (*hereinafter – FEZ*), etc.) received more than one-tenth (about **EUR 155.4 million**) of the total investments.

Relatively largest investments in RDI infrastructure (about **EUR 662.54 million** and **EUR 295.68 million**, respectively) went to **Vilnius and Kaunas counties**. Significantly smaller investments (about **EUR 68.36 million**) were allocated to **Klaipėda county**. Geographically unrestricted investments amounted to **EUR 72.89 million**. Significant investments (**EUR 13.13 million**) were also made in **Šiauliai county**. In each of the remaining **counties - Marijampolė, Panevėžys, Tauragė, Telšiai, Utena** - investments in RDI **did not reach EUR 20 million**.

The scope of the investments in IT infrastructure

The evaluation focused on the EU funds' investments in IT infrastructure in education and RDI in the period of 2007-2020. During this period, the total of **EUR 124.05 million** was invested in IT infrastructure. Nearly two-thirds (around EUR 80 million) of these investments were made during the 2007-2013 programming period, a bit more than one-third (around EUR 44 million) of all investments - during the 2014-2020 programming period¹. In the period of 2007-2020, about **EUR 59 million** went to **IT infrastructure in education**. About two-fifths (about **EUR 24 million**) of all investments in IT infrastructure in education went to **GE**, about one-fifth (approximately **EUR 9 million** and **EUR 10 million**, respectively) was allocated to both **VET** and **higher education** (only studies). Relatively smallest investments in IT infrastructure were allocated to **PSE** and **NFE** (**EUR 1.8 million** and **EUR 0.3 million**, respectively). In the period of 2007-2020, **EUR 43 million** was allocated for **IT infrastructure in RDI**. Up to half (about **EUR 20 million**) of these investments went to **universities**, slightly less than one-third (about **EUR 14 million**) - to the **private sector**. About one-fifth (about **EUR 9 million**) of the investments was allocated to **other RDI entities** (clusters, associations, business incubators, FEZ operators, etc.), and up to 1 percent (over **EUR 0.5 million**) - to **research institutes**. About **EUR 22 million** was allocated to IT infrastructure, as part of complex university (studies' and RDI) infrastructure.

¹ It is important to note that the actual volumes of investments in IT infrastructure during the 2014-2020 programming period may be higher. However, the structure of data on EU funds' projects collected in the EU Structural Assistance Computer-Based Information Management and Monitoring System in some cases does not allow to identify the share of investments allocated for IT equipment (among investments allocated for purchasing equipment).

EVALUATION OF EU FUNDS' INVESTMENTS IN EDUCATION INFRASTRUCTURE IN 2004-2020

PRE-SCHOOL EDUCATION (PSE)

Scope of the investments in PSE infrastructure

In the period of 2004-2020, the total of **EUR 83.9 million** (under **9 EU funds' measures**) was allocated for PSE infrastructure. These investments were allocated to **299 unique institutions implementing PSE programmes**. Investments of the 2004-2006 programming period reached less than one-tenth of the municipalities in half of the counties and only 2 percent of all institutions implementing PSE programmes, investments of the 2007-2013 programming period - almost all municipalities and one-third of all institutions implementing PSE programmes, investments of the 2014-2020 programming period - three quarters of the municipalities in all counties and 15 percent of all institutions implementing PSE programmes. In addition, in the 2007-2013 programming period, **EUR 23.2 million** was invested in the infrastructure of **76 universal multifunctional centers** (*hereinafter – UMCs*), at least partly intended for the provision of PSE services, in more than three quarters of the municipalities in all counties.

Relevance of the investments in PSE infrastructure

In the period of 2004-2020, **the relevance** of the investments in PSE infrastructure **in the context of the national strategic agenda** varied **between low and high** (in 2004-2006 - low, in 2007-2013 - high, in 2014-2020 - medium). The national strategic agenda primarily focused on increasing the availability of PSE, especially for children at risk of social exclusion. It was suggested to pursue this objective by establishing UMCs in rural areas, ensuring the provision of educational support in institutions implementing PSE programmes, as well as updating the content and forms of PSE. In the period of 2004-2020, **the relevance** of the investments in PSE infrastructure **in respect to the changes in PSE situation** varied **between low and high** (in 2004-2006 - low, in 2007-2013 and 2014-2020 - high). **Investments** in various types of PSE infrastructure were assessed **as meeting the needs of the institutions** by at least two-thirds of the surveyed institutions implementing PSE programmes. Relatively less favourable assessments regarding relevance of the investments were mainly linked to **insufficient complexity of investments in buildings and premises** and **insufficient quality of construction works**.

Sufficiency of the investments in PSE infrastructure

In the period of 2004-2020, **the sufficiency** of the investments in PSE infrastructure **in terms of geographical and target group coverage** varied **between low and high** (in 2004-2006 - low, in 2007-2013 - high, in 2014-2020 - medium). **Investments** in various types of PSE infrastructure were assessed **as sufficient to ensure the compliance of the infrastructure with modern standards** by about two-thirds of the surveyed institutions implementing PSE programmes, emphasizing relatively higher sufficiency of investments in physical equipment. More than half of the institutions mentioned the need for reinvestment in the same infrastructure objects (mostly buildings and premises and IT equipment) in the future, three quarters - the need for additional investments in other infrastructure objects.

Efficiency of the investments in PSE infrastructure

The intensity of the use of new and (or) renewed PSE infrastructure was assessed as **high and very high** by at least two-thirds of the surveyed institutions implementing PSE programmes. At least three quarters of these institutions use the analyzed infrastructure daily or almost daily. **The extent of the use** of new and (or) renewed PSE infrastructure was assessed as **high and very high** by at least three quarters of the institutions implementing PSE programmes. The number of children using this infrastructure in the surveyed institutions varies from less than 100 to more than 300 (mostly up to 200) per year. **The level of the use** of new and (or) renewed PSE infrastructure met the expectations of at least half of the institutions. The level of the use of physical equipment was relatively the most in line

with the expectations of the institutions implementing PSE programmes. More than half of the surveyed institutions did not see any obstacles to the full use of PSE infrastructure developed and (or) renewed using the EU funds, apart from the quarantine announced due to the COVID-19 pandemic, which led to stricter requirements for the organization of the education process. Other institutions mentioned such factors limiting the use of infrastructure to the fullest extent, as **limited volume of the investments, limited physical accessibility, insufficient quality, depreciation of the infrastructure, unstable attendance of the institutions and declining number of children.**

Impact of the investments in PSE infrastructure

The main national strategic goals of PSE development are to increase the availability of PSE and improve its quality. The analyzed EU funds' investments in PSE infrastructure mainly contributed to the latter goal. The investments **allowed to significantly improve the material conditions for the implementation of PSE programmes** in a significant part of the country's territory. According to the majority of the surveyed institutions implementing PSE programmes, the analyzed investments were sufficient to ensure the compliance of the PSE infrastructure with modern standards. Therefore, they have **contributed to the increased variety of forms of education, improvement of employees' skills**, and, subsequently, **improvement of PSE quality** in the institutions having received investments. However, in order to improve the quality of PSE, in addition to investing in infrastructure, it is important to ensure high-quality and relevant educational content and forms, as well as sufficient qualifications of teachers.

