

Lubelskie

Urząd Marszałkowski Województwa Lubelskiego



REGIONAL INNOVATION STRATEGY OF THE LUBELSKIE VOIVODESHIP 2030



Lubelskie

Urząd Marszałkowski Województwa Lubelskiego



**REGIONAL
INNOVATION
STRATEGY
OF THE LUBELSKIE
VOIVODESHIP
2030**

Lublin

March 2021

Members of the Council for Innovation and the Task Team for the Update of the *Regional Innovation Strategy of the Lubelskie Voivodeship 2030* were working on this document and debated about it.

External experts

Marcin Szewczak PhD, DSc, strategic expert

Professor Marian Oliński, PhD, the University of Warmia and Mazury, methodology expert

Professor Maciej Zastempowski, PhD, monitoring and evaluation expert

Development and coordination of the work on the strategy

Lublin Centre for Research on Innovation in the Department of Economy and Entrepreneurship Support of the Marshal's Office of the Lubelskie Voivodeship in Lublin

Graphic design and printing

Firma Reklamowa GRAF MEDIA

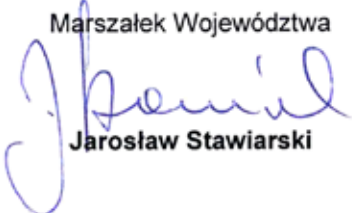


Ladies and Gentlemen!

I present to you the updated *Regional Innovation Strategy of the Lubelskie Voivodeship 2030*. I am glad that despite the Covid-19 pandemic we have managed to create this particularly vital document. The Strategy is the result of cooperation and involvement of key stakeholders in our Region, representing the sector of economy, the world of science, the business environment, non-governmental organisations, and the residents. I would like to sincerely thank all those who devoted their valuable time, committed to this undertaking, and contributed to the development of the document.

The achievement of objectives of the regional development policy is not possible without the development and support of the research and development sector in the acquisition and commercialization of knowledge and without helping enterprises to implement modern technologies. The cooperation of these stakeholders requires adapting to ever changing conditions or rethinking the use of current tools, methods, and instruments. The role of the regional government is to promote actions in this area that will contribute to the commercialization of knowledge and the adoption of innovative solutions to the Region's economy.

I firmly believe that the process of the *Regional Innovation Strategy of the Lubelskie Voivodeship 2030* implementation will come up to the expectations placed in it. I sincerely hope that in the coming years we will embrace opportunities that lie ahead, which will contribute to a high quality of life for the Region's residents and will revive and increase the competitiveness of the economy of the Lubelskie both domestically and abroad.

Marszałek Województwa

Jarosław Stawiarski

/Jarosław Stawiarski, Marshal of the Lubelskie Voivodeship/

/illegible handwritten signature/

**UCHWAŁA NR XXIV/407/2021
SEJMIKU WOJEWÓDZTWA LUBELSKIEGO**

z dnia 29 marca 2021 r.

**w sprawie przyjęcia dokumentu pn.: *Regionalna Strategia Innowacji
Województwa Lubelskiego do 2030 roku.***

Na podstawie art. 18 pkt 2 oraz art. 11 ust. 1e ustawy z dnia 5 czerwca 1998 r. o samorządzie województwa (Dz. U. z 2020 r. poz. 1668) – Sejmik Województwa Lubelskiego uchwala, co następuje:

§ 1. Przyjmuje się dokument pn.: *Regionalna Strategia Innowacji Województwa Lubelskiego do 2030 roku*, stanowiący załącznik nr 1 do niniejszej uchwały.

§ 2. Wykonanie uchwały powierza się Zarządowi Województwa Lubelskiego.

§ 3. Uchwała wchodzi w życie z dniem podjęcia.



Przewodniczący Sejmiku

M Szwał
Jerzy Szwał

Table of contents

List of abbreviations	6
Introduction	8
I. Main factors to describe innovative potential of the Lubelskie Region	12
1.1. Demographic conditions	12
1.2. The region's developmental factors	13
II. Update of the Regional Innovation Strategy of the Lubelskie Voivodeship 2030	38
III. Identifying bottlenecks in the regional innovation system	43
3.1. Analysis of political, economic, social and technological factors (PEST)	44
3.2. Strengths, weaknesses, opportunities and threats analysis (SWOT)	46
3.3. Identification of bottlenecks and measures to prevent them	50
IV. Objectives, actions, sources of funding	56
V. Implementation system	60
5.1. Institutional system	60
5.2. Model of entrepreneurial discovery process – regional innovation laboratory	60
VI. Monitoring and evaluation system	66
List of cited references	71
Attachment No. 1. Smart specialisations of the Lubelskie Voivodeship – list of detailed issues	73
Attachment No. 2. Table of recommendations from international projects regarding the RIS3, executed by the Managing Authority of the Regional Innovation Strategy of the Lubelskie Voivodeship in the years 2016-2020	78

