

Public research organization

Latvian Institute of Organic Synthesis

Strategy
2022-2027

Approved by Scientific Council of
Latvian Institute of Organic Synthesis
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Latvian Institute of
Organic Synthesis

Terms and abbreviations

RRM	Recovery and Resilience Mechanism
TOWS	Threats and opportunities, weaknesses and strengths
DTG 2027	Digital Transformation Guidelines for 2021–2027
ERA	European Research Area
EU	European Union
KDG	Key development goals
GMP	Good Manufacturing Practice
HE	Horizon Europe
EDG 2027	Education Development Guidelines 2021–2027
KPMG	SIA KPMG Baltics
NDP	National Development Plan of Latvia for 2021–2027
Regulation	Regulation of Latvian Institute of Organic Synthesis
OECD	Organization for Economic Co-Operation and Development
LIOS	Latvian Institute of Organic Synthesis
LIOS Strategy 2027	Latvian Institute of Organic Synthesis development strategy for 2022–2027
FTE	Full-time equivalent (work time tracking)
DD	Development direction
STEM	Science, Technology, Engineering and Mathematics
SWOT	Strengths and weaknesses, opportunities and threats
PHG	Public Health Guidelines for 2021–2027
STDIG 2027	Science, Technology Development and Innovation Guidelines 2021–2027

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1. Introduction

The Latvian Institute of Organic Synthesis (hereinafter – LIOS), founded in 1957, is specializing in carrying out basic and practical studies in organic chemistry, molecular biology and bioorganic chemistry. LIOS is the leading drug discovery and development centre in the Baltics and has been announced the best research institute in Latvia according to the last two instances of “International evaluation of scientific institutions activity”. The Institute focuses on research and development of solutions that are important to the society (public health, sustainable chemistry and technology) and has a significant impact not only on the local but also on the international level.

The Development Strategy of the Latvian Institute of Organic Synthesis for 2022–2027 (hereinafter – LIOS Strategy 2027) is a medium-term programming document stating the mission, vision and operational principles. The strategy describes the key development goals, development directions and tasks, as well as the main results and performance indicators of LIOS Strategy.

Purpose and tasks

Given that the current strategy of LIOS was in force from 2016 to 2021, it is necessary to develop a new medium-term development strategy for 2022–2027. Therefore, based on the service contract concluded on 7 October 2021, KPMG Baltics SIA (hereinafter – KPMG) is involved in the development of the medium-term development strategy of LIOS for 2022–2027, outlining the priority activities and the plan of tasks to implement these activities. Within the period of 8 (eight) weeks from the date the contract is signed:

- a data-based characterisation of the current situation is made, which is summarized in the analysis of strengths, weaknesses, as well as opportunities and threats;
- key development goals are defined in line with the vision and mission of LIOS, as well as according to European and national programming documents;
- the development plan was drafted according to defined objectives. The plan sets out the tasks, resources, needed to implement the tasks, and their sources, results to be achieved, indicators (KPI), and time schedule.

Mission, vision, operational principles and key development goals of LIOS

The vision of LIOS at the global and scientific level – a global knowledge society. This is achieved through the mission of LIOS to drive the development and scientific growth of the industry.

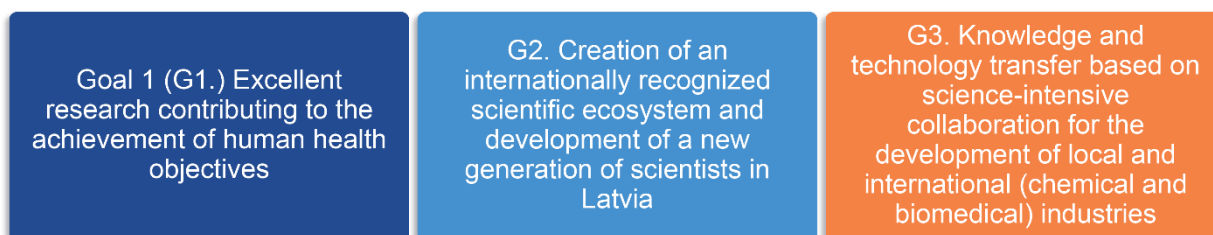
The vision of LIOS as an institution is to become one of the European leaders in chemistry and biomedicine, in which vivid personalities, scientific ideas and new products are created and developed. The institutional mission – Latvian Institute of Organic Synthesis addresses global challenges of human well-being and health (Imagine 1).

Image 1. Mission, vision, activities and principles of LIOS (Source: LIOS)



Key development goals

Key development goals (hereinafter – KDG) defined in line with the vision and mission of LIOS, as well as European and national programming documents.



LIOS Strategy 2027 consists of:

- Data-based description of the current situation (incl. analysis of strengths and weaknesses, opportunities and threats);
- Strategic framework (incl. formulation of mission, vision, operational principles and key development goals);
- Development plan (incl. deliverables, performance indicators, development directions and tasks).

2. Development methodology

LIOS Strategy 2027 was prepared in several successive steps and was based on the following research methods and sources of information:

1. Content analysis of documents

When creating LIOS Strategy 2027, a content analysis of the following documents was performed:

- LIOS mission and vision for 2021–2027¹;
- Latvian Institute of Organic Synthesis strategy for 2016–2020²;
- Materials of international evaluation of scientific institutions activity and recommendations for LIOS³;
- LIOS research program for 2021–2027⁴;
- National Development Plan of Latvia for 2021–2027⁵;
- Science, Technology Development and Innovation Guidelines 2021–2027⁶;
- Priorities and strategic objectives of the European Research Area (hereinafter – ERA)⁷.

Various other sources of information identified and provided by LIOS during the development of the Strategy 2027 were also analysed (referred to in the relevant sections of the document).

2. Data analysis

In order to develop a data-based analysis of the current situation and of the strengths and weaknesses, opportunities and threats (hereinafter – SWOT), an analysis of individual activities of the Institute was carried out, as well as data relating to science, research, technology transfer and higher education sectors. Analysis was carried out by obtaining data from LIOS as well as from other publicly available statistical reports and databases.

3. In-depth interviews

During the initial phase of the project (October–November 2021), a number of extended interviews were conducted with LIOS management and local and

¹ Development of strategic positioning, vision and mission of LIOS, Vidzeme University of Applied Science (Gatis Krūmiņš, Zigurds Zakis and Iveta Putniņa), 2021

² Latvian Institute of Organic Synthesis strategy for 2016–2020, available at: https://www.osi.lv/wp-content/uploads/2013/02/OSI_strategija_060619-1.pdf

³ Results of 2019 “International evaluation of scientific institutions activity”, available at: <https://www.izm.gov.lv/lv/2019-gada-zinatnisko-instituciju-starptautiskais-novertejums>

⁴ During the establishment of LIOS Strategy 2027, the research programme is in the development stage and will be available after it is finished.

⁵ National Development Plan of Latvia for 2021–2027, available at: https://www.pkc.gov.lv/sites/default/files/inline-files/NAP2027_apstiprin%C4%81ts%20Saeim%C4%81_1.pdf

⁶ Science, Technology Development and Innovation Guidelines 2021–2027, available at: <https://www.izm.gov.lv/lv/media/3679/download>

⁷ COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS A new ERA for Research and Innovation COM/2020/628 final, available at: <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=COM%3A2020%3A628%3AFIN>

international experts, providing a comprehensive assessment of the impact of LIOS, as well as external environmental factors to be taken into account when developing LIOS Strategy 2027 (Annex 1 – Interviewees). The results of the interviews were used as one of the sources for developing the original SWOT analysis. The opinions provided were also used to define the tasks to be performed and the objectives to be achieved for the development of LIOS in the next programming period.

4. Working groups

In October–November 2021, working groups with LIOS management, the Scientific Board and other staff were organised (Annex 2 – Working groups). Scope of the working groups:

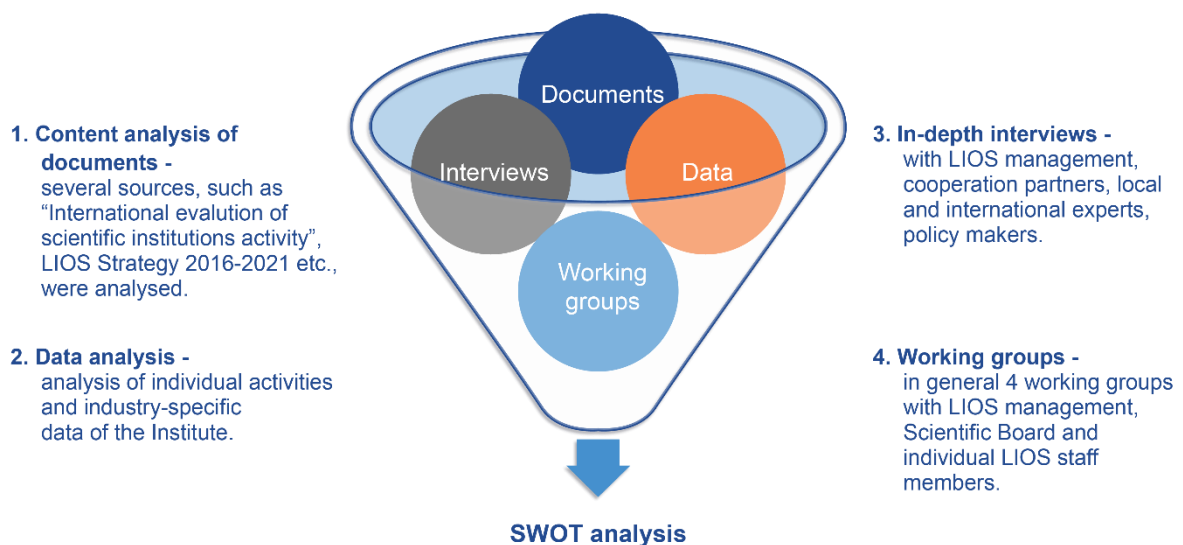
- Human resources – people necessary to provide the impact and results;
- Infrastructure – infrastructure available and to be develop to provide the impact and results;
- Stakeholders, collaboration networks and funding – identification of stakeholders, analysis of collaboration opportunities, including funding;
- Organizational structure – effectiveness of the organizational structure and relevance to the realisation of the vision.

Experts of SIA KPMG Baltics (hereinafter – KPMG) prepared working group guidelines asking participants to express their opinions on the initial SWOT analysis, as well as to outline the main points of change to be included in the LIOS Strategy 2027.

5. Analysis of strengths and weaknesses, opportunities and threats

The data-based characterisation of the current situation, which is reflected in detailed SWOT analysis, was based on a broad list of sources and methods of information, ensuring the reliability of the conclusions (Image 2).

Image 2. Sources and methods of information used in the analysis
(Source: KPMG)



SWOT analysis was carried out analyzing a number of topics, ensuring that all the aspects of the Institute’s activities are addressed (Table 1).

Table 1. Topics covered by SWOT analysis and linking to the topics defined in the technical specification (Source: LIOS, KPMG)

Topics of SWOT analysis	Topics stated in the TS
Impact	3.7. scientific and socio-economic impact
Finances and funding	3.6. Funding 3.4. Collaboration networks (national and international)
Collaboration	3.4. Collaboration networks (national and international) 3.5. Stakeholders
Human resources	3.2. Human resources development
Infrastructure	3.3. Infrastructure development
Organizational culture and structure	3.1. Organizational structure and processes

SWOT analysis conclusions are further synthesised taking into account the approach of threats and opportunities, weaknesses and strengths (hereinafter – TOWS), which allows to make reasonable conclusions and identify four operational strategies of the organization:

- **MAXI-MAXI** strategies that use the strengths to maximise the benefits of opportunities;
- **MINI-MAXI** strategies that minimise weaknesses, taking into account the benefits of opportunities;
- **MAXI-MINI** strategies that use the strengths to minimise threats;
- **MINI-MINI** strategies that minimise weaknesses to avoid threats⁸.

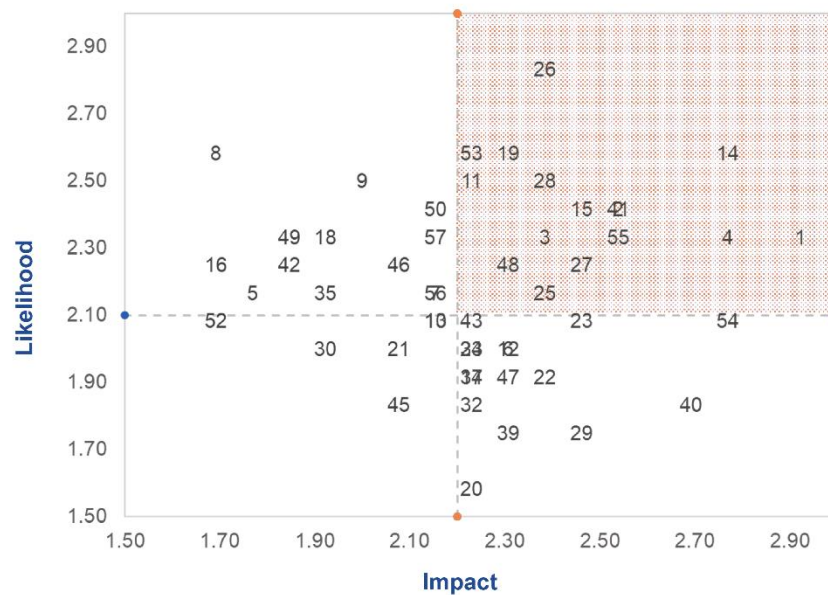
6. Management seminar

Following SWOT and TOWS analysis, KPMG organised a management seminar in order to agree on the key development goals of LIOS Strategy 2027. The seminar is based on a pre-developed “Goal bank” summarising the objectives and activities identified in the previous phases of the analysis (primarily including changes identified in stakeholders working groups and follow-up strategies identified in the TOWS analysis of KPMG experts). The management and members of the Scientific Board evaluated the impact (the extent to which each measure contributes to the implementation of the vision) and likelihood of fulfilment of each objective (the extent to which resources and knowledge of the Institute permits the implementation the

⁸ TOWS Analysis: A Step by Step Guide, available at: <https://blog.oxfordcollegeofmarketing.com/2016/06/07/tows-analysis-guide/>

activity). During the seminar, the results of the “Goal bank” were reviewed (Image 3) and consolidating to identify topics which would form the basis for creating KDG.