The EU funds' **investments in PSE infrastructure have partially contributed to increasing the availability of PSE.** Although the analyzed investments mostly **did not result in the increased capacities of the institutions** implementing PSE programmes, the establishment of UMCs, at least partly intended for the provision of PSE services in rural areas, and the **adaptation of schools' premises** for the provision of PSE services have contributed to the expansion of the PSE material base. Nevertheless, these **investments were not sufficient to achieve a significant increase in the PSE coverage.** Lithuania still significantly lags behind the EU average in terms of share of children at the age of four participating in early childhood education. The availability of PSE is lower for children living in large cities and rural areas. Given the imminent introduction of compulsory PSE at the age of four, the demand for PSE services can be expected to grow even more. The contribution of the investments to increasing the availability of PSE in some cases was limited by the **lack of complexity of investments in buildings and premises.**

In addition, the investments **did not always contribute to increasing the availability of PSE for children with special educational needs** (*hereinafter - SEN*). According to more than half of the institutions having received the investments, the analyzed investments have contributed to increasing the availability of PSE for children with SEN. For example, buildings and premises, as well as virtual environments have been adapted for children with SEN, including those having mobility issues. However, the access to PSE services for children with SEN is not available in very institution implementing PSE programmes. In many cases, the conditions to participate in PSE for this target group have been only partially created - there is either lack of infrastructure adapted for children with certain SEN or specialists working with this target group. Given the foreseen introduction of compulsory education at earlier age, the number of children with SEN is expected to increase. In order to increase the availability of PSE, in addition to investing in the adaptation of the infrastructure to the needs of children with SEN, it is important to ensure sufficient availability of educational support in institutions implementing PSE programmes.

GENERAL EDUCATION (GE)

Scope of the investments in GE infrastructure

In the period of 2004-2020, the total of **EUR 289.6 million** (under **20 EU funds' measures**) was allocated for GE infrastructure. These investments were allocated to **967 unique schools.** Investments of

the 2004-2006 programming period reached about half of the municipalities in all counties and 6 percent of all schools, investments of the 2007-2013 programming period - all municipalities and more than half of all schools, investments of the 2014-2020 programming period - all municipalities and close to two thirds of all schools.

Relevance of the investments in GE infrastructure

In the period of 2004-2020, **the relevance** of the investments in GE infrastructure **in the context of the national strategic agenda** varied **between medium and high** (in 2004-2006 - medium, in 2007-2013 and 2014-2020 - high). The national strategic agenda primarily focused on optimizing schools' network, improving schools' material base and physical environment, increasing availability of GE, updating GE curricula and teaching methods, and improving teachers' skills. In the period of 2004-2020, **the relevance** of the investments in GE infrastructure **in respect to the changes in GE situation** varied **between low and high** (in 2004-2006 - low, in 2007-2013 - high, in 2014-2020 - medium). In four-fifths of the cases, **investments** in various types of GE infrastructure **met the needs of schools**, in up to one-fifth of the cases, the investments were **moderately in line** with the schools' needs or **did not meet them**. Limited relevance of the investments in terms of schools' needs was linked to **insufficient quality of school buses, other physical equipment and material supplies**, as well as **insufficient adaptation of the infrastructure to the education programmes and context of specific schools**.

Sufficiency of the investments in GE infrastructure

In the period of 2004-2020, **the sufficiency** of the investments in GE infrastructure **in terms of geographical and target group coverage** varied **between low and high** (in 2004-2006 - low, in 2007-2013 and 2014-2020 - high). **Investments** in school buses were considered **as sufficient** by four-fifths of schools, investments in virtual learning environments, equipment for teaching technology, natural sciences and (or) arts, energy systems of buildings, equipment for school libraries, educational spaces, sports grounds, adaptation of premises for alternative uses, workplaces of educational support specialists - by at least two-thirds of the institutions. Investments in methodological centers and teachers' workplaces were assessed as sufficient by at least half of the surveyed schools. Relatively less favourable assessments regarding the relevance of the investments were mainly linked to **lack of complexity of investments in buildings and premises** and **fragmentation of investments regarding provision of material supplies for schools**. Three quarters of the institutions identified the need for reinvestment in the same infrastructure in the future, four-fifths - the need for additional investments in other infrastructure objects.

Efficiency of the investments in GE infrastructure

The intensity of the use of new and (or) renewed GE **infrastructure** was assessed **as high and very high** by at least half of the surveyed schools. **The extent of the use** of new and (or) renewed GE **infrastructure** was assessed **as high and very high** by at least one-third of the surveyed schools. **The level of the use** of new and (or) renewed GE **met the expectations** of at least two-fifths of schools. The level of the use of buildings, premises and other spaces, as well as school buses was relatively most in line with schools' expectations. More than half of the surveyed schools did not see any obstacles to the full use of GE infrastructure developed and (or) renewed using the EU funds, apart from the quarantine announced due to the COVID-19 pandemic, which limited the opportunities for contact learning. However, the other half of the institutions mentioned such factors limiting the use of infrastructure to the fullest extent, as **lack of motivation and (or) skills of schools' staff, insufficiency of infrastructure in terms of meeting the needs of the target groups, limited compliance of the infrastructure with the schools' needs, insufficient quality, depreciation of the infrastructure, lack of resources, declining number of pupils**.

Impact of the investments in GE infrastructure

The main national strategic goals of GE development are to increase the availability of GE and improve its quality. The analyzed EU funds' investments in GE infrastructure **allowed to significantly expand the GE material base and improve the material conditions** for the implementation of GE programmes in a significant part of the country's municipalities and schools, thus contributing to the goal of improving the quality of GE. According to the majority of surveyed schools, the analyzed investments were sufficient to ensure the compliance of the GE infrastructure with modern standards. According to the majority of institutions, the investments in GE infrastructure have **contributed to savings in the maintenance costs of school facilities, increased use of IT in the education process, increase in pupils' interest in technology, natural sciences and (or) arts education**, and, consequently, **improvement of GE quality** in the schools having received investments. Nevertheless, in some cases, the contribution of investments to improving the quality of GE was limited by the inefficient use of developed and (or) infrastructure due to such factors as lack of motivation and (or) skills of staff, limited compliance of the infrastructure with the schools' needs and insufficient quality. In addition, in order to improve the quality of GE, in addition to investing in infrastructure, it is important to ensure high-quality and relevant educational content and forms, sufficient qualification of teachers and effective schools' network. In some cases, due to irrational investment decisions, such as modernization of schools having limited number of pupils, the reorganization of schools was accompanied by inefficient use of modernized infrastructure.