List of abbreviations

PA	Public Administration
R&D	Research & Development
R&D&I	Research & Development & Innovation
SPEA	Survey on Population Economic Activity
LDB	Local Data Bank
BMC	Business Model Canvas
BTR	Business Technology Roadmap
CATI	Computer-Assisted Telephone Interviewing
CAWI	Computer-Assisted Web Interview
EDIH	European Digital Innovation Hubs
EIC	European Innovation Council
EIT	European Institute of Innovation & Technology
ERN	European Reference Networks
CSO	Central Statistical Office
HESS	Higher Education for Smart Specialisation
HRSTC	Core of Human Resources in Science and Technology
ICT	Information and Communication Technologies
IESE	Instituto de Estudios Superiores de la Empresa
BEI	Business Environment Institutions
IoT	Internet of Things
IP	Intellectual Property
IT	Information Technology
MA	Managing Authority
JRC	Joint Research Centre
RGU	Regional Government Units
KET	Key Enabling Technologies
NRP	National Reconstruction Plan
KUL	The John Paul II Catholic University of Lublin
LCRI	The Lublin Centre for Research on Innovation
LFA	The Lublin Functional Area
MDLT	Ministry of Development, Labour and Technology
MSCA	Marie Skłodowska-Curie Actions
SME	Sector of small and medium-sized enterprises
MIT	Massachusetts Institute of Technology
RACN	Research and Academic Computer Network - National Research Institute
NCRD	National Centre for Research and Development
SBEI	Science and Business Environment Institutions
OIC Poland	The "OIC POLAND" Polish Foundation of Economic Development Support Centres in Lublin

RES	Renewable Energy Sources
E	Enterprises
PAS	Polish Academy of Sciences
PAED	Polish Agency for Enterprise Development
PEST	Analysis of political, economic, social, and technological factors
SRI	State Research Institute
GDP	Gross Domestic Product
PCA	Polish Classification of Activities
SD OP	Smart Growth Operational Programme
EP OP	Eastern Poland Operational Programme
POLON	Integrated Information System on Higher Education and Science
EDP	Entrepreneurial Discovery Process
SUAS	State University of Applied Sciences
REGON	Registry of National Economy Entities
RIS3	Research and Innovation Strategies for Smart Specialisation
ROP LV	Regional Operational Programme for the Lubelskie Voivodeship
RIS LV	Regional Innovation Strategy of the Lubelskie Voivodeship
DSL V	Development Strategy for the Lubelskie Voivodeship 2014-2020
SWOT	Strengths, Weaknesses, Opportunities and Threats Analysis
TEN-T	Trans-European Transport Network
TRL	Technology Readiness Level
EU	European Union
MCSU	The Maria Curie-Skłodowska University in Lublin
MOLV	Marshal Office of the Lubelskie Voivodeship
PORP	Patent Office of the Republic of Poland
GVA	Gross Value Added
WSK PZL	Communication Equipment Manufacture of the State Aircraft Factory

Introduction

The financial perspective 2014-2020 that is coming to an end, the changing European and domestic conditions, and conclusions from the implementation of the *Regional Innovation Strategy of the Lubelskie Voivodeship 2020 (RIS LV)*, including the entrepreneurial discovery process taking place regionally, make it necessary to update its provisions and revise the areas of smart specializations of the Region and strategic development goals regarding the innovation policy.

The Regional Innovation Strategy of the Lubelskie Voivodeship 2020, adopted by the Voivodeship Sejmik (Regional Parliament) on October 31, 2014, is an extension of the Development Strategy for the Lubelskie Voivodeship 2014-2020 (with a 2030 perspective) adopted by the Regional Parliament on June 24, 2013. The RIS LV is a basic document that shapes the development at the regional level, especially the development of research and innovation for smart specialization.