Image 3. Results of the “Goal bank” task (Source: KPMG)⁹



7. Assessment of programming documents at the European Union and national level

The vision and mission developed by LIOS and the programming documents at the European and national level were analysed to define the KDG. The analysis resulted in conclusions on the significant external factors affecting key objectives, including available external funding (5.2. Framework of programming documents). The conclusions were used as the basis when drawing up the development plan.

8. Development plan

As part of LIOS Strategy 2027, the development plan was drawn up in line with the identified KDG. The plan was based on a list of objectives and activities included in the “Goal bank”. The plan identified development directions, tasks, resources needed to implement the tasks (human, financial, etc.), potential sources of funding, results to be achieved and performance indicators (indicators; KPI), as well as time schedule.

⁹ The numbers indicate the specific objectives for which the implementation and impact assessment is carried out

3. Profile of the Latvian Institute of Organic Synthesis

LIOS is a public research organization supervised by the Ministry of Education and Science. Its autonomous competence is determined by the Law on Scientific Activity and other regulatory enactments of the Republic of Latvia and the “Regulation of Latvian Institute of Organic Synthesis” (hereinafter – Regulation) approved at the meeting of LIOS Scientific Board of 12 February 2007.

LIOS functions:

1. Carry out basic and applied research in organic chemistry, pharmaceuticals, pharmacology, biology and other fields of science;
2. Search for and research new pharmaceutically active substances, preparations and reagents in order to develop and sell materials and software products necessary for medicine, agriculture and other sectors of the economy;
3. Support higher education, involving students from bachelor's or master's programmes, as well as doctoral candidates in the research activities of the Institute, as well as to implement activities for the development of scientific qualifications in the sector concerned;
4. Within the limits of its competence to provide services in the field of research, including chemical, biochemical, biological and other analyses;
5. Develop external economic collaboration and international relations in science¹⁰.

In order to carry out functions identified, the Institute shall:

1. Promote the practical use of the results of basic and applied research;
2. Manage and implement national and international projects and programmes;
3. Develop and implement programmes and tasks for the development of scientific qualifications;
4. Organise scientific conferences, seminars and lectures;
5. Publish information materials;
6. Establish and maintain a library of specialised literature;
7. Perform other tasks specified in regulatory enactments stating scientific activities of the Institute¹¹.

LIOS was founded in 1957 and specialises in carrying out basic and applied research in organic chemistry, molecular biology and bioorganic chemistry. LIOS researchers carry out basic and applied research in organic, physical and medicinal chemistry, molecular pharmacology and bioorganic chemistry, as well as specialise in drug discovery.

The field of specialisation of LIOS scientific activities according to the definitions in the “Revised field of science and technology classification in the Frascati manual” published by the Organisation for Economic Co-operation and Development (hereinafter – OECD) correspond to the following scientific sectors:

¹⁰ Regulation of public research organization “Latvian Institute of Organic Synthesis”

¹¹ Regulation of public research organization “Latvian Institute of Organic Synthesis”

- sub-branch of pharmacology and pharmacy, as well as medicinal chemistry of the basic medicine subgroup (Group 3.1.) of the group of medical and health sciences (Group 3);
- sub-branch of chemical sciences (Group 1.4) of the natural sciences subgroup (Group 1) of organic chemistry group;
- sub-branch of biological sciences (Group 1.6) of the natural sciences subgroup (Group 1) of biochemistry, molecular biology and biochemical research methods¹².
- Engineering and technology sciences (Group 2) subgroup of Materials engineering (subgroup 2.5.) biomaterials, photonic materials and intelligent materials.

These science sectors are fully in line with Smart Specialization Strategy for Latvia, direction 3 “Sectors with a significant horizontal impact on and contribution to the transformation of the economy”, priority 6 “Knowledge base (bioeconomy; biomedical, medical technology, biopharmacy and biotechnology; intelligent materials, technologies and engineering systems; smart energy, ICT)” and specialisation area 2 “Biomedicine, medical technologies, biopharmacy and biotechnologies”¹³. According to the statistical classification of economic activities in the European Union (hereinafter – the EU) NACE (Rev.2), the main activity of LIOS corresponds to the sector of 72.19 “Other research and experimental development on natural sciences and engineering”¹⁴.

In 2021, the Scientific Board is working on a new research agenda defining two strategic research areas – public health (human health issues) and sustainable chemistry and technologies. Three research sub-areas have been identified for each of the strategic research areas. In the field of public health, these include drug discovery, biomaterials and biomedical probes, and in the field of sustainable chemistry and technology – synthesis methodologies, valorization of renewables and smart materials; Image 4)¹⁵.

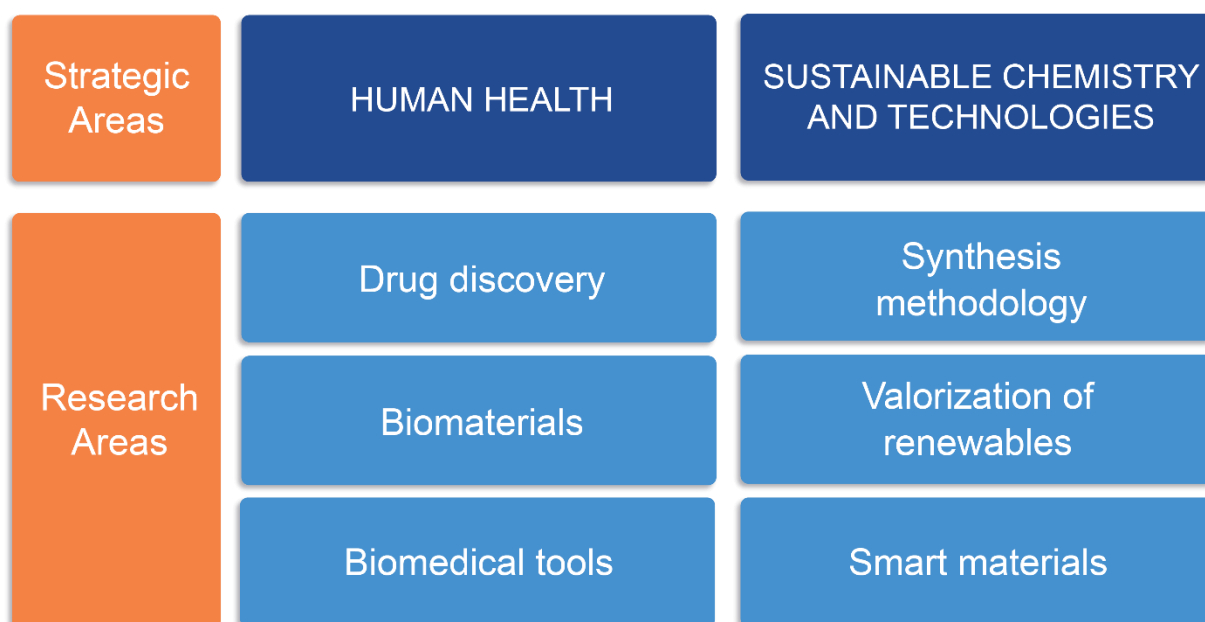
¹² Latvian Institute of Organic Synthesis strategy for 2016–2020, available at: https://www.osi.lv/wp-content/uploads/2013/02/OSI_strategija.pdf

¹³ Smart Specialization Strategy for Latvia, available at: <https://www.izm.gov.lv/lv/viedas-specializācijas-strategija>

¹⁴ Code of economic activities NACE 2.0 rev., available at: <https://nace.lursoft.lv/>

¹⁵ During the development of LIOS Strategy 2027, the research programme is in the development stage and will be available after it is finished.

Image 4. LIOS strategic and research areas (Source: LIOS)



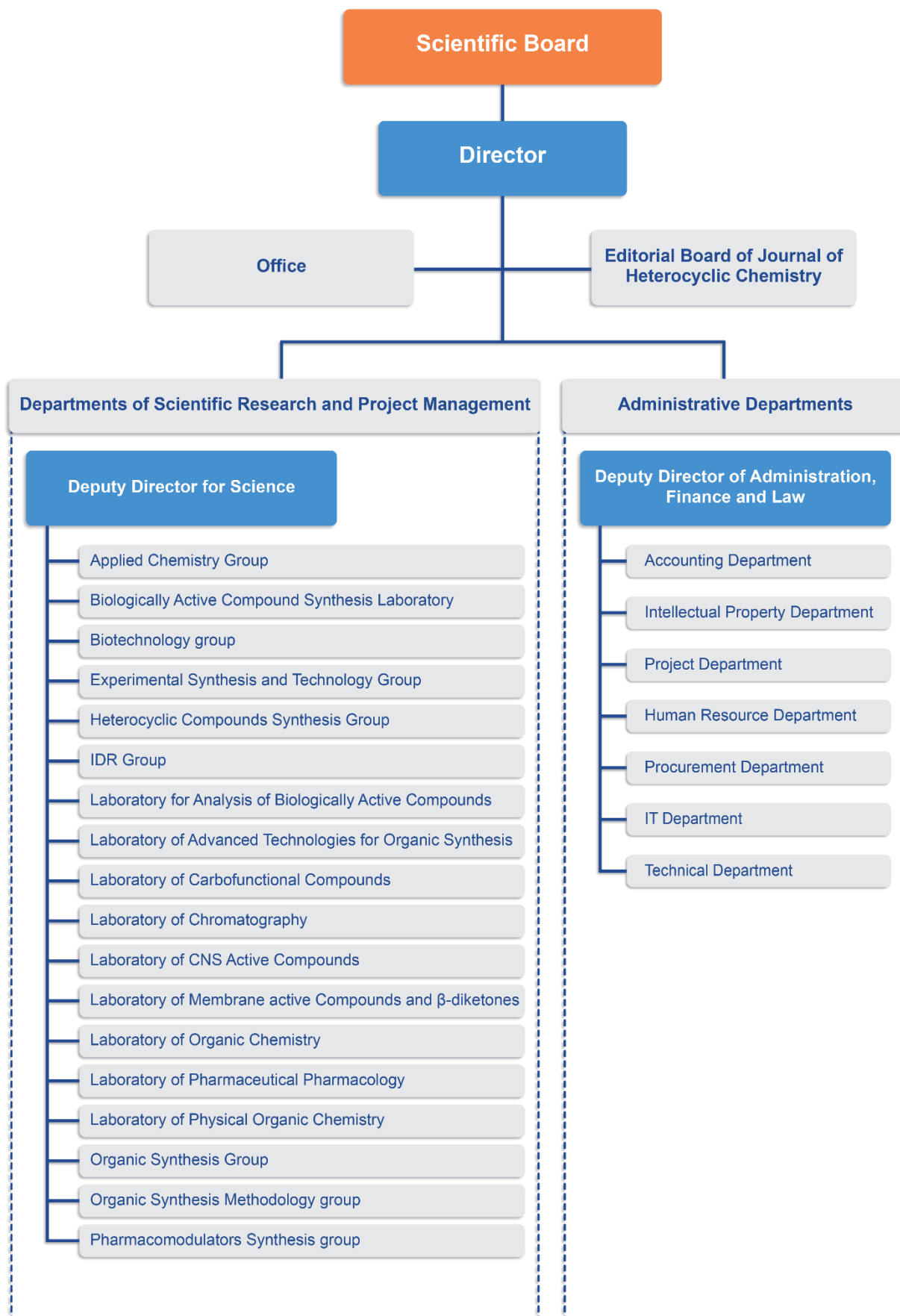
In 2020 the “International evaluation of scientific institutions activity” was concluded, which takes place every 6 years under the Law on Scientific Activity. LIOS received the highest possible rating of all the performance criteria evaluated, becoming the highest rated scientific institution in Latvia for the second time¹⁶. This recognition points out that LIOS belongs to a group of world leaders in the industry.