The EU funds' investments in GE infrastructure have **partially contributed to increasing the availability of GE** - schools have been provided with a wide variety of material supplies and school buses. According to many surveyed schools, the analyzed investments have contributed to increasing the availability of GE for children with SEN and improving of the educational support. Modernized buildings and premises have been adapted to the needs of these target groups, special teaching aids and vehicles have been purchased. However, the contribution of the investments to increasing the availability of GE in some cases was limited by the **lack of complexity of investments in buildings and premises and fragmentation of investments regarding provision of material supplies for schools**. Due to issues regarding the compliance of school buses with the schools' needs, challenges related to pupils' transportation were identified. Also, not all schools' infrastructure is adapted to the needs of pupils with various SEN, especially those with mobility issues. Taking into account the amendment to the Law on Education of the Republic of Lithuania establishing equal opportunities to participate in GE for children with various needs, that will come into force in the coming years, the adaptation of the infrastructure to the needs of the pupils with SEN will become even more important. In order to increase the availability of GE, in addition to investing in the adaptation of the infrastructure to the needs of pupils with SEN, it is important to ensure sufficient availability of educational support in schools.

NON-FORMAL EDUCATION OF CHILDREN (NFE)

Scope of the investments in NFE infrastructure

In the period of 2004-2020, the total of **EUR 31.5 million** (under **7 EU funds' measures**) was allocated for NFE infrastructure. These investments were allocated to **103 unique NFE institutions**. Investments of the 2004-2006 programming period reached one municipality and two unique entities, investments of the 2007-2013 programming period - one-third of the municipalities in all counties and up to one-tenth of all NFE institutions (included in the national registers), investments of the 2014-2020 programming period - more than four-fifths of the municipalities in all counties and about one-third of all NFE institutions (included in the national registers). In addition, in the 2007-2013 programming period, **EUR 23.2 million** was invested in the infrastructure of **76 UMCS**, at least partly intended for the provision of NFE services, in more than three quarters of the municipalities in all counties.

Relevance of the investments in NFE infrastructure

In the period of 2004-2020, **the relevance** of the investments in NFE infrastructure **in the context of the national strategic agenda** varied **between low and high** (in 2004-2006 - low, in 2007-2013 - medium, in 2014-2020 - high). The national strategic agenda primarily focused on increasing the availability, variety and quality of NFE, as well as availability and quality of STE(A)M² NFE. In the period of 2004-2020, **the relevance** of the investments in NFE infrastructure **in respect to the changes in NFE situation** varied **between low and high** (in 2004-2006 - low, in 2007-2013 and 2014-2020 - high). **Investments** in various types of NFE infrastructure were assessed as **meeting the needs of the institutions** by at least four-fifths of the surveyed NFE institutions, emphasizing relatively higher relevance of the investments in IT equipment.

Sufficiency of the investments in NFE infrastructure

In the period of 2004-2020, **the sufficiency** of investments in NFE infrastructure **in terms of geographical and target group coverage** varied **between low and medium** (in 2004-2006 - low, in 2007-2013 and 2014-2020 - medium). **Investments** in various types of NFE infrastructure were assessed **as sufficient to ensure the compliance of the infrastructure with modern standards** by at least three quarters of the surveyed NFE institutions, emphasizing relatively higher sufficiency of investments in IT equipment. The limited sufficiency of the investments in terms of institutions' needs was linked to **lack of complexity of investments in buildings and premises**. Two-thirds of the institutions mentioned the need for reinvestment in the same infrastructure objects in the future, more than four-fifths - the need for additional investments in other infrastructure objects.

Efficiency of the investments in NFE infrastructure

The intensity of the use of new and (or) renewed NFE **infrastructure** was assessed as **high and very high** by at least three-quarters of the surveyed NFE institutions. At least three quarters of these institutions use the analyzed infrastructure daily or almost daily. **The extent of the use** of new and (or) renewed NFE **infrastructure** was assessed as **high and very high** by at least three quarters of the surveyed NFE institutions. The number of children using this infrastructure in the surveyed institutions varies from less than 100 to more than 500 (mostly up to 300) per year.

The level of the use of new and (or) renewed NFE **infrastructure met the expectations** of at least four-fifths of the institutions. The level of the use of IT equipment was relatively the most in line with the expectations of the NFE institutions. Half of the surveyed institutions did not see any obstacles to the full use of NFE infrastructure developed and (or) renewed using the EU funds, apart from the quarantine announced due to the COVID-19 pandemic, which limited the opportunities for contact learning. However, the other half of the institutions mentioned such factors limiting the use of infrastructure to the fullest extent, as **lack of infrastructure, limited physical accessibility and insufficient quality of the infrastructure, limited compliance of the infrastructure with the institutions' needs, lack of human resources, unstable attendance of the institutions and declining number of children**.

Impact of the investments in NFE infrastructure

The main national strategic goals of NFE development are to increase the availability and variety of NFE. The analyzed EU funds' investments **have created preconditions for improving the material conditions for the implementation of NFE programmes and increasing the capacity of NFE infrastructure**, therefore contributed to the goal of increasing the availability of NFE. As a result of these investments, the premises of NFE institutions have been expanded and adapted for NFE programmes, the

² STE(A)M - Science, Technology, Engineering, Art and Mathematics.

conditions for storing inventory have been improved, institutions have been provided with high-quality and modern educational tools. According to the majority of the surveyed NFE institutions, the investments allowed to increase their capacities. In addition, **investments in the establishment of UMC have contributed to increasing the availability of NFE in rural areas**. In the period of 2015–2019, the number of pupils participating in NFE in the country has doubled. However, availability of NFE is also influenced by the peculiarities of the NFE funding system, as well as by the level of coherence between NFE and GE. The extent of funding allocated for NFE differs among municipalities, causing **differences in the availability of NFE in the country**. In addition, NFE institutions pointed out that **pupils' opportunities to participate in NFE are sometimes limited by heavy workload in GE**.

The EU funds' investments have also partially contributed to the goal of increasing the variety of NFE. According to the majority of the surveyed NFE institutions, the investments in infrastructure have **contributed to the increase in the variety of forms of service provision and provided an opportunity to introduce new NFE services**. The expansion of the range of NFE services was influenced by the renovation of existing premises and installation of new spaces, acquisition of new educational means. In addition to the introduction of new NFE programmes, other new activities have been launched in some institutions. After receiving investments in infrastructure, NFE institutions have updated the content and implementation methods of NFE programmes, providing an opportunity to work in both individual classrooms and common spaces, combine contact individual or group learning with distance learning using IT equipment. However, despite the growing focus on STE(A)M NFE in recent years, **the majority of the investments were related to the infrastructure required for implementing the most common - arts and sports education - NFE programmes**. Furthermore, in order to increase the variety of NFE, in addition to the investments in infrastructure, it is important to ensure high-quality and diverse content of NFE programmes and sufficient qualifications of NFE teachers.