The RIS LV update is consistent with and complementary to the work on updating the DSLV as well as with documents and guidelines at the EU and national level, including in particular the *National Strategy of Regional Development 2030*. Also, the time horizon of the new RIS LV is consistent with the period covered by the Development Strategy for the Lubelskie Voivodeship and the National Strategy of Regional Development, i.e. it covers the 2020-2030 decade. It is necessary that the document in question is updated as part of the entrepreneurial discovery process (EDP) that takes place in the region. To confirm that the Lubelskie meets the detailed criteria in this respect, the approval of the European Commission must be obtained.

Legal basis

The **regional government** is responsible for conducting the development policy pursuant to Article 3 (2) of the *Act on the Principles of Development Policy*¹. The regional government is also responsible for defining the development strategy in accordance with Article 11 (1) of the *Act on Regional Government*² that covers in particular the objectives of stimulating economic activity and increasing the level of competitiveness and innovation of regional economy. Pursuant to Article 4 (1) of the *Act on the Principles of Development Policy*, the development policy is conducted on the basis of development strategies, programmes, and programme documents. In terms of research and innovation policy, the *Regional Innovation Strategy* constitutes such a document. Additionally, according to Article 11 (1b) of the *Act on Regional Government*, a period not exceeding the time covered by current medium-term national development strategy is provided in the regional development strategy. On September 17, 2019, the Council of Ministers adopted the *National Strategy of Regional Development 2030*³.

¹ The Act of December 6, 2006 on the Principles of Development Policy (Journal of Laws of 2019, item 1295, as amended).

² The Act of June 5, 1998 on Regional Government (Journal of Laws of 2020, item 1668).

³ *Resolution No. 102 of the Council of Ministers of September 17, 2019 on the adoption of the National Strategy of Regional Development 2030 (MP 2019, item 1060)*. (Journal of Laws, 2019, item 1060).

Drafting the *Regional Innovation Strategy* and coordinating work in this area is the responsibility of the Board of the Lubelskie Voivodeship, while the decision to start working on the Strategy is the sole competence of the Regional Parliament. This decision is tantamount to adopting a document specifying the principles, mode, and schedule of the Strategy implementation. The Parliament is also responsible for adopting the Strategy itself in accordance with Article 18 (2) of the *Act on Regional Government*.

The basic principle affecting the coherence of the regional development management system is to ensure mutual complementarity of individual documents prepared at the regional and national level. An integral approach in the development policy also results from the way how the development goals indicated in the *Strategy for Responsible Development for the period up to 2020 (including the perspective up to 2030)*, adopted by the Council of Ministers on February 14, 2017⁴, are addressed.

Assumptions underlying the update

The main goal of actions taken is to update the Regional Innovation Strategy of the Lubelskie Voivodeship with the 2030 time horizon, covering the areas of smart specialisations of the Region, including the conditions and criteria resulting from the assumptions of the EU programming period for the years 2021-2027. The updated Regional Innovation Strategy is the basis for the coordination and support of the innovation policy in the Region.

The document was developed based on the principles listed below coming from the *Strategy for Responsible Development* and the *Development Strategy of the Lubelskie Voivodeship*:

- **the selective approach principle** means focusing on products, technologies, industries, or sectors that will enable the achievement of the assumed goals, including an increase in the productivity and innovation of the Region's economy, thereby improving the quality of life of its residents;
- **the consistency principle** means that the objectives and directions of actions indicated in RIS LV 2030 are consistent with the objectives and directions of the *Development Strategy for the Lubelskie Voivodeship 2030*, the *National Strategy of Regional Development 2030* and strategic documents developed at the EU level;
- **the partnership and cooperation principle** means that thanks to the cooperation between public entities, scientific community, enterprises and citizens, the chance of achieving the goals of the strategy will increase. The process of developing, consulting, monitoring, and evaluating the implementation of the strategy will involve all interested institutions and public organisations, including regional governments, representatives of academic, social, and economic circles (including entrepreneurs, business environment institutions and non-governmental organisations) and civil society based on full cooperation for the development of innovation (the quadruple helix model). The cooperation was based on the

⁴ Resolution No. 8 of the Council of Ministers of February 14, 2017 on the adoption of the Strategy for Responsible Development up to 2020 (with a perspective to up 2030) (Journal of Laws, 2017, item 260).

principles of transparency, openness, and equal participation, therefore the strategic areas of intervention in the field of development and strengthening the innovative and competitive potential of the Region should integrate all regional stakeholders;