The functions of the supervisory board at LIOS are performed by the Scientific Board. The Scientific Board decides upon strategic research directions, approves budgets and elects the Director. Members of The Scientific Board are elected by the General Assembly of LIOS. The current members were elected at the end of 2018 their powers expire in December 2022. The senior management of the Institute, which ensures the day-to-day management, is performed by the Director and two Deputy Directors – Deputy Director for Science and Deputy Director of Administration, Finance and Law. LIOS own 17 laboratories (research groups) and 9 administrative departments (Image 5)

¹⁶ Results of 2019 “International evaluation of scientific institutions activity”, available at: <https://www.izm.gov.lv/lv/2019-gada-zinatnisko-instituciju-starptautiskais-novertejums>

Image 5. LIOS Organizational Chart (Source: LIOS)

LIOS Organizational Chart



4. Data-based characterisation of the current situation

This chapter provides a data-based characterisation of the current situation, compiled in a concentrated manner in the SWOT analysis (4.2. SWOT analysis). It is based on a diversified list of sources, as well as various methods of data sourcing and analysis, thereby contributing to a comprehensive and reasonable conclusion. The SWOT conclusions are further synthesized, according to the TOWS approach, which allows to draw conclusions and identify several organizational development strategies and specific actions to be taken (4.1. Key findings on the current situation).

4.1. Key findings on the current situation

The findings on the current situation are structured according to the six dimensions described in Chapter 2 “Development methodology”, providing a complete overview of the Institute’s achievements and operational aspects.

LIOS impact

LIOS is the leading drug discovery and development centre in Baltics and has been announced the best research institute in Latvia according to the last two “International evaluation of scientific institutions activity”. The Institute focuses on research and development of solutions that are important to the society (public health, sustainable chemistry and technology) and has a significant impact not only on the local but also on the international level. LIOS is widely recognized and has sound reputation that promotes the possibility of engaging in negotiations on the development of the national science policy¹⁷. Moreover, this impact extends to scientific, social and economic aspects.

The scientific impact of LIOS is primarily characterized by high-quality scientific results, for example, the proportion of scientific publications in the Top 25% scientific journals and citation impact (Table 2). The positive contribution of LIOS to the development of scientific discipline has also been appreciated by international experts, giving the highest score of “International evaluation of scientific institutions activity” (5 in both the amount and in each of the evaluation criteria). Experts have highlighted that the quantity of scientific results has increased and citation impact rates have also improved, as well as the quality of journals in which the articles of the Institute’s scientists are published. At the same time, the originality of the research topics and issues raised is highlighted, which strengthens the role of LIOS in the global science industry¹⁸. Local experts have also stated during the interviews that LIOS is characterised by “high scientific capacity”, which has a positive impact on the entire scientific community in Latvia¹⁹.

¹⁷ Stakeholders interviews by KPMG in October–November 2021 (Annex 1 – Interviewees).

¹⁸ Results of 2019 “International evaluation of scientific institutions activity”, available at: <https://www.izm.gov.lv/lv/2019-gada-zinatnisko-instituciju-starptautiskais-novertejums>

¹⁹ Stakeholders interviews by KPMG in October–November 2021 (Annex 1 – Interviewees).

Table 2. Individual results of LIOS scientific breakthroughs (Source: LIOS)

LIOS	2016	2017	2018	2019	2020
Proportion of scientific publications in Q1 (Top 25%) scientific journals	26%	28%	29%	39%	52%
Field-weighted Citation Impact	0.63	0.74	0.70	0.82	0.81
Impact factor	n/a	3.25	3.03	3.63	3.30
Number of indexed publications by SCOPUS ^{20 21}	66	572	52	66	98
Proportion of publications developed as a result of international scientific collaboration	29%	49%	46%	59%	44%

LIOS contribution to the discipline of science is facilitated by international collaboration, which is reflected, for example, in the collective publications (Table 2). Some of the most successful results of scientific collaboration in recent years (2019 – 2020):

- Prof. Ivars Kalviņš together with researchers from the Jagiellonian University and Hirsfeld Institute of Immunology and Experimental Therapy (Poland) have identified a new target for anti-metastatic treatment in breast cancer (Cancers 2020, 12(10), 2850, DOI: 10.3390/cancers12102850).
- The group of Prof. Maija Dambrova and the group of Prof. Tatiana Borisova (Palladin Institute of Biochemistry, Ukraine) have described new pharmacological activities of sigma-1 receptor ligands that could be used to better understand the molecular function of the sigma-1 receptor (Experimental Neurology 2020, 333, 113434, DOI: 10.1016/j.expneurol.2020.113434).
- The group of Dr. Pēteris Trapencieris together with researchers from the University of Oxford have identified bicyclic boronates as promising broad-spectrum β -lactamase inhibitors (ACS Infectious Diseases 2020, 6 (6), pp. 1398-1404 DOI:10.1021/acsinfecdis.9b00330).
- The group of Dr. Pavel Aresenyan in collaboration with researchers from the Kaunas University of Technology have contributed to the discovery of new OLEDs (Dalton Transactions 2020, 49 (11), pp. 3393-3397. DOI: 10.1039/d0dt00214c).

²⁰ Results of 2019 “International evaluation of scientific institutions activity”, available at: <https://www.izm.gov.lv/lv/2019-gada-zinatnisko-instituciju-starptautiskais-novertejums>; LIOS Annual Reports for 2019 and 2020, available: <https://www.osi.lv/publiska-informacija/gada-parskati/>

²¹ Number of indexed publications by SCOPUS, available at: <https://www.scopus.com/results/results.uri?sort=plf-f&src=s&sid=a5fc1efdb827c1233839aa2fec48d904&sot=aff&sdt=a&sl=15&s=AF-ID%2860071066%29&origin=AffiliationProfile&editSaveSearch=&txGid=d903dbbaca2f80ebf211d202326d318c>

- Prof. K. Jaudzems together with researchers from Aalto University, VTT Technical Research Centre of Finland, and Max Planck Institute has contributed to the development of biomimetic composites (Sci. Adv. 2019, 5, eaaw2541).
- Group of Prof. E. Suna together with group of Prof. S. Waldvogel from University of Mainz has developed novel electrochemical synthesis of pharmaceutically relevant heterocycles (Chem. Comm. 2019, 12255).
- Dr. M. Makrecka-Kuka and Prof. M. Dambrova have collaborated with researchers from Virginia Tech and University of North Carolina to investigate the cardioprotective mechanism of idebenone (J. Mol. Cell. Cardiol. 2019, 135, 160)²².

Important examples of international collaboration indicate that LIOS research directions are closely linked to public needs (e.g. public health), thereby contributing to the social impact of the Institute. At the same time, it should be pointed out that one of the identified weaknesses is related to the lack of a unique, institute-specific research direction, the development of which enhances LIOS recognition and collaboration capabilities. The ability to adapt to global changes in research directions is therefore of great importance for further development, and the conformity of LIOS with it may change making it difficult to attract funding from the industry as well as for international research programs.

- In addition to addressing societal challenges, the social impact of LIOS also includes the preparation of the new generation of scientists (
- Table 3). High-quality opportunities for students to get involved in science and create thesis under the scientific management of LIOS researchers, as well as the involvement of researchers in the implementation of study programs of various levels are appreciated by representatives of Latvia's largest universities, indicating the desire to develop further collaboration in training of early stage researchers²³. In 2014, a student support program was developed for the development of thesis, within the framework of which EUR 225 thousand were allocated in 2020, but since the beginning of the program, more than EUR 1.5 million²⁴. The Institute involves a large number of students each year in research projects, for example, 80 students were employed in 2020 (Table 3).

Table 3. LIOS involvement in the preparation of the new generation of scientists (Source: LIOS)

LIOS	2016	2017	2018	2019	2020
Holders of Doctoral Degree	2	5	3	7	4
Holders of Master Degree	6	6	5	9	8

²² LIOS Annual Reports for 2019 and 2020, available: <https://www.osi.lv/publiska-informacija/gada-parskati/>

²³ Stakeholders interviews by KPMG in October–November 2021 (Annex 1 – Interviewees).

²⁴ Results of 2019 “International evaluation of scientific institutions activity”, available at: <https://www.izm.gov.lv/lv/2019-gada-zinatnisko-instituciju-starptautiskais-novertejums>; LIOS Annual Reports for 2019 and 2020, available: <https://www.osi.lv/publiska-informacija/gada-parskati/>

LIOS	2016	2017	2018	2019	2020
Holders of Bachelor Degree	n/a	5	10	9	5
Post-doctoral researchers	6	7	9	28	28
Students employed by LIOS	85	80	60	70	80

In order to continue to ensure the successful preparation of the new generation of scientists, LIOS should strengthen collaboration with Latvian and foreign universities in the development and implementation of joint doctoral programmes. During the interviews, representatives of Latvia’s largest higher education institutions confirmed their willingness to strengthen the current lines of collaboration, as well as to develop new ones. One of the development directions is related to the implementation of the Open Science strategy and development of public science, where a significant contribution of LIOS as a leading scientific institute is expected²⁵.

In addition to the impact aspects mentioned above, LIOS also provides a significant contribution to the Latvian economy, which is based on the development of economically viable products and technology transfer. The Institute focuses on drug discovery and development, and regularly patents developed drugs and their use (Table 4).

Table 4. Individual results of LIOS knowledge and technology transfer (Source: LIOS)

LIOS	2016	2017	2018	2019	2020
Patents in Latvia	2	4	0	5	3
International patents	3	2	6	4	4
Industry funding	MEUR 2.9	MEUR 3.9	MEUR 4.1	MEUR 4.3	MEUR 4.6

The economic impact is enhanced by the continued demand in industry for services to address complex research challenges, and the competences of LIOS researchers as well as the developed scientific infrastructure play an important role in meeting them. Despite successful operations to date, the working groups identified the lack of sufficient number of unique products and technologies developed through

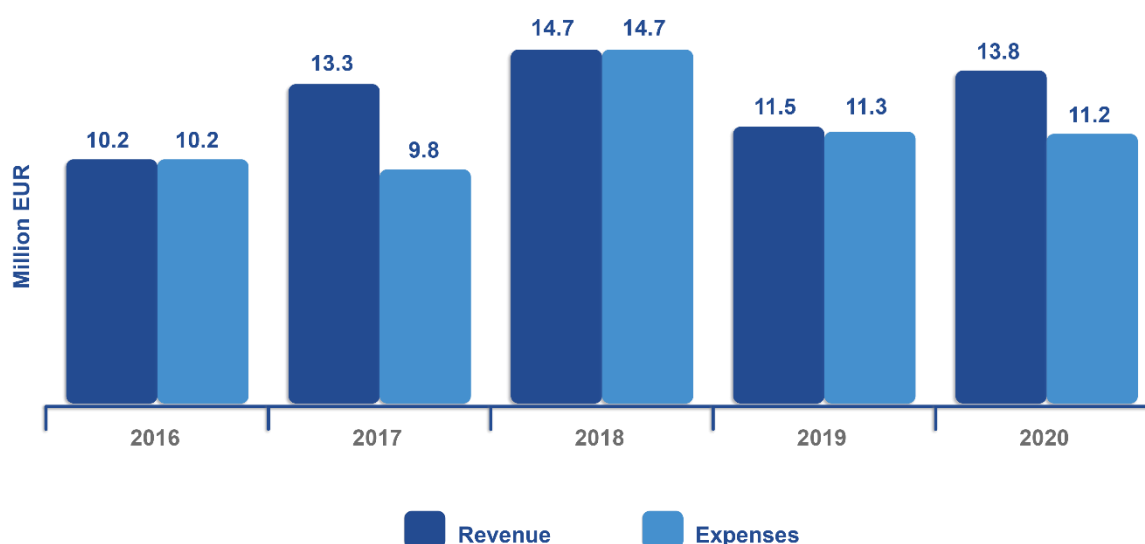
²⁵ Stakeholders interviews by KPMG in October–November 2021 (Annex 1 – Interviewees).

independent research to promote LIOS brand awareness in the industry and in the wider community²⁶. Insufficiently developed technology transfer and business development (especially start-up, spin-off) also prevents from exercising a wider impact. Providing these competencies and capacities within the Institute would allow for a more active involvement in the development of the biomedical industry at the local and international level, using the related opportunities. Continuing and improving collaboration with merchants would allow to adapt to changes brought by modifications in the direction of research in industry, as well as the development of new technologies and research methods²⁷.

Finances and funding

The creation of scientific, social and economic impacts is largely driven by the stable financial situation of LIOS (liquidity ratio 1.85 in 2020; long-term liabilities of 3.85%; Image 6), which provides the necessary investments to realize the vision and development objectives²⁸. There is an internal grant system created for the development of new research directions and supporting students.

Image 6. LIOS revenue and expenses, 2016–2019 (Source: LIOS)



The revenue structure is diversified, with about a third of funding coming from contract work commissioned by the private sector, and two thirds from public funding, thus reducing dependence on a single source of funding.²⁹ At the same time, the pharmaceutical and other industries that use LIOS services, as well as the overall instability of the business environment, represents a significant risk for further funding from the private sector. This is due to the demand for short-term contract work, which

²⁶ Stakeholders working group by KPMG in October–November 2021 (Annex 2 – Working groups).

²⁷ Stakeholders interviews by KPMG in October–November 2021 (Annex 1 – Interviewees).

²⁸ LIOS annual report for 2020, available at: <https://www.osi.lv/publiska-informacija/gada-parskati/>; Stakeholders interviews by KPMG in October–November 2021 (Annex 1 – Interviewees).