VOCATIONAL EDUCATION AND TRAINING (VET)

Scope of the investments in VET infrastructure

In the period of 2004-2020, the total of **EUR 210.3 million** (under **11 EU funds' measures**) was allocated for VET infrastructure. These investments were allocated to **75 unique VET schools**. Investments of the 2004-2006 programming period reached almost half of the municipalities in almost all counties and more than half of all VET schools, investments of the 2007-2013 programming period - almost two-thirds of the municipalities in all counties and more than four-fifths of all VET schools, investments of the 2014-2020 programming period - almost two-thirds of the municipalities in all counties and three quarters of all VET schools.

Relevance of the investments in VET infrastructure

In the period of 2004-2020, **the relevance** of the investments in VET infrastructure **in the context of the national strategic agenda** varied **between medium and high** (in 2004-2006 - medium, in 2007-2013 and 2014-2020 - high). The national strategic agenda primarily focused on ensuring the geographical accessibility of VET, updating the content and forms of VET, modernizing the material base of VET, increasing accessibility of VET for various target groups, and improving the vocational guidance infrastructure in VET schools. In the period of 2004-2020, **the relevance** of the investments in VET infrastructure **in respect to the changes in VET situation** was **medium**. Investments in the infrastructure of VET schools' sectoral practical training centres (*hereinafter – SPTC*) were assessed as **corresponding to the current technological level of the country** by almost three quarters of the surveyed VET schools.

Sufficiency of the investments in VET infrastructure

In the period of 2004-2020, **the sufficiency** of investments in VET infrastructure **in terms of geographical and target group coverage** varied **between medium and high** (in 2004-2006 - medium,

in 2007-2013 and 2014-2020 - high). More than half of the surveyed VET schools assessed **investments** in various types of VET infrastructure as **sufficient to ensure the continuous provision of VET services**, less than half of institutions – as **sufficient to expand the scope of VET services**. More than three quarters of the them mentioned the need for reinvestment in the same infrastructure objects, almost all institutions indicated the need for additional investments in other infrastructure objects.

Efficiency of the investments in VET infrastructure

The intensity of the use of new and (or) renewed VET schools' SPTC infrastructure **was assessed as high and very high** by more than two-thirds of the surveyed VET schools. The maximum load of the SPTC infrastructure, reaching 16 hours per day, was recorded in only one-tenth of the analyzed SPTCs. However, in half of the analyzed SPTCs, the intensity of the use of infrastructure was sufficiently high, reaching 8 to 12 hours per day. The intensity of the use of other (non-SPTC) VET infrastructure was assessed as high and very high by at least half of the institutions. This infrastructure is used daily or almost daily in at least one-third of the cases. **The extent of the use** of new and (or) renewed VET SPTC infrastructure was assessed **as high and very high** by three quarters of the surveyed VET schools. The number of users of this infrastructure during the school year varies from less than 100 to more than 900 (mostly between 100 and 300). The infrastructure of almost all analyzed SPTCs is used not only by students and staff of the same VET school, but also by students and teachers of other VET schools and employees of companies.

The extent of the use of new and (or) renewed **other (non-SPTC) VET infrastructure** was assessed as **high and very high** by at least half of the institutions. The number of VET students using this infrastructure in the surveyed institutions during the school year varies from 100 to 500 (mostly between 300 and 400). **The level of the use** of new and (or) renewed VET schools' SPTC infrastructure **met the expectations of the institutions** in about three quarters of the cases, the level of the use of other (non-SPTC) infrastructure - in at least two-thirds of the cases. The level of the use of physical and IT equipment was relatively the most in line with the expectations of VET schools. More than half of the surveyed institutions did not see any obstacles to the full use of VET infrastructure developed and (or) renewed using the EU funds, apart from the quarantine announced due to the COVID-19 pandemic, which limited the opportunities for contact learning. Up to half of the institutions mentioned such factors limiting the use of infrastructure to the fullest extent, as **unstable attendance of VET schools, the need for additional investments for employing the equipment, purpose of the equipment, lack of premises, content of VET programmes and insufficient demand for VET**.

Impact of the investments in VET infrastructure

The main national strategic goals of VET development are to increase the availability of VET, improve its quality and increase its correspondence to the needs of the labor market. The analyzed EU funds' investments have led to a significant expansion of VET material base, therefore, have contributed to the goal of increasing the availability of VET. According to the majority of surveyed VET schools, the investments in infrastructure have **contributed to the increased capacities of VET schools and provided an opportunity for introducing new formal and non-formal continuing VET programmes. The capacities of modernized VET infrastructure even exceeded the total number of VET students**. High sufficiency of the investments in terms of target group coverage has allowed to significantly improve the material conditions for the implementation of VET programmes, creating opportunities for improving VET quality and its correspondence to the needs of the labor market. According to the majority of surveyed VET schools, the analyzed investments have **contributed to the increase in VET's correspondence to the needs of the labor market, VET quality and demand for VET** in the institutions having received investments.

Nevertheless, the contribution of the investments to improving VET quality and increasing VET's correspondence to the needs of the labor market in some cases was **limited by the risk of inefficient**

use of VET infrastructure modernized using the EU funds, posed by rapidly declining numbers of VET students and reorganization of VET schools, which did not always contribute to the increase in their efficiency. In addition to investing in infrastructure, it is important to ensure the relevance of VET programmes, sufficient qualifications of VET teachers, sufficient demand for VET and efficient network of VET schools. In VET schools, still not enough attention is given to the development and implementation of continuing VET programmes, mechanisms for attracting more students to VET schools are lacking.

COLLEGE STUDIES

Scope of the investments in college studies' infrastructure

In the period of 2004-2020, the total of **EUR 55.1 million** (under **10 EU funds' measures**) was allocated for college studies' infrastructure. These investments were allocated to **15 unique colleges** (14 public colleges). Investments of the 2004-2006 programming period reached about one-third of all and more than half of public colleges, investments of the 2007-2013 programming period - up to half of all and about three quarters of public colleges, investments of the 2014-2020 programming period - half of all and almost all public colleges.

Relevance of the investments in college studies' infrastructure

In the period of 2004-2020, **the relevance** of the investments in college studies' infrastructure **in the context of the national strategic agenda** was **high**. The national strategic agenda primarily focused on improving the study process and management in higher education institutions, updating study content and forms, improving vocational guidance in higher education institutions, updating studies' material base, increasing teachers' competencies, and increasing the scope and variety of student support. In the period of 2004-2020, **the relevance** of the investments in college studies' infrastructure **in respect to the changes in the situation of higher education** was **high**. **Investments** in various types of college studies' infrastructure were assessed **as meeting the needs of institutions** by at least half of the surveyed colleges, emphasizing relatively higher relevance of physical equipment and buildings and premises.

Sufficiency of the investments in college studies' infrastructure

In the period of 2004-2020, **the sufficiency** of the investments in college studies' infrastructure **in terms of geographical and target group coverage** varied **between medium and high** (in 2004-2006 - medium, in 2007-2013 and 2014-2020 - high). **Investments** in various types of college studies' infrastructure were assessed **as sufficient to meet the needs of the target groups** by at least half of the surveyed colleges. Three-quarters of the institutions mentioned the need for reinvestment in the same infrastructure objects, all respondents indicated the need for additional investments in other infrastructure objects.