- **the continuation principle** means that the planned actions are a continuation of directions and solutions from the previous programming period set out in the *Regional Innovation Strategy of the Lubelskie Voivodeship 2020*. Moreover, the strategy update includes the analysis of the results of the implementation of the Regional Innovation Strategy of the Lubelskie Voivodeship developed in 2014 and the instruments of its implementation, mainly from the *Regional Operational Programme for the Lubelskie Voivodeship for the years 2014-2020*;
- **the mobilizing domestic capital principle** means that it is necessary to create conditions that will enable domestic funds, in particular private ones, to be involved in the implementation of development operations on a larger scale;
- **the internationalization principle** provides for active participation in shaping EU policies and actions to strengthen international cooperation in the areas of regional smart specialisation;
- **the measurability principle** provides for description of the intended effects by means of indicators, their monitoring, and then qualitative assessment of the effectiveness of achieving of the adopted objectives.

The main stages of work

The update of the *Regional Innovation Strategy of the Lubelskie Voivodeship 2030* can be divided into the stages listed below.

- I. The preparatory stage includes:
 - ◆ adopting Resolution No. XVII/287/2020 by the Parliament of the Lubelskie Voivodeship on the adoption of the *Principles, mode, and schedule for updating the Regional Innovation Strategy of the Lubelskie Voivodeship 2030* on July 27, 2020;
 - ◆ appointing, by the Order of the Marshal of the Lubelskie Voivodeship No. 124/2020 of August 25, 2020, the Task Team for the Update of the Regional Innovation Strategy of the Lubelskie Voivodeship 2030 consisting of representatives of substantive departments of the Marshal's Office of the Lubelskie Voivodeship and subordinate organisational units;
 - ◆ appointing, by the Board of the Lubelskie Voivodeship by Resolution No. CLVIII/3025/2020 of June 23, 2020, the 2030 Council for Innovation composed of representatives of business, science, public administration, and civil society.
- II. The diagnostic and conceptual stage includes:
 - ◆ analysis of the context and innovative potential of the Lubelskie Region based on the available information, data, expert opinions, including analyses of applications for co-funding from the 2014-2020 financial perspective and experiences resulting from the *gov_LAB* project implemented jointly with the Polish Agency for Enterprise Development

and the project implemented in the Lubelskie Voivodeship by the European Commission's Joint Research Centre (JRC) Platform S3 entitled *Higher Education for Smart Specialisation*;

- ◆ analysis of challenges, including bottlenecks, to innovation diffusion based on the available information, data, expert opinions, including primarily the study *Analysis of challenges, including bottlenecks, to innovation diffusion in the Lubelskie Region*;
- ◆ defining objectives and actions taken in the field of innovation development and areas of smart specialisations covered by state aid on the basis of previous stages of work and consultations, including the analysis of economic, scientific, technological, educational and institutional potential, external conditions and development trends in the country and in the world; a comprehensive implementation system was also proposed with actions to be taken to enable the regional authorities to achieve the set goals of the strategy and to make use of the Region's identified potentials;
- ◆ updating the RIS LV 2030 monitoring system, in which the proposed goals and directions of actions formed the basis to determine the type and method of measuring progress in the strategy implementation. A monitoring system has been developed to cover the aspects of data collection and development of monitoring and evaluation reports.

III. The acceptance stage includes:

- ◆ public consultations and information campaigns were conducted to ensure the transparency of the update process, to present the progress of work on the update of *RIS LV 2030*, including through the Council for Innovation. The work was crowned with extensive public consultations, i.e. the document was posted on the Marshal's Office website and announcements encouraging residents to share their opinions were made in the regional press. Every citizen – resident of the Lubelskie – could participate in the consultations by expressing their opinions and suggestions in the form of e-mails on the proposed wording of the document. Once the comments submitted during public consultations were collected and constructive conclusions were canalised, a draft of the updated *RIS LV 2030* was prepared;
- ◆ adopting the updated *Regional Innovation Strategy of the Lubelskie Voivodeship 2030* by way of a resolution of the Parliament of the Lubelskie Voivodeship.