²⁹ LIOS Annual Reports for 2019 and 2020, available: <https://www.osi.lv/publiska-informacija/gada-parskati/>

makes impossible to predict the long-term workload of equipment and researchers³⁰. The structure of demand also affects the development of LIOS, as the demand for research intensive services is insufficient, which leads to a focus on more technical services (such as analysis, measuring etc.), which in turn does not promote the development of new competencies³¹. In order to minimise the impact of these risk factors, it is necessary to prepare and develop the service portfolio offered by the Institute, independently develop its niche products and technologies, and to promote long-term collaboration with private sector partners, especially outside Latvia. One more potential solution would be the reduction of fragmentation of research areas and the development of greater synergies between already existing research areas, providing services that cover a wider scope of competencies of the Institute's researchers. The report and interviews of the "International evaluation of scientific institutions activity" called for the establishment of LIOS Fund, thus facilitating the attraction of private donors and providing an additional source of income for the implementation of specific initiatives³².

LIOS is well-known for its high competitive ability in attracting funds indicated by the fact that funding mainly comes from competition based sources (83% in 2019); Annex 3 – LIOS projects providing largest income for the period of 2016–2021;

(Annex 4 – LIOS largest ongoing projects in 2021)³³. The next financial programming period is also linked to a number of options, the use of which could promote the realisation of the Institute's vision. For example, changes in the calculation of the financial reference amount to scientific institutions are planned moving to a results-based approach which, given the research achievements of LIOS described above, could prove beneficial to the Institute. Investments of the EU Structural and Investment Funds, the Recovery and Resilience Mechanism (hereinafter – RRM) and the state budget for the development of research infrastructure, new research directions and human resources are also planned (5.2. Framework of programming documents)³⁴. Despite the positive features of funding sources, it should be borne in mind that the negative economic consequences of the global public health crisis and the need for sustained public budget support for a number of sectors and population could have a negative impact on the fiscal policy in the next years, including state budget expenditures for science and research, as well as provided national co-financing³⁵.

Collaboration

According to the specific nature of the industry represented by LIOS, it appears that collaboration at the local and international level with industrial and academic partners has a particularly important role to play in realising the vision of becoming one of the

³⁰ Stakeholders working group by KPMG in October–November 2021 (Annex 2 – Working groups).

³¹ Stakeholders interviews by KPMG in October–November 2021 (Annex 1 – Interviewees).

³² Stakeholders interviews by KPMG in October–November 2021 (Annex 1 – Interviewees).

³³ Results of 2019 "International evaluation of scientific institutions activity", available at: <https://www.izm.gov.lv/lv/2019-gada-zinatnisko-instituciju-starptautiskais-novertejums>; LIOS Annual Report for 2019, available at: <https://www.osi.lv/publiska-informacija/gada-parskati/>

³⁴ National Development Plan of Latvia for 2021–2027, available at: https://www.pkc.gov.lv/sites/default/files/inline-files/NAP2027_apstiprin%C4%81ts%20Saeim%C4%81_1.pdf, Operational Programme for Latvia for 2021–2027, available at: <https://www.esfondi.lv/planosana-1>; European Union Recovery and Resilience Mechanism Plan, available at: https://www.esfondi.lv/upload/anm/01_anm_plans_04062021.pdf

³⁵ Stakeholders interviews by KPMG in October–November 2021 (Annex 1 – Interviewees).

European leaders in chemistry and biomedicine. A positive feature is that the organizational culture is already open for collaboration, as evidenced by the partners' stating that LIOS is "a leader in collaboration with the industry", "driving force behind the development of the university" "prepared to collaborate"³⁶. Also, the effectiveness of collaboration, the reliability of LIOS, and competence in the management of high profile research projects are characterized by both the number of collective publications with international partners (Table 2) and the funding attracted from the industry (Table 4). However, in order to enhance LIOS impact and quality of the results, it is necessary to improve collaboration between research groups within the Institute, which may create new opportunities for development³⁷.

According to the management, directly targeted involvement in the international scientific community (e.g. Alliance4Life) has been an important starting point in the development of the Institute in the programming period of the previous Institute's strategy (Table 5). Consequently, involvement in international research organizations, councils of scientific institutions and universities, as well as the establishment of research consortia to realize research projects, develop staff competencies, shape the new generation of scientists and influence science policy should be further developed³⁸. Similarly, in the "International evaluation of scientific institutions activity", it is recommended that an international scientific advisory panel is set up to make recommendations for the development of research directions, provide support for the assessment of scientific and industrial trends, serving as another format for collaboration with the scientific community³⁹.

Table 5. Sectoral organizations and consortia in which LIOS is involved in (Source: LIOS)

No.	Organization or consortium
1	EU-OPENSREEN ERIC
2	Alliance4life
3	European Brain and Behaviour Society
4	European Society of Neurochemistry
5	Federation of European Neuroscience Societies
6	European Federation for Medicinal Chemistry (EFMC)
7	European Academy of Sciences and Arts
8	EC Horizon 2020 Programme Committee
9	Baltic Science Network (BSN), International Expert Committee
10	European Association of Research Managers and Administrators (EARMA)
11	European Chemical Society (EuCheMS) Organic Chemistry Division
12	American Chemical Society (ACS)

³⁶ Stakeholders interviews by KPMG in October–November 2021 (Annex 1 – Interviewees).

³⁷ Stakeholders working group by KPMG in October–November 2021 (Annex 2 – Working groups).

³⁸ Stakeholders interviews by KPMG in October–November 2021 (Annex 1 – Interviewees).

³⁹ Results of 2019 "International evaluation of scientific institutions activity", available at: <https://www.izm.gov.lv/lv/2019-gada-zinatnisko-instituciju-starptautiskais-novertejums>

No.	Organization or consortium
13	Mitochondrial Physiology Society
14	Analysis, knowledge dissemination, justice implementation and special testing of novel synthetic opioids (JUSTSO)

Human resources

Unlike the national development programme and the 2014–2020 programming period of the EU funds, which focussed on the development of infrastructure and technological equipment, the development of science human capital, including the renewal of scientific staff and the increase in the number of scientists, has been the priority at the national level during the programming period 2021–2027⁴⁰. LIOS has successfully implemented staff renewal, ensuring that around 41% of research and technical staff and 22% of project managers are under 34 (Table 6). In the future, it may be negatively affected by the insufficient number of students in the field of Science, Technology, Engineering and Mathematics (hereinafter – STEM), including Medicine. Compared to 2016, the number of LIOS scientific staff (full-time equivalent (hereinafter – FTE); Table 6) decreased, therefore, the development objectives highlight the need to attract researchers at different levels and to increase the scientific staff of the Institute (6.2. Development direction, tasks). Staff currently working at LIOS is assessed as internationally competitive, as evidenced by the scientific and economic impact indicators of LIOS. The main improvements to be made in relation to human resources of the Institute are the recruitment of highly-qualified researchers, including foreign researchers. This would contribute not only to the development of the international dimension, but also to increasing the number of experienced research project managers, promoting research capacity, and opening up new collaboration capabilities with other organizations⁴¹.

Table 6. LIOS staff (Source: LIOS)

LIOS	2016	2017	2018	2019	2020
FTE of scientific staff	183.43	156.53	153.34	140.82	143.09
Scientific technical and service staff (FTE)	51.14	52.46	59.92	65.93	62.40
Scientific employees (scientific staff, scientific technical and service staff)	234.57	209.00	213.30	206.80	205.49

⁴⁰ Stakeholders interviews by KPMG in October–November 2021 (Annex 1 – Interviewees); National Development Plan of Latvia for 2021–2027, available at: https://www.pkc.gov.lv/sites/default/files/inline-files/NAP2027_apstiprin%C4%81ts%20Saeim%C4%81_1.pdf; Operational Programme for Latvia for 2021–2027, available at: <https://www.esfondi.lv/planosana-1>

⁴¹ Stakeholders working group by KPMG in October–November 2021 (Annex 2 – Working groups).

LIOS ambition to become a “talent magnet” and to be the industry’s best employer in Latvia is limited by a number of factors to be addressed in order to ensure a high-quality working environment, high worker satisfaction and engagement (5.1. Mission, vision and key development goals of the Latvian Institute of Organic Synthesis). In order to ensure this, a non-discriminatory and inclusive working environment must be developed, including through the full implementation of the principles of gender equality, as well as by providing support for the staff well-being and the balance between work and private life^{42 43}. According to LIOS staff survey, 35% of respondents indicated that support for well-being is the most important factor in promoting a research culture⁴⁴. Whereas, the working groups identified the need to develop a non-monetary motivation system and to promote feedback as part of the organization culture. The current staff reward system has been assessed as well targeted, but in response to changes in external environmental conditions it should also be regularly reviewed to maintain competitiveness of LIOS⁴⁵.

In order to remain competitive in attracting highly-qualified staff, it is necessary to clearly define the career path development, including horizontal development within the organization. The reform of the national academic career system could contribute to this by making it more attractive and motivating students and early stage professionals to participate fully in scientific activities. At the same time as clearly defining the career path, a systematic approach to competence development and further training should be developed, which has been identified by the LIOS staff working group as one of the weaknesses of the Institute⁴⁶. Without an efficient development system, it will not be possible to successfully overcome challenges related to industry trends, such as highest level digital research competencies⁴⁷.

Infrastructure

LIOS operates in a technologically intensive science sector, so the availability of the most advanced technologies is essential for competitiveness. Both international and local experts have stated that LIOS owns world-class equipment aligned to key research directions (organic chemistry, medical chemistry, pharmacology, physical organic chemistry)^{48 49}. This was achieved by making significant (approx. EUR 30 million) investments in the renovation of research infrastructure and equipment during the previous programming period⁵⁰. Maintaining the size of investment could be negatively affected by changes in national priorities, for example by reducing the annual level of investment for the maintenance and development of infrastructure and the material and technical base, in order to find funding in addition to investments in

⁴² Stakeholders working group by KPMG in October–November 2021 (Annex 2 – Working groups).

⁴³ LIOS survey of staff’ perception of institutional environment and research culture, conducted in September 2021. 27% of respondents indicated that they faced discrimination in the working environment.

⁴⁴ LIOS survey of staff’ perception of institutional environment and research culture, conducted in September 2021.

⁴⁵ Stakeholders working group by KPMG in October–November 2021 (Annex 2 – Working groups).

⁴⁶ Stakeholders working group by KPMG in October–November 2021 (Annex 2 – Working groups).

⁴⁷ Stakeholders interviews by KPMG in October–November 2021 (Annex 1 – Interviewees).

⁴⁸ LIOS equipment, available at: <https://www.osi.lv/petnieciba/resursi/>

⁴⁹ Results of 2019 “International evaluation of scientific institutions activity”, available at: <https://www.izm.gov.lv/lv/2019-gada-zinatnisko-instituciju-starptautiskais-novertejums>; Stakeholders interviews by KPMG in October–November 2021 (Annex 1 – Interviewees).

⁵⁰ Results of 2019 “International evaluation of scientific institutions activity”, available at: <https://www.izm.gov.lv/lv/2019-gada-zinatnisko-instituciju-starptautiskais-novertejums>

human capital of science in Latvia. While investment in the human capital of the scientific sector is critical, it is also essential to ensure that infrastructure investments are maintained at an appropriate level in order to respond to technological innovations that can create a new competitive advantage, and to take the opportunities and avoid risks related to the impact of digital transformation trends on the research process (e.g. more efficient use of machine learning, automation, computer modelling (in-silico))⁵¹.

As major constraints on infrastructure development and use, the following was identified: slow deployment of the latest technologies in drug discovery, as well as insufficient infrastructure service that limits both the use of infrastructure and equipment and burdens scientists with technical tasks, preventing them from fully focusing on research activities. The solution proposed by the working group is an infrastructure and technological development plan which would clearly define the needs of technological, scientific technical staff and services and their priority in order to plan and attract the necessary funding accordingly⁵².

Current load of equipment amounts to 80%, indicating it is used effectively⁵³. Laboratories are also used appropriately, but there is insufficient space available for one employee in individual laboratories⁵⁴. For example, according to the internal analysis of LIOS at the beginning of 2021, the space for one scientific employee in different departments ranges from 9 m² to 33 m² (the minimum space per scientific employee is 12 m²). In order to address this, more flexible collaboration between research groups should be promoted, including transparent and efficient use of infrastructure and shared resources (including premises). Please refer to Image 7 for total space of LIOS premises. Regarding the high quality of equipment available, the sharing of research infrastructure must be improved, which could be facilitated by targeted development of the national core facility within LIOS. In order to facilitate its establishment and the achievement of the desired results, it is essential to establish a governance model that facilitates the efficient service of research teams and creates wider synergies⁵⁵.

⁵¹ Stakeholders interviews by KPMG in October–November 2021 (Annex 1 – Interviewees).

⁵² Stakeholders working group by KPMG in October–November 2021 (Annex 2 – Working groups).