Efficiency of the investments in college studies' infrastructure

The intensity of the use of new and (or) renewed college studies' infrastructure was assessed as **high and very high** by at least three quarters of the surveyed colleges. At least half of these institutions use the analyzed infrastructure daily or almost daily. **The extent of the use** of new and (or) renewed college studies' infrastructure was assessed **as high and very high** by more than four-fifths of the surveyed colleges. **The level of the use** of new and (or) renewed college studies' infrastructure was in all cases in line with the expectations of the institutions. The main factor limiting the use of infrastructure to the fullest extent was **declining number of college students**.

Impact of the investments in college studies' infrastructure

The main national strategic goals in the area of higher education are to increase the availability and improve the quality of studies. The analyzed EU funds' investments have created preconditions for a

significant improvement in the college studies' material base. In the majority of colleges, good learning infrastructure is distinguished as one of the advantages of college studies. The investments in college studies' infrastructure **have created preconditions for improving quality of studies in colleges with relatively highest potential, attracting relatively largest number of students**. According to the majority of surveyed colleges, the analyzed investments were **sufficient to ensure the compliance of the studies' infrastructure with modern standards** and have **contributed to the increased use of IT in the study process**. The current level of IT integration in the study process was assessed as high and very high. According to the majority of surveyed institutions, the investments in infrastructure have **contributed to the improvement of studies' quality and increase in their correspondence to the needs of the labor market** in the colleges having received investments.

Nevertheless, some challenges regarding the quality of college studies remain. Due to quality deficiencies, relatively large share of colleges' study programmes faces accreditation difficulties, many college graduates cannot find jobs corresponding to their formal level of education. Furthermore, in order to improve the quality of college studies, in addition to investing in infrastructure, it is important to ensure the availability of relevant study programmes and forms and sufficient qualification of teachers. The analyzed investments were allocated to the majority of public colleges, partially contributing to increasing of the availability of college studies. However, in order to increase the availability of college studies for people living in different socioeconomic environments and remote areas, in addition to investing in infrastructure, it is important to ensure the availability of effective student support system and effective network of colleges. Due to **the rapidly declining number of college students**, especially in colleges established in smaller towns, it is difficult to ensure wide variety and good quality of studies, as well as supply of required specialists in the regions. As a result, there is a **risk of inefficient use of college studies' infrastructure, developed and (or) renewed using the EU funds**.

UNIVERSITY STUDIES

Scope of the investments in university studies' infrastructure

In the period of 2004-2020, the total of **EUR 1.002 billion** was allocated to universities. **EUR 145.1 million** went for studies' infrastructure only, EUR 436.8 million - for RDI infrastructure only, EUR 420 million - for complex university (studies' and RDI) infrastructure. Investments to only studies' infrastructure were financed under **14 EU funds' measures** and were allocated to **15 unique universities** (13 public universities). Investments of the 2004-2006 programming period reached one-third of all and more than half of public universities, investments of the 2007-2013 programming period - more than two-thirds of all and almost all public universities, investments of the 2014-2020 programming period - more than one-third of all and about half of public universities.

Relevance of the investments in university studies' infrastructure

In the period of 2004-2020, **the relevance** of the investments in university studies' infrastructure **in the context of the national strategic agenda** was **high**. The national strategic agenda primarily focused on improving the study process and management in higher education institutions, updating study content and forms, improving vocational guidance in higher education institutions, updating studies' material base, increasing teachers' competencies, and increasing the scope and variety of student support. In the period of 2004-2020, **the relevance** of the investments in university studies' infrastructure **in respect to the changes in the situation of higher education** varied **between medium and high** (in 2004-2006 - medium, in 2007-2013 and 2014-2020 - high). **Investments** in various types of university studies' infrastructure were assessed **as meeting the needs of institutions** by at least three quarters of the surveyed universities, emphasizing relatively higher relevance of physical equipment and buildings and premises.

Sufficiency of the investments in university studies' infrastructure

In the period of 2004-2020, **the sufficiency** of the investments in university studies' infrastructure **in terms of geographical and target group coverage** varied **between medium and high** (in 2004-2006 and 2007-2013 - medium, in 2014-2020 - high). **Sufficiency** of the investments in various types of university studies' infrastructure **in terms of institutions' needs** varied. Investments in physical equipment were sufficient in up to half of the cases, investments in buildings and premises - in up to one-third of the cases, investments in IT equipment - in one-fourth of the cases. According to the universities, **investments in IT equipment and buildings and premises were largely insufficient**. Up to three quarters of the institutions identified the need for reinvestment in the same infrastructure objects, also all respondents indicated the need for additional investments in other infrastructure objects.

Efficiency of the investments in university studies' infrastructure

The intensity of the use of new and (or) renewed university studies' infrastructure was assessed as **high and very high** by at least four-fifths of the surveyed universities. At least four-fifths of these institutions use the analyzed infrastructure daily or almost daily. **The extent of the use** of new and (or) renewed university studies' infrastructure was assessed as **high and very high** by more than three quarters of the surveyed universities. **The level of the use** of new and (or) renewed university studies' infrastructure in at least two-thirds of the cases **met the expectations of the institutions**.

Half of the surveyed universities did not see any obstacles to the full use of university studies' infrastructure developed and (or) renewed using the EU funds. Several institutions identified such factors limiting the use of infrastructure to the fullest extent, as **depreciation of the infrastructure** and **limited amount of funding allocated**, which in some cases led to purchasing only part of the necessary equipment. Despite mostly positive assessments regarding the use of infrastructure by the universities, previous studies have pointed to the **insufficient cooperation in using infrastructure among universities and between universities and other entities, insufficient use of university infrastructure (especially RDI infrastructure) and steady decline in the number of university students**. These factors pose a risk of ineffective use of university studies' infrastructure developed and (or) renewed using the EU funds.

Impact of the investments in university studies' infrastructure

The main national strategic goals in the area of higher education are to increase the availability and improve the quality of studies. The analyzed EU funds' investments have created preconditions for a significant improvement in material conditions of university studies. The majority of the surveyed universities indicated that the investments in IT equipment and buildings and premises were largely insufficient to meet the needs of the target groups. Nevertheless, the investments in infrastructure have **created preconditions for improving quality of studies in universities with relatively highest potential, attracting relatively largest number of students**. According to the majority of the surveyed institutions, the analyzed investments have **contributed to the increased use of IT in the study process**. The current level of IT integration in the study process was assessed as high and very high.