I. Main factors to describe innovative potential of the Lubelskie Region

The factors characterizing innovative potential of the Lubelskie Region were described primarily based on conclusions and recommendations from the project called *Development Strategy for the Lubelskie Voivodeship 2030* and based on data contained in the *Prospective Diagnosis of the Lubelskie Voivodeship*, which is the basis for its update, including the most up-to-date data from the Central Statistical Office of Poland in this regard, available at the end of 2020, and the beginning of 2021 (Local Data Bank of the Central Statistical Office). The report entitled *Strategic Directions of Economic Development of the Lubelskie Voivodeship in the Context of the Regional Innovation Strategy*, commissioned by the Lubelskie Voivodeship as part of the update of the Regional Innovation Strategy 2030, was also used. Furthermore, the regional innovation ranking for 2019 developed by the European Commission (Regional Innovation Scoreboard) and the ranking called *Millennium Index 2019 – Potential of Innovation of Regions* were considered. The analysis of the regions' potential in the field of research, development, and innovation (R&D&I) was also used. The analysis was performed by the Ministry of Funds and Regional Policy and was presented at the meeting of regions' representatives on October 20, 2020. The purpose of the characteristics of selected issues conditioning the development of the Lubelskie is to show the region's innovative potential, to identify the challenges and development opportunities it faces, and ultimately to contribute and justify an attempt to update the areas of smart specialisations in the Lubelskie Voivodeship in new financial perspective for the years 2021-2027.

1.1. Demographic conditions

The Lubelskie Region covers an area of 25,122 km², which constitutes 8% of the total area of the country. In this regard, the Region ranks third in Poland, following the Mazowieckie and Wielkopolskie Regions. It consists of four subregions, i.e. Bialski, Chełmsko-Zamojski, Lubelski and Puławski, 20 districts, 4 district towns, 50 towns, 213 communes and 4,034 villages. Lubelskie is inhabited by over 2.1 million people, which accounts for 5.5% of the total population of Poland. The population of the Region is decreasing year by year. Residents of rural areas account for the greater part of the population (53.5%), which is quite unusual considering the fact that in Poland as a whole, the percentage of urban residents is approx. 60%. Suburbanization is typical of the Region; it leads to a constant increase in the number of residents of rural areas, especially in communes neighbouring on cities. The largest increase was recorded in communes adjacent to the city of Lublin, Biała Podlaska, Chełm and Zamość. Lubelskie is one of the least populated and urbanized areas in the country. The low level of urbanization of the Region undoubtedly reduces the chances for its development and adversely affects the ability to generate innovation, but on the other hand, suburbanization in the model of sustainable regional development may be positive. This is certainly affected by a growing negative net migration rate, which in 2019

amounted to – 2.86‰ and concerns especially people aged 25-34, mainly those with higher education. The shortage of high-quality jobs in the Lubelskie Region, along with the growing demand for highly qualified employees in other parts of Poland and the disproportions in earnings to the disadvantage of Lubelskie, lead to emigration of young people with university education. The analysis of the population structure shows a downward trend of people in pre-productive and productive age in recent years. At the same time, the number of people in post-productive age is growing. The number of economically active people is declining. The unemployment level in the Region is above the national average. The unemployment rate at the end of September 2020 was 7.9%, but since 2013 it has fallen by 6.9 pp (at national level, a decrease in the registered unemployment rate by 8.2 pp was recorded in this period). High percentage of people being unemployed for a long time and a unemployed people over 50 years old is one of the main problems of the Lublin labour market. Population ageing is evident in the Region as much as it is in the country⁵. This tendency affects almost all spheres of economic and social life. It causes changes of the labour market and affects the structure of the economy, the development of its individual parts and the stagnation of others. An ageing society means, on the one hand, a possible decline in the productivity growth rate, an increase in expenditure on health care system and long-term care for elderly people, thereby reducing financial resources for investments; instead, however, it provides the prospect of development of the care services sector, technologies adapted to users and the use of smart machines⁶. According to the 2050 forecasts, the population growth in the Region will continue to decline⁷.

1.2. The region's developmental factors

In 2019, the Lubelskie Region was 10th in the country in terms of development rate⁸. Gross Domestic Product (GDP) is the basic indicator used to describe the economic potential of the region. The level and dynamics of GDP growth are stable and directly correlated with the economic structure of the Region, including the share of agriculture, which prevails in the structure of the economy, and its relatively low contribution to the regional GDP. The economic structure is characterized by quite low concentration of entities operating in sectors that contribute the most to GDP and generate the highest added value, i.e. in the enterprise sector.

In 2018, GDP in the Lubelskie Region amounted to PLN 79,187,000,000 and was 4.1% higher than in 2017. At that time, Lubelskie generated 3.7% of the national GDP⁹. In 2019, a significant change was recorded in this area. The GDP growth dynamics in the Region was one of the highest in the country (8.3% compared to 7.8% for the country). In this respect, Lubelskie

⁵ The Prospective Diagnosis of the Lubelskie Voivodeship, the Marshal's Office of the Lubelskie Voivodeship in Lublin, Department of Regional Policy, Lublin, February 2019

⁶ The Strategy for Responsible Development 2020 (with an outlook to 2030). The document adopted by a resolution of the Council of Ministers on February 14, 2017.