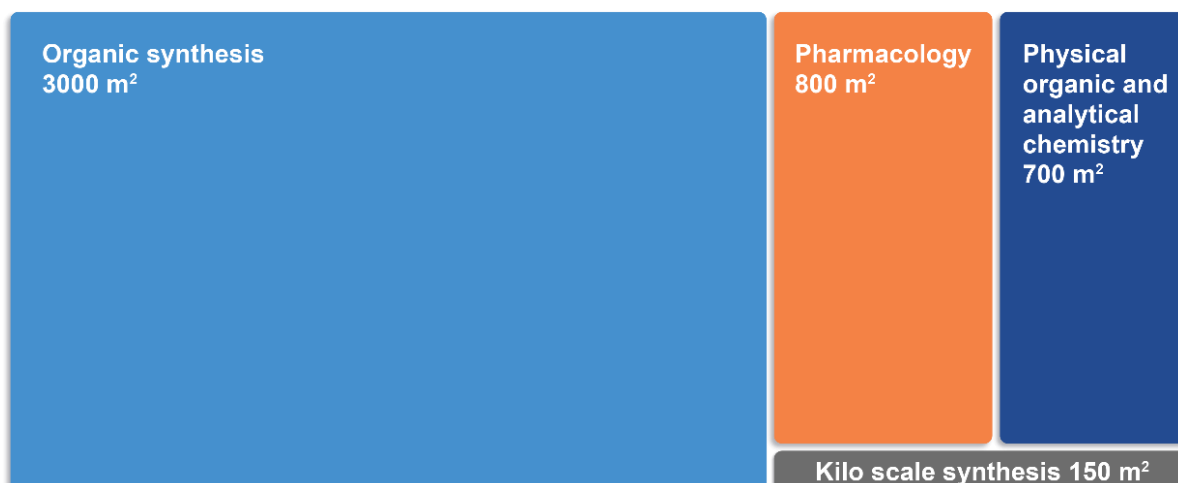
⁵³ Results of 2019 “International evaluation of scientific institutions activity”, available at:

<https://www.izm.gov.lv/lv/2019-gada-zinatnisko-instituciju-starptautiskais-novertejums>

⁵⁴ Stakeholders working group by KPMG in October–November 2021 (Annex 2 – Working groups).

⁵⁵ Stakeholders interviews by KPMG in October–November 2021 (Annex 1 – Interviewees); Stakeholders working group by KPMG in October–November 2021 (Annex 2 – Working groups).

Image 7. LIOS laboratories Size of (Source: LIOS)



Taking into account the energy consumption needed for the research process, a major threat is increased energy costs as a result of various circumstances, including policies on reducing the climate change. Tasks related to the improvement of energy efficiency, the principles of the circular economy and the reuse of resources, as well as other tasks, should be taken to reduce or eliminate existing risks⁵⁶.

Organizational culture and structure

According to the Law on Scientific Activity, LIOS is managed by the Director, who is elected by the Scientific Board for a period of four years, and by Deputy Directors, jointly forming the executive authority of the Institute. The separation of the supervisory and executive bodies of LIOS and the definition of tasks and responsibilities is carried out together with the Scientific Board in order to avoid conflicts of interest if the decision-making and supervisory bodies are not completely separated from the executive authority⁵⁷. LIOS own 17 laboratories (research groups) and 9 administrative departments (Image 5). During the interviews, independence of the research groups was identified as one of the strengths of the organizational structure, promoting high-quality research⁵⁸. At the same time, internal collaboration and circulation of information should be improved in order to support a consolidated internal culture of the organization to avoid internal disintegration of teams⁵⁹. It is also affected by the non-flexible organization culture characteristic of scientific institutions, linked to the duration of scientific career development and the significant investments made by both researchers and scientific institutions, which can slow down the development of new research directions and the exploitation of promising development opportunities⁶⁰.

Despite good research results, it is recommended to improve the management of technology transfer and related business development activities, incl., by increasing the capacity of the Institute and introducing centralized and coordinated recording of

⁵⁶ Stakeholders interviews by KPMG in October–November 2021 (Annex 1 – Interviewees).

⁵⁷ LIOS Annual Reports for 2019 and 2020, available: <https://www.osi.lv/publiska-informacija/gada-parskati/>

⁵⁸ Stakeholders interviews by KPMG in October–November 2021 (Annex 1 – Interviewees).

⁵⁹ Stakeholders working group by KPMG in October–November 2021 (Annex 2 – Working groups).

⁶⁰ Stakeholders interviews by KPMG in October–November 2021 (Annex 1 – Interviewees).

technology transfer activities⁶¹. At the same time, the members of the working groups have pointed out that the administrative management load and the fragmentation of the activities of leading researchers between the various projects limit the development of new strategic initiatives. Therefore it is necessary to strengthen the various types of support functions, mechanisms and structures, such as support for high-quality pre-awards for EU Framework Program⁶².

The Institute must also take into account changes in the system of higher education and science management, therefore closer institutional collaboration with other state research institutes should be considered, for example, by forming joint councils, it is necessary to maintain scientific, financial and institutional independence, which is especially important in the Institute's culture⁶³.

4.2. SWOT analysis

SWOT analysis describes various aspects of LIOS operations – infrastructure, human resources, collaboration networks (national and international), stakeholders, funding, organizational structure and processes, scientific and socio-economic impact, as well as other external environmental factors. The analysis is based on a variety of sources of information, thus ensuring a data-based analysis, the reliability of the conclusions reached and also the relevance of LIOS.

⁶¹ Stakeholders interviews by KPMG in October–November 2021 (Annex 1 – Interviewees).

⁶² Stakeholders working group by KPMG in October–November 2021 (Annex 2 – Working groups).

⁶³ Development of strategic positioning, vision and mission of LIOS, Vidzeme University of Applied Science (Gatis Krūmiņš, Zigurds Zaķis and Iveta Putniņa), 2021

Strengths	Weaknesses
<p>Impact</p> <ul style="list-style-type: none"> • High-quality research with significant impact on the science sector globally • Most of the research articles are published in the Q1 journals (CiteScore) • High average impact factor for journals publishing LIOS research articles • Research directions are closely related to societal needs (human health, sustainable chemistry and technology) • The highest rating in the “International evaluation of scientific institutions activity” among Latvian scientific institutions • Significant contribution to the preparation of Latvian students at bachelor’s, master’s and doctoral level 	<p>Impact</p> <ul style="list-style-type: none"> • Lack of a unique, institute-specific research direction that promotes recognition and collaboration capabilities within the sector • Lack of a unique product that would promote LIOS brand recognition in the wider community • Insufficiently developed technology transfer and business (start-up, spin-off) development

Strengths	Weaknesses
<p>Human resources</p> <ul style="list-style-type: none"> • Internationally competitive research staff • Preconditions for attracting highly-qualified foreign and local researchers • Successful renewal of research staff • Targeted staff rewarding system 	<p>Human resources</p> <ul style="list-style-type: none"> • Significant proportion of staff believes they have encountered discrimination in the working environment • Lack of experienced research project managers and high level researchers • Lack of competence and infrastructure for the highest level digital research • Insufficient use of the non-monetary motivation system and poorly developed cross-feedback • Lack of a clearly defined and communicated career development path, including horizontal development within the organization • Lack of a systematic approach to competence development and further training • Insufficient support to staff well-being, incl. the balance between work and private life • Incomplete implementation of gender equality principles, including gender imbalance in the management positions

Strengths	Weaknesses
<p>Infrastructure and resources</p> <ul style="list-style-type: none"> • Highest level research infrastructure and equipment available according to the main research directions of the Institute • The Institute’s researchers have access to the latest scientific discoveries by subscribing to databases recognised by the international scientific community • Secured financially significant investments in renovation of research infrastructure and equipment • Infrastructure is utilized to 80%, its use is considered to be effective 	<p>Infrastructure and resources</p> <ul style="list-style-type: none"> • Slow deployment of the latest technologies in drug discovery • Insufficient infrastructure service that limits the use of infrastructure and equipment and burdens scientists • Lack of infrastructure and technological development plan • Insufficient space in individual laboratories, taking into account the number of staff concerned
<p>Finances and funding</p> <ul style="list-style-type: none"> • Stable financial situation and independence ensuring the development of the Institute as well as a diversified revenue structure reduces the risk and dependence on a single source of funding • High competitiveness in attracting funds with most funding coming from competition based sources • High share of revenue from industry in total revenue, the leader among scientific institutions in Latvia in collaboration with the industry • Advanced internal grant system • for developing new research directions and supporting students 	<p>Finances and funding</p> <ul style="list-style-type: none"> • Fragmentation of research funding and areas • Lack of portfolio of services offered by the Institute

Strengths	Weaknesses
<p>Collaboration</p> <ul style="list-style-type: none"> • Trusted partner in international research projects • Targeted engagement in the international scientific community to increase the impact (e.g., Alliance4Life) • Significant proportion of publications developed as a result of international scientific collaboration • High reputation and professionalism as a basis for collaboration with industry 	<p>Collaboration</p> <ul style="list-style-type: none"> • Insufficient level of collaboration between research groups
<p>Organizational culture, structure</p> <ul style="list-style-type: none"> • Widespread recognition, good reputation and resources to influence the national science policy • Independence and flexibility of research groups 	<p>Organizational culture, structure</p> <ul style="list-style-type: none"> • Insufficient visibility of LIOS in the public, including insufficient collaboration with policy makers • Lack of centralized and coordinated recording and management of technology transfer and related business activities • Insufficiently developed pre-award support mechanisms for EU Framework Program project applications • Administrative management burden and fragmentation of activities of leading researchers between the various projects limit the development of new strategic initiatives

Opportunities	Threats
<p>Impact</p> <ul style="list-style-type: none"> Continued demand in industry for services to address complex research challenges Development of new, science-intensive technologies in the pharmaceutical industry Development of the local industry 	<p>Impact</p> <ul style="list-style-type: none"> Global changes in research directions in industry as well as in international research programs may reduce the current overlap with the research directions developed by LIOS
<p>Human resources</p> <ul style="list-style-type: none"> Developing human capital – renewal of scientific staff and increasing the number of scientists – as a national priority for which access to financing instruments is expected Open labour market and capability to attract foreign scientists Reform of the national academic career system 	<p>Human resources</p> <ul style="list-style-type: none"> Insufficient number of STEM students can lead to a significant increase in competition for highly-qualified staff
<p>Infrastructure and resources</p> <ul style="list-style-type: none"> Targeted development of the national core facility Applying the results of digital transformation during the research process Improving energy efficiency in line with climate change mitigation priorities Implementation of the principles of circular economy 	<p>Infrastructure and resources</p> <ul style="list-style-type: none"> Decrease in investment for the maintenance and development of infrastructure and the material and technical base, by redirecting resources at the national level to human resources development Increased energy costs Collaboration between various institutions in research data management is not properly organized at the national level Incomplete translation research ecosystem at the national level, such as lack of Phase 1 clinical studies infrastructure

Opportunities	Threats
<p>Finances and funding</p> <ul style="list-style-type: none"> • Change of the calculation of the financial reference amount to scientific institutions to a results-based approach • Availability of EU Structural Funds, RRM and national co-financing for the development of research infrastructure and implementation of new research directions in accordance with the recommendations of the “International evaluation of scientific institutions activity” • Attracting funding available under 	<p>Finances and funding</p> <ul style="list-style-type: none"> • Instability in the industry and the business environment • Cyclicity of ESIF and other public funding • Economic shocks caused by the global public health crisis may adversely affect the fiscal policy, including state budget expenditures for science and research
<p>Collaboration</p> <ul style="list-style-type: none"> • Involvement in research organizations at international level, Boards of scientific institutions and universities • Collaboration with universities to develop LIOS transferable skills • Implementation of the international scientific advisory panel • Establishment of research consortia with local and foreign universities and scientific institutes • Closer institutional collaboration with other national scientific institutes, e.g. by forming joint councils 	<p>Collaboration</p> <ul style="list-style-type: none"> • Insufficient demand in the local industry for research intensive services offered by LIOS

Opportunities	Threats
<p>Organizational culture, structure</p> <ul style="list-style-type: none"> • Implementation of the Open Science strategy and development of public science • Collaboration with Latvian and foreign universities in the development and implementation of doctoral programmes • the RRM Excellence Grants Program • Establishment of LIOS Fund 	<p>Organizational culture, structure</p> <ul style="list-style-type: none"> • Decreased level of autonomy as a result of reforms in the public research and higher education governance system • Lack of collaboration between research groups, as well as the dominance of such financial instruments that mainly involve foreign researchers, can have a negative impact on the organization's internal culture • Non-flexible (conservative) organization culture characteristic of scientific institutions resultant from the duration of scientific career development • Incorrectly selected core facility management model may hinder provision of efficient serves to research groups and prevent from achieving expected synergies

5. Strategic framework

The strategic framework is formed of the mission, vision and operational principles established under the “Development of strategic positioning, vision and mission of LIOS”⁶⁴ project and the key development goals. A description of the framework for programming documents is also provided, indicating the context that impacts the establishment of LIOS Strategy 2027.

5.1. Mission, vision and key development goals of the Latvian Institute of Organic Synthesis

It is important to respect the main **operational principles** during the day-to-day activities and planning the strategic development of LIOS. Compliance with these principles is equally important for everyone – scientists, administration and staff assisting to the scientists. The principles – the Institutes scientific excellence and international performance, LIOS as the most desired employer and a cooperation nexus, as well as historical continuity.

Scientific excellence

The historically high scientific standards of LIOS are maintained by helping address the objectives set by the European Union and the UN for improving the health of humanity. Our discoveries create new means of medical treatments and future materials. Strong technical base and experience can deliver outstanding results in a variety of chemical and biomedical spheres, as evidenced by high-quality scientific publications and registered patents.

The most desired employer

Taking care of the careers of more than 300 employees, LIOS is the industry’s best employer in Latvia. The institute is an ecosystem where students and early stage specialists may grow rapidly, and the top-level scientists can realize the most audacious ambitions. An international team and countless partnerships also make LIOS a prestigious workplace outside Latvia. At the same time, our aim is an effective balance between work and private life.