Most universities identified the contribution of the analyzed infrastructure to **increasing studies' correspondence to the needs of the labor market**, as well as **improved quality and attractiveness of the studies** in the universities having received investments. However, in order to improve the quality of studies, in addition to investing in infrastructure, it is important to ensure the relevance of study programmes and forms, sufficient qualifications of teachers and efficient network of universities. The optimization of the universities' network was criticized as having weak coordination, the universities' infrastructure - as fragmented and excess. Moreover, the investments in the university infrastructure are often sought without taking into account the existing infrastructure, thus there is a **risk of ineffective use of university studies' infrastructure developed and (or) renewed using the EU funds**. The analyzed investments were allocated to the majority of public universities, partially contributing to

increasing of the availability of university studies. Nevertheless, in order to increase the availability of university studies, in addition to investing in infrastructure, it is important to ensure the existence of effective student support system.

EVALUATION OF EU FUNDS' INVESTMENTS IN RDI INFRASTRUCTURE IN 2004-2020

Relevance of the investments in RDI infrastructure

In the period of 2004-2020, **the relevance** of the investments in university studies' infrastructure **in the context of the national strategic agenda** varied **between medium and high** (in 2004-2006 - medium, in 2007-2013 and 2014-2020 - high). The national strategic agenda focuses on increasing scientific and technological competence and capacity, increasing the scope and quality of research, developing knowledge and research-based industry and businesses, increasing human resources in RDI, strengthening business-science cooperation and promoting smart specialization. In the period of 2004-2020, **the relevance** of the investments in RDI infrastructure **in respect to the changes in RDI situation** varied **between low and medium-high** (in 2004-2006 - low, in 2007-2013 and 2014-2020 - medium-high). In 2004-2020, **the relevance of the investments RDI infrastructure in terms of institutions' needs** was **high**. According to more than four-fifths of the surveyed research institutions, various types of RDI infrastructure developed and (or) renewed using the EU funds' investments met their expectations. According to more than three quarters of the surveyed study and research institutions (*hereinafter – RSI*) and clusters and business entities, investments in RDI physical equipment were the most relevant.

Sufficiency of the investments in RDI infrastructure

In the period of 2004-2020, **the sufficiency** of the investments in RDI infrastructure **in terms of geographical and target group coverage** varied **between low and medium-high** (in 2004-2006 – low and in 2007-2013 and 2014-2020 – medium-high). Investments in RDI infrastructure were assessed **as sufficient to ensure the continuity of RDI activities** by almost three quarters of RSI and clusters and almost four-fifths of business entities. More than half of RSI and clusters and three quarters of business entities assessed the analyzed investments **as sufficient to increase the extent and (or) diversity of RDI activities**. Three quarters of all institutions mentioned the need for reinvestments in the same infrastructure objects to cover depreciation, while a slightly smaller share of institutions expressed the need for additional investments in other infrastructure objects.

Efficiency of the investments in RDI infrastructure

The **intensity of the use** of new and (or) renewed **open access RDI infrastructure** was assessed as **high and very high** by at least two-thirds of RSI and clusters. At least three-quarters of all institutions indicated that newly developed or renewed RDI infrastructure is used daily or almost daily. The **extent of the use** of the **open access RDI infrastructure** was assessed as **high and very high** by more than two-fifths of RSI and clusters. In the surveyed institutions, the number of people using this infrastructure varies from 100 to 500 per year. Although the majority of the RSI and clusters stated that the RDI infrastructure was used at full capacity, the remaining respondents pointed to such factors limiting the full use of the analyzed infrastructure as **depreciation of physical infrastructure, lack of business demand for R&D activities** and **insufficient general demand for high technologies**.

The **intensity of the use** of new and (or) renewed **other RDI infrastructure (non-open access)** was assessed as **high and very high** by more than three quarters of the RSI and clusters. According to at least two-thirds of institutions, the analyzed infrastructure is used daily or almost daily. The **extent of the use** of **other RDI infrastructure (other than open access)** was assessed as high and very high by more than half of the RSI and clusters. In the surveyed institutions, the number of people using this infrastructure

varies from 100 to 500 per year. Although the majority of the RSI and clusters stated that the analyzed infrastructure was used at full capacity, the remaining institutions indicated such factors limiting the full use of the infrastructure, as **depreciation of infrastructure, limited funding for R&D activities and limited demand for RDI infrastructure.**

The intensity of the use of new and (or) renewed **RDI infrastructure** was also assessed as **high and very high** by business entities. At least two-thirds of businesses indicated that the analyzed infrastructure is used daily or almost daily. According to approximately 90 percent of business entities, new and (or) renewed **RDI infrastructure met the expectations of their companies.** More than half of business entities stated that RDI infrastructure was used at full capacity, while the remaining businesses indicated such factors limiting the full use of RDI infrastructure, as **lack of employees with relevant skills, high labour taxation, lack of financial resources to undertake R&D activities and complexity of R&D activities which sometimes renders the current RDI infrastructure inapplicable for the purpose.**

Impact of the investments in RDI infrastructure

Two main national strategic goals for the development of RDI are the **creation of a knowledge society** and **the promotion of a competitive economy.** The analyzed EU funds' investments have contributed to the achievement of these goals. For instance, EU funds' investments in RDI infrastructure **have significantly contributed to closer cooperation both between science and business entities, and with foreign partners, boosted integration of research and study processes and strengthened capacity to commercialize R&D results and increase competitiveness of enterprises.** According to the majority of the surveyed RSI, clusters and business entities, the EU funds' investments have **contributed to the strengthening of cooperation in RDI between science and business, allowed to establish closer relations with foreign partners, and increased integration of science and studies.** According to the majority of surveyed business entities, the analyzed investments have **contributed to the growth of income from innovative products and (or) services.** As such, it can be concluded that the investments in RDI infrastructure have significantly contributed to the positive changes in RDI system, its indicators and created positive spill-overs to the whole economy.

However, the impact of the analyzed investments to increasing the competitiveness of the economy and building a knowledge-based society is limited by the long-standing problems of Lithuanian RDI system. Lithuania still has a **relatively small number of private business entities engaged in R&D activities.** The latter leads to relatively low cooperation between businesses and science, low demand for R&D activities and low level of R&D expenditure in the business sector. In addition, RSI **still lack incentives to proactively seek business partners and implement joint research and business projects.** R&D activities performed by RSI and the available RDI infrastructure are little known to business entities whose representatives do not have personal contacts with representatives of RSI. Another persistent problem in the RDI sector is **the lack of human resources.** Working conditions of researchers in Lithuania are significantly worse, compared to many Western European countries. This encourages the migration of researchers and reduces the number of human resources that could carry out R&D activities and utilise the created RDI infrastructure in Lithuania.

EVALUATION OF EU FUNDS' INVESTMENTS IN IT INFRASTRUCTURE IN EDUCATION AND RDI IN 2004-2020

Relevance of the investments in IT infrastructure

The majority of 2004-2020 EU funds' investments in IT infrastructure in education and RDI was allocated for the **provision of educational and research institutions with computer equipment and software.** These investments corresponded to the goals of **integrating IT in the learning process,** as well as

expanding general RDI infrastructure and upgrading material base of smart specialization, enshrined in the national strategic agenda of the analyzed period. The investments in IT infrastructure also encompassed the **development of IT infrastructure of various national-level education and science systems**. These investments allowed to digitize and automate some education and science management processes, thus have undoubtedly **contributed to increasing the efficiency of education and science management systems** and **created preconditions for improving the quality of education and R&D activities**. According to the majority of educational and RDI institutions having received the investments, the investments in IT infrastructure **met the needs of the institutions**. In the field of education, the investments in IT equipment of NFE institutions were relatively the most relevant, while the investments in IT infrastructure of institutions implementing PSE programmes and universities - relatively the least relevant. The investments in IT infrastructure in education were assessed as meeting the needs of institutions by all surveyed NFE institutions, more than four-fifths of schools and colleges, three quarters of VET schools and universities, and three-fifths of institutions implementing PSE programmes. The investments in IT infrastructure in RDI were assessed as meeting the needs of institutions by almost all surveyed business entities and four-fifths of RSI and clusters. Despite relatively high relevance of the investments in IT infrastructure at the time of investing, due to **depreciation and technological changes**, currently IT equipment often no longer meets the needs of institutions.

Sufficiency of the investments in IT infrastructure

The sufficiency of the investments in IT equipment **in terms of ensuring the compliance of the infrastructure with modern standards and meeting the needs of the target groups** was assessed differently. In the field of education, the sufficiency of the investments in IT infrastructure was assessed relatively most favourably by the NFE institutions and colleges, relatively least favourably - by the universities. The investments in IT equipment were assessed as sufficient by more than four-fifths of the surveyed NFE institutions and colleges, three quarters of schools, three-fifths of institutions implementing PSE programmes, half of VET schools and more than one-quarter of universities. Almost all surveyed colleges and universities mentioned the need for future investment in IT equipment in 2021-2027. Also, more than four-fifths of VET schools, over two-thirds of schools and one-third of institutions implementing PSE programmes and NFE institutions indicated the need to invest in IT equipment in the future.

The investments in various infrastructure (including IT) were assessed **as sufficient to ensure the continuity of RDI** by almost four-fifths of the surveyed business entities and about three quarters of RSI and clusters. More than half of the surveyed RSI and clusters and business entities indicated the need for future investments in IT equipment in 2021-2027. Compared to other types of investments in infrastructure, investments in IT equipment are relatively less sustainable. Computer hardware and software wears out or become morally outdated relatively quickly. The continued use of this type of infrastructure after the end of the investment projects depends on the possibility to upgrade it. Surveyed educational and research institutions emphasized **the need for continuous and regular investments in updating of IT equipment**, which institutions often do not have the possibilities to do at their own expense.

Efficiency of the investments in IT infrastructure

According to the majority of surveyed educational and research institutions, the **intensity** (in terms of frequency and duration of use) **of the use of new and (or) renewed IT equipment** is **high**. The intensity of the use of IT equipment is relatively highest in NFE institutions, relatively lowest - in institutions implementing PSE programmes. The intensity of the use of the analyzed infrastructure was assessed **as high and very high** by almost all surveyed NFE institutions, four-fifths of colleges and universities, three quarters of schools and VET schools, and two-thirds of institutions implementing PSE programmes. New and (or) renewed IT equipment is used daily or almost daily in almost all surveyed NFE institutions, four-

fifths of universities, three quarters of institutions implementing PSE programmes, two-thirds of colleges and one-third of VET schools.

In at least half of the cases, **the use of IT infrastructure** (in terms of number of users) **was high and very high**. In NFE institutions, the extent of the use of IT equipment was relatively the highest, in VET schools - the lowest. The extent of the use of IT equipment developed and (or) renewed using the EU funds was assessed as high and very high by almost all surveyed NFE institutions, four-fifths of schools and colleges, three quarters of institutions implementing PSE programmes and universities, and half of VET schools. **The level of the use** (in terms of intensity and extent of the use) **of IT infrastructure met the expectations of institutions** in at least two-thirds of the cases. The level of the use of IT equipment met the expectations of all surveyed NFE institutions and colleges, three quarters of VET schools and universities, two-thirds of schools and three-fifths of institutions implementing PSE programmes. The main factors limiting the full use of IT equipment at different levels of education were **depreciation of this type of infrastructure, shortage of funding for its upgrading, lack of IT capacities of schools' staff**.

The intensity of the use of IT equipment as part of **open access RDI infrastructure** was assessed as **high and very high** by four-fifths of the surveyed RSI and clusters, who mostly indicated that the analyzed infrastructure is used daily or almost daily. **The intensity of the use of IT equipment** as part of **other (non-open access) RDI infrastructure** was assessed as high and very high by about three quarters of surveyed RSI and clusters. In almost two-thirds of these institutions the analyzed infrastructure is used daily or almost daily. According to more than four-fifths of the surveyed business entities, the analyzed IT equipment is used daily or almost daily. The level of its use met the expectations of almost all business entities. As in the case of IT infrastructure in education, the main obstacle to the full use of IT infrastructure in RDI is **rapid depreciation of the infrastructure or the loss of its correspondence to the current technology level**.

Impact of the investments in IT infrastructure

From the beginning of the period of 2004-2020, the national strategic agenda for the development of education emphasizes **the importance of IT integration in learning process at different levels of education**. In the areas of GE and VET, some efforts have been made to computerize the workplaces of students and teachers, to ensure high-quality and fast internet connection in schools, to develop digital educational content and virtual learning environments, and to improve the IT skills of schools' staff. It was hoped that with the help of IT tools, the improved curriculum and the introduction of flexible forms would contribute to the increased attractiveness of learning process and the increased motivation of students. In the field of higher education, the goal was to expand the use of IT in the study process by updating the content of study programmes, introducing flexible study forms and improving the IT competencies of staff. The national strategic agenda for the development of RDI stresses **the need to develop general RDI infrastructure, especially IT, and upgrade material base for smart specialization areas**, including IT.

According to four-fifths of the surveyed schools, colleges and universities, the IT infrastructure developed and (or) updated using the EU funds **have contributed to the increase of IT integration in learning or study process**. The current level of IT integration in learning or study process was assessed as high and very high by all surveyed colleges and over two-thirds of the surveyed universities and schools. Given the significant scope of EU funding allocated for the development of IT infrastructure during the analyzed period, it can be concluded that the analyzed investments in IT equipment have definitely **contributed to a significant increase in the level of computerization of educational and research institutions, especially schools and universities**. However, the extent of the impact of the investments in IT infrastructure to achieving the main goals of education and RDI **will depend on the possibilities to ensure the sustainability of the investments**, i.e., upgrade IT equipment after the end of the investment projects.