A cooperation nexus

LIOS is a collaboration partner demanded in Latvia and other countries around the world, able to adapt quickly to the situation and focus its activities in new directions. Our activity is based on high science-intensive collaboration with the industry and active participation in international scientific networks. Together with several universities in Latvia and Europe we are preparing the next generation of scientists. The Institute’s unique infrastructure is open to public-private partnership projects, bold start-up experiments, cross-sectoral ideas and digital innovations. Collaboration within the Institute inspires innovative thinking and cross-sectoral initiatives.

⁶⁴ Development of strategic positioning, vision and mission of LIOS, Vidzeme University of Applied Science (Gatis Krūmiņš, Zigurds Zaķis and Iveta Putniņa), 2021

International performance

For the tenth consecutive year, LIOS has been internationally appraised as the best research institute in Latvia. From a trusted partner, we become an international research leader with unique competencies and tools to make new scientific discoveries. By attracting the best specialists, we adapt the experience and knowledge acquired in other countries to the needs of Latvia. Our discoveries are published by the world's most prestigious scientific journals.

Historical continuity

Since establishment in 1957, LIOS ambitions and exactingness has been passed down for generations. After restoration of Latvia's independence we took advantage of the new opportunities provided by the access to the global science space, pharmaceutical industry and information technologies. The Institute became a modern leader in drug discovery and development. The great proportion of new scientists shows that we are in the position to fight for a place at the forefront of the Latvian and European science in the future.

Statement / slogan / brand DNA

LIOS statement, slogan and brand DNA preparation was carried out by the experts from the Vidzeme University of Applied Science Gatis Krūmiņš, Zigurds Zaķis and Iveta Putniņa (Table 7).

Table 7. LIOS statement, slogan and brand DNA

Leader of chemistry and biomedicine	Understand. Discover. Create.	
No. 1 in the industry	Innovation leader	Cure through knowledge
No. 1 in Latvia	Create new opportunities	Strength of knowledge
Traditions of excellence	Next milestone	

CURE THROUGH KNOWLEDGE

Mission and vision

Mission and vision is formulated at two levels – institutional and global or scientific industry level. At the institutional level LIOS as a research institute is an important part of the science ecosystem, while globally LIOS focuses on contribution to the society in general.

The vision of LIOS at the global and scientific level – a global knowledge society. Meaning – the activities of the Institute must contribute to increase the overall level of public education by encouraging the development of the knowledge-based society. This can be achieved by the Institute by implementing its mission, i.e. to lead disciplinary developments and scientific growth.

The vision of LIOS as an institution is to become one of the European leaders in chemistry and biomedicine, in which vivid personalities, scientific ideas and new products are created and developed. The institutional mission – Latvian Institute of Organic Synthesis addresses global challenges of human well-being and health (Image 8).

Image 8. Mission, vision, activities and principles of LIOS (Source: LIOS)



Key development goals

Key development goals (hereinafter – KDG) defined in line with the vision and mission of LIOS, as well as European and national programming documents (Table 8).

Table 8. Key development goals

<p>Goal 1 (G1.) Excellent research contributing to the achievement of human health objectives</p>	<p>G2. Creation of an internationally recognized scientific ecosystem and development of a new generation of scientists in Latvia</p>	<p>G3. Knowledge and technology transfer based on science-intensive collaboration for the development of local and international (chemical and biomedical) industries</p>
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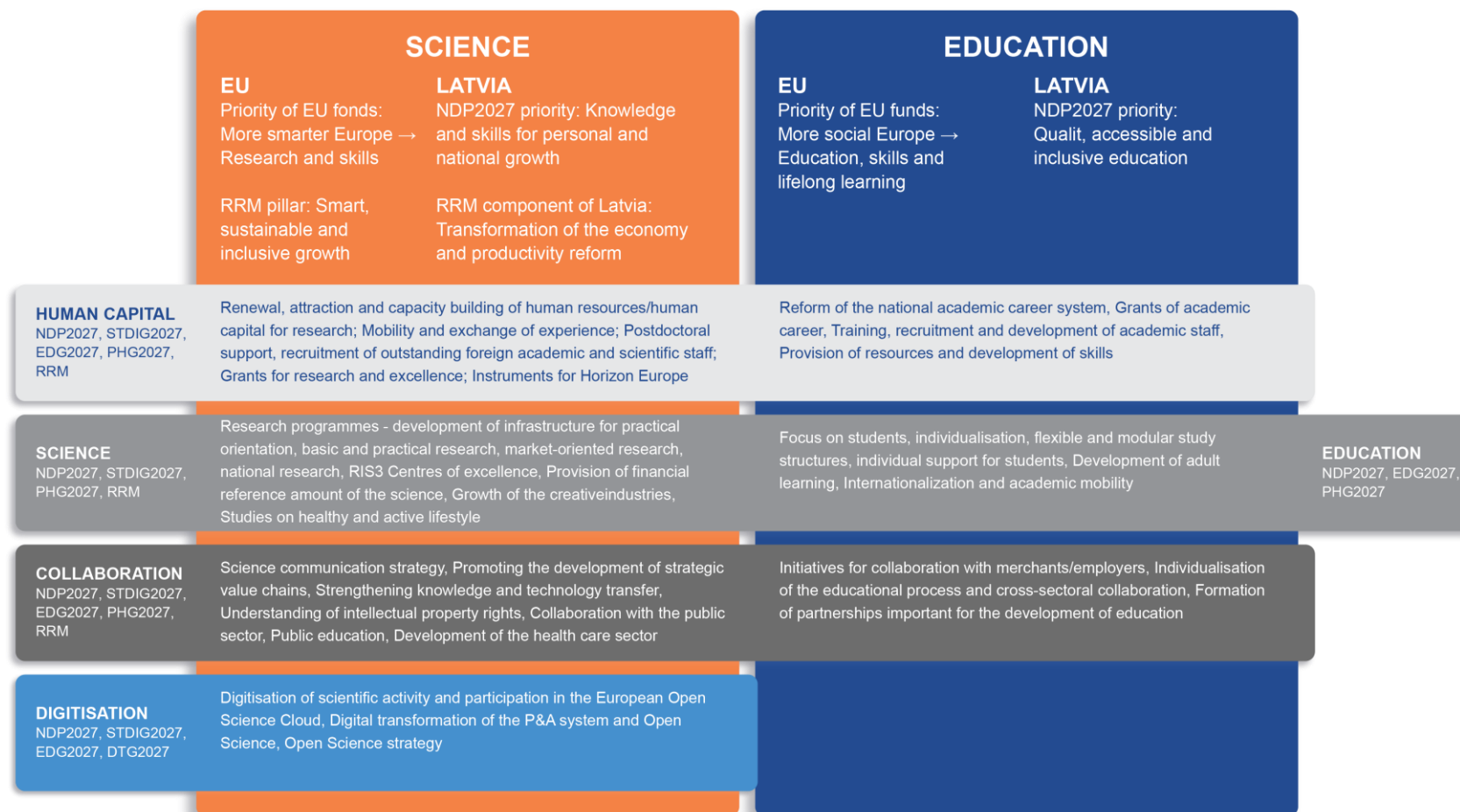
5.2. Framework of programming documents

As a result of assessment of the national and EU policy, KPMG experts prepared a summary of priorities defined in the programming documents. The overall framework of priorities is summarized below (Image 9), showing that all priorities can be divided into 2 main blocks – Science and Education – and into 3 “horizontal” blocks – Human Capital, Collaboration and Digitalisation. This order of priority shows how important and how often each of the aspects in general is mentioned in the programming documents.

Comparing the priorities of the programming documents with the KDG defined above, they appear to be mutually agreed:

- Both the programming documents and LIOS strategy emphasizes the importance of science and knowledge for personal, national and economic growth, which is strongly influenced by the development of **research and academic staff**, as well as the provision of **quality, accessible and inclusive education**. KDG defined by LIOS include both aspects, towards the achievement of outstanding and usable research results, creation and development of the scientific ecosystem, and the transfer of knowledge to the industry.
- The achievement of EU and national goals is supported by setting priorities – collaboration (including knowledge transfer and commercialization) and digitalisation – which are further included in the directions of LIOS development strategy, such as collaboration with universities and the industry, and technological innovation according to research needs.

Image 9. Key priorities of programming documents at EU and national level (Source: KPMG)⁶⁵



⁶⁵ Priority of EU funds – Operational Program for Latvia for 2021–2027; NDP2027 – National Development Plan of Latvia for 2021–2027, priorities; STDIG2027 – Science, Technology Development and Innovation Guidelines; EDG2027 – Education Development Guidelines 2021–2027; PHG2027 – Public Health Guidelines for 2021–2027; RRM – Recovery and Resilience Mechanism; DTG2027 – Digital Transformation Guidelines for 2021–2027.

6. Development plan

In accordance with the defined mission and vision of LIOS, for each of the three key development goals, four development directions (hereinafter – DD) were prepared, which characterize the key actions to ensure the achievement of the goals set (Table 9).

Table 9. Key development goals of LIOS and development directions

Goal 1 (G1.) Excellent research contributing to the achievement of human health objectives	G2. Creation of an internationally recognized scientific ecosystem and development of a new generation of scientists in Latvia	G3. Knowledge and technology transfer based on science-intensive collaboration for the development of local and international (chemical and biomedical) industries
DD 1.1. Development of research groups for excellence	DD 2.1. Providing a comprehensive and motivating career development support system	DD 3.1. Development of the service portfolio offered by the Institute and sales promotion
DD 1.2. Improving the productivity and efficiency of the support system for scientific activity	DD 2.2. Targeted attraction of highly-qualified local and foreign scientists	DD 3.2. Development of competencies and capacity of knowledge and technology transfer
DD 1.3. Ensure access to relevant research infrastructures and technologies	DD 2.3. Development of synergistic collaboration in the establishment of the scientific ecosystem	DD 3.3. Development of infrastructure and technology to realise existing and new commercial opportunities
DD 1.4. Promoting the exchange of successful research ideas and strengthening internal collaboration	DD 2.4. Improving the communication of research achievements and public engagement	DD 3.4. Improving and diversifying forms of collaboration with local and international industries

For each DD, the tasks defined in the “Goal bank” are selected, identifying the necessary resources, the sources of funding, the parties responsible and co-responsible and the due date (6.2. Development direction, tasks).

6.1. Results to be achieved and performance indicators of the Strategy

Within the framework of the development plan, the performance indicators are first defined, indicating their reference values (in 2020 or the last available ones), the target values to be achieved in 2024 and 2027, as well as the measurement unit and the compilation period (Table 10)

Table 10. Results to be achieved and performance indicators of the development plan

KDG	Performance indicator	Reference value (year)	Value in 2024	Value in 2027	Measurement unit	Period
KDG1	Proportion of scientific publications in Q1 (Top 25%) scientific journals	53% (2020)	60%	67%	%	Once a year
KDG1	Field-weighted Citation Impact	0.82 (2020)	1.2	1.4	n/a	Once a year
KDG1	International evaluation of scientific institutions activity	5 (2019)	5.0	5.0	Points	Once a period (2025)
KDG1	Number of research projects as lead partner/coordinator	2 (2021)	2.0	3.0	Number of projects	Cumulatively over the last 3 years
KDG1	Number of pillars of EU Framework Program excellence grants	5 (2021)	7	10	Number of projects	Cumulatively over the last 3 years
KDG1	Investments in research infrastructure and equipment over the last 3 years	4.5 (2021)	8.0	12.0	MEUR	Cumulatively over the last 3 years
KDG1	Establishment of the national core facility ⁶⁶	0 (2021)	1.0	1.0	Item	Once a period
KDG2	Number of thesis (master's and doctoral) written and defended in collaboration with LIOS	MSc - 22, Dr - 14 (2021)	MSc - 25, Dr - 16	MSc - 26, Dr - 17	Number of the thesis	Cumulatively over the last 3 years
KDG2	Proportion of scientific and scientific technical staff (incl. project managers) under 34 ⁶⁷	41% (incl. project managers – 22%); 2021)	>41% (incl. project managers – >22%)	>41% (incl. project managers – >22%)	%	Once a year
KDG2	Increase of scientific employees, %	-	15%	30%	%	Once a year
KDG2	Share of foreign researchers in total research staff	10% (2021)	10%	15%	%	Once a year

⁶⁶ During the establishment of the national core facility, performance indicators can be identified that should be included in the list of results to be achieved and performance indicators by LIOS Strategy 2027.

⁶⁷ The age chosen relates to a number of aspects: 1) available statistics by age cohorts (for example, 25–34 years), 2) group of early stage doctors, including doctors of Science up to age 35 (for example, here: https://www.izm.gov.lv/lv/petijums-par-augstakas-izglitiba-parvaldibu-sadarbiba-ar-pasaules-banku/doktori_info_apskats_191020171_1.pdf) or who have been employed in science for 2–7 years (for example, here: <https://erc.europa.eu/funding/starting-grants>)), taking into account that degree of the doctor of Medical Science or Health Science is obtained at age (median) 31.