RECOMMENDATIONS AND STRATEGIC PROPOSALS

RECOMMENDATIONS AND STRATEGIC PROPOSALS ON THE NEED FOR INVESTMENTS IN EDUCATION INFRASTRUCTURE AND POSSIBILITIES FOR MORE EFFICIENT USE OF THIS INFRASTRUCTURE

Recommendations

- In order to avoid insufficient complexity of investments, **it is recommended** to invest comprehensively in the infrastructure of the same institution, ensuring that the new and (or) renewed infrastructure is available to the majority of the relevant target group.
- In order to ensure the greatest possible use of new and (or) renewed infrastructure in the educational process and to effectively address the lack of learning facilities, **it is recommended** to improve the institutions' internal systems for managing material resources, which would allow to efficiently manage the use of limited number of material supplies, and to invest in the development of universal educational spaces, easily adaptable for various purposes.
- In order to ensure the sustainability of new and (or) renewed physical and IT equipment, **it is recommended** to oblige the institutions or their founders to ensure financing for the renewal of physical and IT equipment after a certain period of time.
- In order to ensure the compliance of new and (or) renewed educational infrastructure with the needs of institutions and integration of pupils with SEN, **it is recommended** to coordinate the need for specific infrastructure with schools, providing them with an opportunity to choose the most appropriate infrastructure from a standartized priority list of infrastructure, and to quantify the needs of infrastructure needs for persons with SEN.
- In order to increase the integration of persons with SEN in education institutions, **it is recommended** to invest in the adaptation of education infrastructure to the needs of children with various SEN, especially those having mobility issues, including workplaces for educational support specialists, as well as services increasing the integration of persons with SEN in education institutions.
- In order to ensure the greatest possible use of new and (or) renewed infrastructure in the education process, **it is recommended** to regularly improve IT skills of teachers, provide methodological assistance regarding integration of new infrastructure in the education process, as well as raise teachers' awareness of the importance of updating the content and forms of education, by clearly communicating the aims and benefits of the use of new infrastructure and ensuring the dissemination of good practices.
- In order to respond to relevant changes in the epidemiological and technological context of GE, **it is recommended** to set up innovative learning environments at schools, for example, hybrid, outdoor classrooms, universal learning environments, spaces adapted to STE(A)M education.
- In order to decrease the differences in the availability of NFE among municipalities, **it is recommended** to invest in innovative forms of NFE, especially in the areas with relatively small NFE coverage, by developing the infrastructure and services required for the provision of new forms of NFE services.

Strategic proposals

- In order to significantly increase PSE coverage in the country and address the increasing numbers of children in PSE (including children with SEN) due the introduction of compulsory education at earlier age, **it is suggested** to primarily direct future investments in PSE infrastructure to increasing the availability of PSE, focusing on the areas with the relatively lowest availability of PSE - large cities and rural areas.
- In order to rationally increase the capacity of PSE infrastructure, **it is suggested** to plan investments in PSE infrastructure taking into account the socio-economic and demographic context, as well as the peculiarities of the network of education institutions in specific areas. In the areas with a relatively small population, **it is suggested** to invest in the universal infrastructure aimed at providing different services to the community, as well as finance various forms of PSE services. In the areas with a relatively large population, **it is suggested** to seek different ways to increase the capacities of institutions implementing PSE programmes, such as adapting unused premises or non-traditional spaces.
- In order to maximize the use of new and (or) renewed GE infrastructure, **it is suggested** to plan investments in GE infrastructure taking into account the country's demographic trends and other contextual factors influencing the schools' network and the use modernized infrastructure, and to target investments in GE infrastructure only at schools having sufficiently large and non-declining number of pupils.
- In order to increase NFE and GE integration, **it is suggested** to give priority to the infrastructure required for implementing STE(A)M NFE, which is considered the most promising and having the largest potential in terms of improving learning outcomes of children, by not only creating new infrastructure but also by providing access to the existing relevant infrastructure in schools and VET schools, colleges, etc.
- In order to maximize the use of new and (or) renewed VET infrastructure, especially SPTC infrastructure, **it is suggested** to take measures aimed at increasing the demand for VET in the regions, promoting the use of VET schools' SPTC infrastructure by external users and raising public awareness of the services provided in SPTCs.
- In order to maximize the use of new and (or) renewed colleges' infrastructure, **it is suggested** to take measures aimed at increasing the relevance and attractiveness of college studies, as well as seek ways for alternative use of college studies' infrastructure by providing access to this infrastructure and encouraging its use by external entities, such as students and teachers of schools, VET schools and NFE institutions.
- In order to maximize the use of new and (or) renewed university infrastructure, **it is suggested** to assess the scope and level of use of the existing infrastructure, including the scope, level of use and opportunities for further use of infrastructure intended for other than study and RDI, as well as seek ways to increase the cooperation in using infrastructure among universities and other subjects, cooperation between science and business, solve the problem of the lack of researchers in the universities.

RECOMMENDATIONS AND STRATEGIC PROPOSALS ON THE NEED FOR INVESTMENTS IN RDI INFRASTRUCTURE AND POSSIBILITIES FOR MORE EFFICIENT USE OF THIS INFRASTRUCTURE

Recommendations

- In order to increase the share of GDP of expenditure on RD performed by business, **it is recommended**:
 - to support the reorientation of traditional industries towards knowledge-intensive and innovation-based, support RDI activities and the commercialization of their results, support creation of RDI infrastructure for prototyping, testing and demonstration, pilot production and preparation for the market and support introduction of incentives for companies to participate in international innovative public procurement and integration into high value-added production chains;
 - to support the emergence of new and innovative enterprises in Lithuania by promoting the attraction of high value-added and RDI-intensive foreign direct investment; to support the emergence of new knowledge-intensive enterprises;
 - to support the development of RDI ideas in business by directing young innovative companies to business angel networks, accelerators and venture capital fund managers.
- In order to increase cooperation between science and business, **it is recommended**:
 - further increase incentives of businesses to use open access RDI infrastructure by raising the business profile of the available research services, R&D research topics and existing RDI infrastructure in universities and research institutes, further increase cooperation, coordination and flexibility of universities and research institutions in responding to business inquiries and business services; carry out systematic monitoring of business inquiries and their nature by establishing a monitoring system of market needs;
 - to change the criteria for evaluating the performance of researchers by increasing incentives for joint research and business projects, increase funding for RDI infrastructure for prototyping, testing and demonstration, and ensure investments for upgrading existing RDI infrastructure to cover its depreciation and this way maintain its relevance for potential users
- In order to attract the most-skilled researchers and expand human resources in the RDI system, **it is recommended** to increase investments in human resources, improve the working conditions of researchers by increasing their salaries, reducing wedges between teaching and research activities, reducing the administrative burden and increasing funding for high-level RDI projects.

Strategic proposals

- In order to increase the demand for R&D activities and this way increase share of GDP of expenditure on R&D performed by business, **it is suggested** to encourage more active development and application of R&D -based innovations in both traditional-industrial companies and newly emerging companies.
- In order to strengthen cooperation between science and business and achieve a systemic breakthrough in the field of RDI, **it is suggested** to increase the publicity of the activities of science institutions, expand incentives for researchers to carry out joint science and business projects and renew the worn-out RDI infrastructure.

- In order to increase utilisation of RDI infrastructure, **it is suggested** to improve the situation of human resources in RDI in Lithuania.