KDG	Performance indicator	Reference value (year)	Value in 2024	Value in 2027	Measurement unit	Period
KDG2	Proportion of collective publications with international partners from the total number of scientific publications	50% (2018-2020)	50%	50%	%	Cumulatively over the last 3 years
KDG2	Assessment of staff satisfaction and sense of belonging ⁶⁸	n/a	<i>To be updated</i>	<i>To be updated</i>	n/a	Once in two years
KDG2	Number of LIOS membership in international organizations and consortia	14 (2019)	16	18	Number of organizations	Once a year
KDG2	Development of gender equality plan ⁶⁹	0 (2021)	1	1	Item	Once a period
KDG3	Revenue from industry	4.6 (2020)	5	5.5	MEUR	Once a year
KDG3	Number of intellectual property objects ⁷⁰	42 (2021)	30	15	Number of objects	Once a year
KDG3	Establishment of LIOS-HUB ⁷¹	0 (2021)	1	1	Item	Once a period

Monitoring the implementation of LIOS Strategy 2027 means regularly evaluating progress of the results to be achieved and the performance indicators. When evaluating progress of the performance indicators, proposals for the Strategy updating will be prepared, which will be implemented at least once in the programming period (in 2024). At the same time, taking into account changes in the external environment (for example, regulatory enactments, market changes) or in the internal activities of the Institute, LIOS Strategy 2027 may be updated more frequently by preparing an action plan for the next year. The executive authority of LIOS – Director and Deputy Directors – is responsible for supervision, although the monitoring report and changes planned are approved by the Scientific Board.

⁶⁸ During the development of the methodology for assessing staff satisfaction and sense of belonging, performance indicators can be identified that should be included in the list of results to be achieved and performance indicators by LIOS Strategy 2027.

⁶⁹ During the development of the gender equality plan, performance indicators can be identified that should be included in the list of results to be achieved and performance indicators by LIOS Strategy 2027

⁷⁰ It is necessary to reassess existing IP items and decide on their continued maintenance. As a result, the number of IP items could be reduced by keeping only IP items with comprehensively assessed commercial potential

⁷¹ During the establishment of LIOS-HUB, performance indicators can be identified that should be included in the list of results to be achieved and performance indicators by LIOS Strategy 2027.

6.2. Development direction, tasks

According to the defined KDG, the development plan has been drawn up which sets out the course of action, tasks⁷², resources and sources of funding needed to implement the tasks, as well as the time schedule and persons and/or departments responsible (Annex 5 – Detailed LIOS development plan). The plan shall be updated at least annually within the session of budgetary planning. Particularly, the plan should highlight the tasks that should be funded by centrally managed overhead.

6.2.1. KDG1: Excellent research contributing to the achievement of human health objectives

No. of DD	Development direction	Task No.	Tasks	Deadline/time schedule	Responsible person	Co-responsible person
1.1.	Developing research teams for excellence	1.1.1.	Targeted attraction of highly-qualified scientists	31.12.2027	Deputy Director of Administration, Finance and Law	Deputy Director for Science
		1.2.1	Defining clear criteria for setting up and maintaining the research group	31.12.2022	Deputy Director of Administration, Finance and Law	Deputy Director for Science
		1.1.3.	Improving the circulation of internal information by ensuring uniform participation in major project applications	Continuously	Deputy Director of Administration, Finance and Law	Project Department
		1.1.4.	Systematic and targeted training for the improvement of competencies, such as project writing, management, etc.	Continuously	Deputy Director of Administration, Finance and Law	Deputy Director for Science

⁷² During the work, several formulations of tasks were identified, the implementation of which applies to different KDO's and CA's. Accordingly, they may repeat in the common list, but their implementation should be interpreted in the context of the specific KDO and CA to which the measure is linked.

No. of DD	Development direction	Task No.	Tasks	Deadline/time schedule	Responsible person	Co-responsible person
		1.1.5.	Consolidate common research topics by reducing unhealthy internal competition and uniting LIOS team for common development goals	Continuously	Deputy Director for Science	
		1.1.6.	Participation in establishment of cooperation network with GMP companies in order to develop pilot production	Continuously	Deputy Director for Science	
		1.1.7.	Active participation in the development of the late pre-clinical and Phase 1 clinical study platform	Continuously	Deputy Director for Science	
1.2.	Improving the productivity and efficiency of the support system for scientific activity	1.2.1.	Improving the circulation of internal information at the Institute by ensuring uniform participation in major project applications	Continuously	Deputy Director of Administration, Finance and Law	Project Department
		1.2.2	Improvement of pre-award support mechanisms for EU Framework Program	Continuously	Deputy Director of Administration, Finance and Law	Deputy Director for Science Project Department
		1.2.3.	Systematic and targeted training for the improvement of competencies, such as project writing, management, etc.	Continuously	Deputy Director of Administration, Finance and Law	Deputy Director for Science

No. of DD	Development direction	Task No.	Tasks	Deadline/time schedule	Responsible person	Co-responsible person
		1.2.4.	Improvement of the system of internal grants, providing support when starting research activities, promoting the development of new and increasing the capacity of already existing directions	Continuously	Deputy Director of Administration, Finance and Law	Deputy Director for Science
		1.2.5.	Increasing the capacity of scientific technical staff by relieving researchers from technical tasks	30.06.2023	Deputy Director for Science	Deputy Director of Administration, Finance and Law
		1.2.6.	Systematic promotion of the development of highest level digital research competencies	Starting from 2024	Deputy Director of Administration, Finance and Law	Deputy Director for Science
		1.2.7.	Development of the international scientific advisory panel	Continuously	Deputy Director for Science	
		1.2.8.	Development of the LIOS fund to attract external resources, such as donations	31.12.2022	Deputy Director of Administration, Finance and Law	
		1.2.9.	To evaluate whether it is possible to implement <i>HR Excellence Award</i>	31.12.2027	Deputy Director of Administration, Finance and Law	Human Resource Department

No. of DD	Development direction	Task No.	Tasks	Deadline/time schedule	Responsible person	Co-responsible person
1.3.	Ensure access to relevant research infrastructures and technologies	1.3.1.	Development of the national core facility	Starting from 2024	Deputy Director for Science	Procurement Department, IT and Technical Department
		1.3.2.	Increasing laboratory space by providing adequate facilities for all researchers	Continuously	Deputy Director for Science	Procurement Department, IT and Technical Department
		1.3.3.	Development of biopharmaceuticals by providing unique equipment and specially equipped premises	05.10.2021	Deputy Director for Science	Procurement Department, IT and Technical Department
		1.3.4.	Outsourcing of infrastructure service	Starting from 2024	Deputy Director for Science	Procurement Department, IT and Technical Department
		1.3.5.	Renewal of IT infrastructure according to the requirements of Open Science and the EC Digital Compass	31.12.2026	Deputy Director for Science	Procurement Department, IT and Technical Department
		1.3.6.	Collaboration with external partners to increase the testing capabilities	Continuously	Deputy Director for Science	Lab. Heads, Procurement Department, IT and Technical Department
		1.3.7.	Implementation of the concept "Green Labs" to reduce the environmental impact of laboratories	31.12.2024	Deputy Director for Science	Procurement Department, IT and Technical Department

No. of DD	Development direction	Task No.	Tasks	Deadline/time schedule	Responsible person	Co-responsible person
		1.3.8.	Active participation in the development of the late pre-clinical and Phase 1 clinical platform	Continuously	Deputy Director for Science	Procurement Department, IT and Technical Department
		1.3.9.	Implementation of the principles of circular economy and reuse of resources	31.12.2024	Deputy Director for Science	Procurement Department, IT and Technical Department
		1.3.10.	Improving energy efficiency in line with climate change mitigation priorities	31.12.2024	Deputy Director for Science	Procurement Department, IT and Technical Department
1.4.	Promoting the exchange of successful research ideas and strengthening internal collaboration	1.4.1.	Development of solutions needed for regular brainstorming of research and commercialisation ideas	Continuously	Deputy Director for Science	
		1.2.4	Organizing an annual internal conference and LIOS internal scientific seminars, ensuring brainstorming and strengthening collaboration between researchers	Continuously	Deputy Director for Science	
		1.4.3.	Increasing involvement in international and local organizations, contributing to the impact on science policy	Continuously	Director	Deputy Director of Administration, Finance and Law Deputy Director for Science

No. of DD	Development direction	Task No.	Tasks	Deadline/time schedule	Responsible person	Co-responsible person
		1.4.4.	Increasing involvement in local and international consortia to increase access to relevant external databases	Continuously	Deputy Director for Science	
		1.4.5.	Closer institutional collaboration with other scientific institutions, incl. forming joint councils	Continuously	Director	Deputy Director of Administration, Finance and Law Deputy Director for Science
		1.4.6.	Development of the international scientific advisory panel	31.12.2022	Deputy Director for Science	

6.2.2. KDG2: Creation of an internationally recognized scientific ecosystem and development of a new generation of scientists in Latvia

No. of DD	Development direction	Task No.	Tasks	Deadline/time schedule	Responsible person	Co-responsible person
2.1.	Providing a comprehensive and motivating career development support system	2.1.1.	Establishing a systematic approach to attracting students by promoting sustainability of staff renewal	Continuously	Deputy Director of Administration, Finance and Law	Deputy Director for Science
		2.1.2.	Implementation of a non-monetary motivation system and reciprocal assessment into day-to-day activities	31.12.2022	Deputy Director of Administration, Finance and Law	Human Resource Department
		2.1.3.	Systematic and targeted training for the improvement of competencies, such as project writing, management, etc.	Continuously	Deputy Director of Administration, Finance and Law	Human Resource Department
		2.1.4.	Comprehensive development of the professional capacity of managers, providing training, feedback and formalised assessment	Continuously	Deputy Director of Administration, Finance and Law	Deputy Director for Science
		2.1.5.	Defining the career development opportunities, including horizontal development within the organization, and regular development of the performance assessment system	31.12.2022	Deputy Director of Administration, Finance and Law	Deputy Director for Science

No. of DD	Development direction	Task No.	Tasks	Deadline/time schedule	Responsible person	Co-responsible person
		2.1.6.	Full range of support to new employees starting to work at LIOS	Continuously	Deputy Director of Administration, Finance and Law	Deputy Director for Science
		2.1.7.	Defining clear criteria for setting up and maintaining the research group	31.12.2022	Director	Deputy Director for Science Deputy Director of Administration, Finance and Law
		2.1.8.	Improvement of the system of internal grants, providing support when starting research activities, promoting the development of new and increasing the capacity of already existing directions	30.06.2023	Chairman of the Scientific Board	Deputy Director of Administration, Finance and Law
		2.1.9.	Review of the remuneration system by introducing a combination of fixed and variable pay	30.06.2023	Deputy Director of Administration, Finance and Law	Human Resource Department
		2.1.10.	Development of the support system for staff well-being, incl. the balance between work and private life	Continuously	Deputy Director of Administration, Finance and Law	Deputy Director for Science

No. of DD	Development direction	Task No.	Tasks	Deadline/time schedule	Responsible person	Co-responsible person
		2.1.11.	Incorporating the categorization of leading researchers into the career development road map, providing wider opportunities	Continuously	Deputy Director of Administration, Finance and Law	Deputy Director for Science
		2.1.12.	Drawing up a proposal (including potential projects, financing opportunities, indicators to be achieved, available support) to attract early stage scientists-leaders	31.12.2022	Deputy Director of Administration, Finance and Law	Human Resource Department
		2.1.13.	Development of leadership, conflict resolution and mutual collaboration competencies, by promoting an inclusive working environment	31.12.2022	Deputy Director of Administration, Finance and Law	Human Resource Department
		2.1.14.	Development of a roadmap for foreign researchers starting to work at LIOS	Continuously	Deputy Director of Administration, Finance and Law	Deputy Director for Science
		2.1.15.	Improvement of the motivation system, including recognition of the thesis defended (setting out criteria and appropriate forms of recognition, such as bonuses, etc.)	31.12.2022	Scientific Board	Deputy Director for Science Deputy Director of Administration, Finance and Law

No. of DD	Development direction	Task No.	Tasks	Deadline/time schedule	Responsible person	Co-responsible person
		2.1.16.	Revision of the staff rewarding system	31.12.2022	Scientific Board	Deputy Director for Science Deputy Director of Administration, Finance and Law
		2.1.17.	Development and implementation of gender equality policies	31.12.2023	Deputy Director of Administration, Finance and Law	Human Resource Department
		2.1.18.	To evaluate the possibility of the system <i>HR Excellence Award</i> implementation	31.12.2027	Deputy Director of Administration, Finance and Law	Human Resource Department
2.2.	Targeted attraction of highly-qualified local and foreign scientists	2.2.1.	Targeted attraction of European Excellence grants	Continuously	Deputy Director of Administration, Finance and Law	Deputy Director for Science Project Department
		2.2.2.	Increasing the number of foreign researchers by promoting the development of an international environment within LIOS	31.12.2027	Deputy Director of Administration, Finance and Law	Human Resource Department
		2.2.3.	Active recruitment of foreign postdoctoral researchers for international research teams	Continuously	Deputy Director of Administration, Finance and Law	Deputy Director for Science

No. of DD	Development direction	Task No.	Tasks	Deadline/time schedule	Responsible person	Co-responsible person
		2.2.4.	Improving the support system for foreign researchers, ensuring that both work and housing issues are addressed	Continuously	Deputy Director of Administration, Finance and Law	Human Resource Department
2.3.	Development of synergistic collaboration in the establishment of the scientific ecosystem	2.3.1.	Creation and development of internationally competitive doctoral programmes in collaboration with Latvian and foreign science universities and institutes	Continuously	Deputy Director for Science	Deputy Director of Administration, Finance and Law
		2.3.2.	Development of the national core facility	Starting from 2024	Deputy Director for Science	Procurement Department, IT and Technical Department
		2.3.3.	Organizing an annual internal conference and LIOS scientific seminars, ensuring brainstorming and strengthening collaboration between researchers	Continuously	Deputy Director for Science	
		2.3.4.	Increasing involvement in international and local organizations, contributing to the impact on science policy	Continuously	Director	Deputy Director of Administration, Finance and Law Deputy Director for Science

No. of DD	Development direction	Task No.	Tasks	Deadline/time schedule	Responsible person	Co-responsible person
		2.3.5.	Increasing involvement in local and international consortia to increase access to relevant external databases	Continuously	Deputy Director for Science	
		2.3.6.	Closer institutional collaboration with other scientific institutions, incl. forming joint councils	Continuously	Director	Deputy Director of Administration, Finance and Law Deputy Director for Science
		2.3.7.	Development of the LIOS fund to attract external resources, such as donations	31.12.2024	Deputy Director of Administration, Finance and Law	
2.4.	Improving the communication of research achievements and public engagement	2.4.1.	More regular and targeted communication about LIOS achievements, promoting visibility, recruitment at local and international level	30.06.2022	LIOS office	
		2.4.2.	Developing a comprehensive science communication strategy and strengthening strategic communication	31.12.2022	LIOS office	
		2.4.3.	More intensive science communication by informing children of school age about chemistry, biology and medical topics	Continuously	LIOS office	

6.2.3. KDG3: Knowledge and technology transfer based on science-intensive collaboration for the development of local and international (chemical and biomedical) industries

No. of DD	Development direction	Task No.	Tasks	Deadline/time schedule	Responsible person	Co-responsible person
3.1.	Development of the service portfolio offered by the Institute and sales promotion	3.1.1.	Development of internationally visible and excellent niche competence, by promoting visibility and collaboration capabilities both within the industry and society	Continuously	Deputy Director for Science	Deputy Director of Administration, Finance and Law
		3.1.2.	Development of solutions needed for regular brainstorming of research and commercialisation ideas	Continuously	Deputy Director for Science	
		3.1.3.	Organizing an annual internal conference and LIOS scientific seminars, ensuring brainstorming and strengthening collaboration between researchers	Continuously	Deputy Director for Science	
		3.1.4.	Consolidate common research topics by reducing unhealthy internal competition and uniting LIOS team for common development goals	Continuously	Deputy Director for Science	

No. of DD	Development direction	Task No.	Tasks	Deadline/time schedule	Responsible person	Co-responsible person
		3.1.5.	Establishment of service portfolio (e.g. availability of methods and test systems) offered by the Institute	31.12.2022	Deputy Director of Administration, Finance and Law	Deputy Director for Science
		3.1.6.	Improving price policy by ensuring higher flexibility and attractiveness of long-term contracts	Continuously	Deputy Director of Administration, Finance and Law	
3.2.	Development of competencies and capacity of knowledge and technology transfer	3.2.1.	Targeted attraction of highly-qualified scientists	31.12.2027	Deputy Director of Administration, Finance and Law	Deputy Director for Science
		3.2.2.	Systematic and targeted training for the improvement of competencies, such as project writing, management, etc.	Continuously	Deputy Director of Administration, Finance and Law	Human Resource Department
		3.2.3.	Increasing the capacity of the Institute's technology transfer and related business activities	Continuously	Deputy Director of Administration, Finance and Law	Deputy Director for Science
		3.2.4.	Increasing the capacity of scientific technical staff by relieving researchers from technical tasks	Starting from 2024	Deputy Director for Science	Deputy Director of Administration, Finance and Law

No. of DD	Development direction	Task No.	Tasks	Deadline/time schedule	Responsible person	Co-responsible person
		3.2.5.	Systematic promotion of the development of highest level digital research competencies	Continuously	Deputy Director of Administration, Finance and Law	Deputy Director for Science
		3.2.6.	Development of the international scientific advisory panel	31.12.2022	Deputy Director for Science	
3.3.	Development of infrastructure and technology to realise existing and new commercial opportunities	3.3.1.	Development and implementation of the infrastructure and technological development plan	31.12.2022	Deputy Director for Science	Procurement Department, IT and Technical Department
		3.3.2.	Development of the national core facility	Starting from 2024	Deputy Director for Science	Procurement Department, IT and Technical Department
		3.3.3.	Increasing the capacity of scientific technical staff by relieving researchers from technical tasks	Starting from 2024	Deputy Director for Science	Deputy Director of Administration, Finance and Law
		3.3.4.	Development of biopharmaceuticals by providing unique equipment and specially equipped premises	31.12.2027	Deputy Director for Science	Procurement Department, IT and Technical Department

No. of DD	Development direction	Task No.	Tasks	Deadline/time schedule	Responsible person	Co-responsible person
		3.3.5.	Participation in establishment of a cooperation network with GMP manufacturers in order to develop pilot production	Continuously	Deputy Director for Science	Procurement Department, IT and Technical Department
		3.3.6.	Outsourcing of infrastructure service	Starting from 2024	Deputy Director for Science	Procurement Department, IT and Technical Department
		3.3.7.	Renewal of IT infrastructure according to the requirements of Open Science and the EC Digital Compass	31.12.2026	Deputy Director for Science	Procurement Department, IT and Technical Department
		3.3.8.	Increase of testing capabilities	Continuously	Deputy Director for Science	Procurement Department, IT and Technical Department
		3.3.9.	Implementation of the concept "Green Labs" to reduce the environmental impact of laboratories	31.12.2024	Deputy Director for Science	Procurement Department, IT and Technical Department
		3.3.10.	Implementation of the principles of the circular economy	31.12.2024	Deputy Director for Science	Procurement Department, IT and Technical Department

No. of DD	Development direction	Task No.	Tasks	Deadline/time schedule	Responsible person	Co-responsible person
		3.3.11.	Improving energy efficiency in line with climate change mitigation priorities	31.12.2024	Deputy Director for Science	Procurement Department, IT and Technical Department
3.4.	Improving and diversifying forms of collaboration with local and international industries	3.4.1.	Active involvement in the development of the industry, establishing close collaboration with IDAL (Investment and Development Agency of Latvia) and other stakeholders	Continuously	Deputy Director of Administration, Finance and Law	
		3.4.2.	Active participation in the development of the late pre-clinical and Phase 1 clinical platform	Continuously	Deputy Director for Science	
		3.4.3.	Development of the LIOS fund to attract external resources, such as donations	31.12.2024	Deputy Director of Administration, Finance and Law	

Annexes

Annex 1 – Interviewees

No.	Interviewees	Date
1.	Co-founder and lead partner of Technopolis Group	25.10.
2.	Rector of the University of Latvia	26.10.
3.	Professor of Medicinal Chemistry at the Uppsala University	26.10.
4.	Member of the Board of the SIA Pharmidea and Chairman of the Board of the Association of the Latvian Chemical and Pharmaceutical Industry	27.10.
5.	Vice-rector of the Riga Technical University	27.10.
6.	Vice-rector of the Riga Stradins University	27.10.
7.	Deputy State Secretary at the Ministry of Education and Science and Director of the Department of Higher Education, Science and Innovation	27.10.
8.	Director of the Central European Institute of Technology of the Masaryk University	1.11.

Annex 2 – Working groups

No.	Scope of the working group	Participants	Date
1.	Human resources – people necessary to provide the impact and results	LIOS management, representatives of the Scientific Board, staff	1.11.
2.	Infrastructure – infrastructure available and to be develop to provide the impact and results	LIOS management, representatives of the Scientific Board, staff	2.11.
3.	Stakeholders, collaboration networks and funding – identification of stakeholders, analysis of collaboration opportunities, as well as for funding	LIOS management, representatives of the Scientific Board, staff	4.11.
4.	Organizational structure – effectiveness of the organizational structure and relevance to the realisation of the vision	LIOS management	5.11.

Annex 3 – LIOS projects providing largest income for the period of 2016–2021

Name of the project (Latvian or English)	Total amount of the project for the period (EUR)
No. 1.1.1.4/17/I/007 Latvijas Organiskās sintēzes institūta infrastruktūras attīstīšana viedās specializācijas jomā - biomedicīna, medicīnas tehnoloģijas, biofarmācija un biotehnoloģijas	8 249 567.33
No. 115583 European Gram Negative Antibacterial Engine	7 125 746.79
No. 2011/0045/2DP/2.1.1.3.1./11/IPIA/VIAA/001 Farmācijas un biomedicīnas Valsts nozīmes pētniecības centra zinātniskās infrastruktūras attīstība	1 981 215.16
No. 763721/857287 Baltic Biomaterials Centre of Excellence (BBCE)	848 750.73
No. 857394 Networking for excellence in functional pharmacology to study the role of fatty acid metabolism in neurological disorders (FAT4BRAIN)	740 271.57
No. 951883 Springboard for excellence in advanced development of antibacterials (SPRINGBOARD)	674 971.87
No. 316149 Strengthening the research and innovative capacities of the Latvian Institute of Organic Synthesis, the leading Baltic regional centre for drug discovery	655 325.96
No. 1.1.1.1/16/A/294 Antimetastātisku zāļvielu kandidātu izstrāde	595 354.08
No. 1.1.1.1/16/A/290 Malārijas asins posma proteāžu inhibitoru izveide	593 536.15
No. 1.1.1.1/16/A/281 Diazonamīda mazmolekulārie struktūranalogi kā pretvēža līdzekļi	584 011.10
No 857290;1.1.1.5/19/A/004 Biotechnology at Latvian Institute of Organic Synthesis to achieve excellence in drug discovery	579 183.57
No. 1.1.1.1/16/A/288 Monokristālu rentgenstaru difrakcijas analīze kristāliskajā sūklī iekļautajiem organiskiem savienojumiem	573 487.21

Name of the project (Latvian or English)	Total amount of the project for the period (EUR)
No. 1.1.1.1/16/A/292 Jaunu Sigma-1 receptora pozitīvo alostērisko modulatoru sintēze un attīstīšana Alcheimera terapijai	510 132.76
No. 115583 European Gram Negative Antibacterial Engine	422 347.45
No. 666918 Developing new therapies for Batten disease (BATCURE)	398 110.53

Annex 4 – LIOS largest ongoing projects in 2021

Name of the project	Total amount of the project (EUR)
No. 101038074 Structure determination of amyloid oligomers, the pathogenic species in Alzheimer's disease using fast MAS NMR and microfluidics (Oligomers-MAS-NMR)	140 202.24
No. 964537 RISK assessment of chemicals integrating HUman centric Next generation Testing strategies promoting the 3Rs	499 653.75
No. 1.1.1.5/21/A/002 Zāļu vielu izstrāde selektīvai kadherīnu trans-dimerizācijas kontrolei	140 202.24
No. 1.1.1.5/21/A/003 Šūnu adhēzijas mehānismu fotokontrolē	140 202.24
Nr.1.1.1.1/20/A/009; Garķēžu acilkarnitīni kardiovaskulārajās saslimšanās: jauni zāļu mērķi un diagnostiskās iespējas	800 219.02
No. 871198 Anti-Cancer Light-Controllable Antibody-Peptide Conjugates (ALISE)	55 200.00
No. 964997 Alliance for Life Sciences: From Strategies to Actions in Central and Eastern Europe	155 912.50
No. Izp-2020/1-0050 Tuberkulozes ārstēšana: personalizētās terapijas perspektīvas izpēte	60 000.00
No. Izp-2020/1-0327 Plazmodija serīna proteāzes SUB1 inhibitoru attīstīšana par pretmalārijas zāļvielu līdersavienojumiem	300 000.00
No. LT08-2-LMT-K-01-041 Inhibition of AHR signalling in pancreatic cancer to increase susceptibility to PD-1/PD-L1 inhibitors and chemotherapy via ELAVL1 pathway	125 000.00
No.1.1.1.2/VIAA/4/20/747 Koronavīrusu metiltransferāžu nsp14 un nsp16 inhibitori kā pretvīrusu zāļvielas	111 504.90

Name of the project	Total amount of the project (EUR)
No.1.1.1.2/VIAA/4/20/754 Uz laktāmiem balstītu SARS-CoV-2 Mpro un citu virālo proteīnu inhibitoru izstrāde	111 504.90
No.1.1.1.2/VIAA/4/20/751 Jaunu Žiliā-Kočinska olefinēšanas reaģentu izpēte	111 504.90
No.1.1.1.2/VIAA/4/20/756 Jaunas metodes amiloīdu pētīšanai ar cietvielu KMR pie ātra griešanās režīma	111 504.90
No.1.1.1.2/VIAA/4/20/757 Ūdens un dažādu jonu loma prostatas skābās fosfatāzes proteīna 248-286 (PAP248-286) nepareizas salocīšanās un agregācijas	111 504.90
No.1.1.1.2/VIAA/4/20/752 Sintēzes pieeju izveide limonoīda Libigvīna A karkasa konstruēšanai	111 504.90
No.1.1.1.2/VIAA/4/20/748 Jaunu reaģentu un sintēzes metožu izstrāde monofluorētu savienojumu iegūšanai ar pielietojumu zāļu vielu meklējumos	111 504.90
No.1.1.1.2/VIAA/4/20/755 Adrenerģisko receptoru ligandi metabolisko saslimšanu ārstēšanai	111 504.90

Annex 5 – Detailed LIOS development plan

Excel file (in Latvian): Detalizēts OSI Attīstības plāns

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