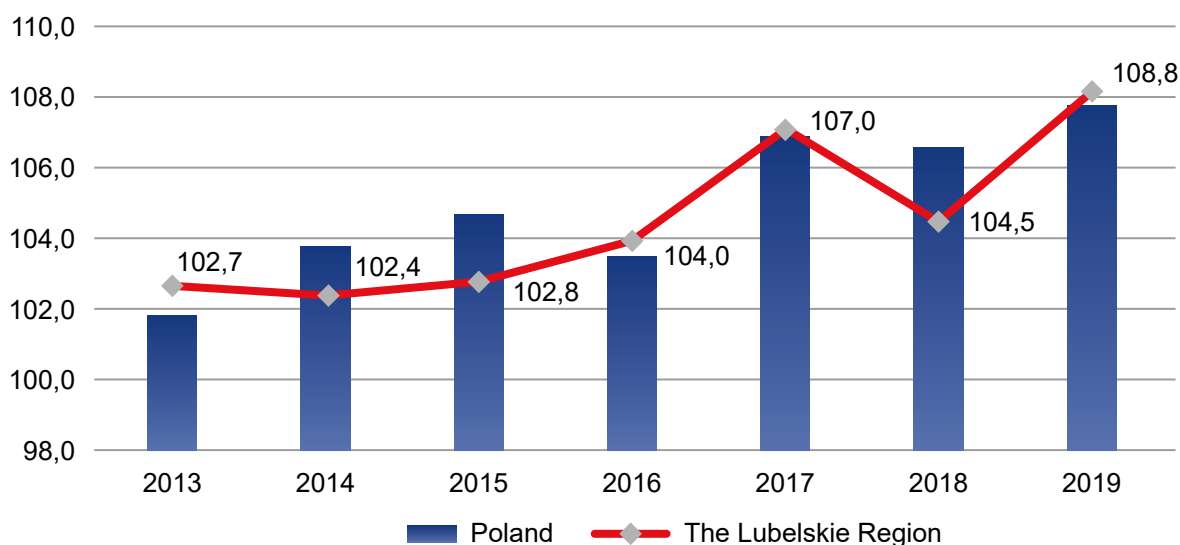
⁷ Demographic situation of the Lubelskie Voivodeship in 2019, Statistical Office in Lublin, Lublin 2020

⁸ Preliminary estimates of Gross Domestic Product by regions – 2019.

⁹ Methodological report as part of the study "Strategic directions of economic development of the Lubelskie Voivodeship in the context of the Regional Innovation Strategy", EU-CONSULT Sp. z o. o., November 2020

was ahead of five regions (including the Warsaw, the capital, and the Mazowieckie Voivodeship), while the GDP growth dynamics in eleven regions was lower. GDP itself only shows the strength of the regional economy, while GDP per capita is used as a measure of prosperity. In 2019 in the Lubelskie Region, it reached the level of 68.4% of the national average and its growth dynamics was 8.8% compared to 2018 and was one of the highest in the country (only Mazowieckie and Łódzkie Voivodeships recorded better results)¹⁰.

Chart 1. Dynamics of GDP per capita in 2013-2019 in the Lubelskie Region and Poland [%]



Source: own study based on CSO data – Estimates of gross domestic product by Region (data for 2019 according to preliminary estimates)

These results made it possible to increase the share of the Lubelskie Region in the creation of national GDP in 2019 by 0.1% compared to 2018 (the Region's share in national GDP was 3.8% and it was higher than that recorded in six regions). Despite the fact that Lubelskie still ranks last, among other regions in terms of GDP per capita compared to the average for Poland (PLN 40,741 per capita compared to PLN 59,598 on average in the country in 2019), it should be emphasized that the positive trend of the above-average increase in the value of GDP per capita in 2019¹¹.

¹⁰ CSO data – Estimates of gross domestic product by Voivodeship (data for 2019 according to preliminary estimates)

¹¹ CSO data – Estimates of gross domestic product by Voivodeship (data for 2019 according to preliminary estimates)

Chart 2. The value of GDP per capita in the Lubelskie Region compared to the average for Poland

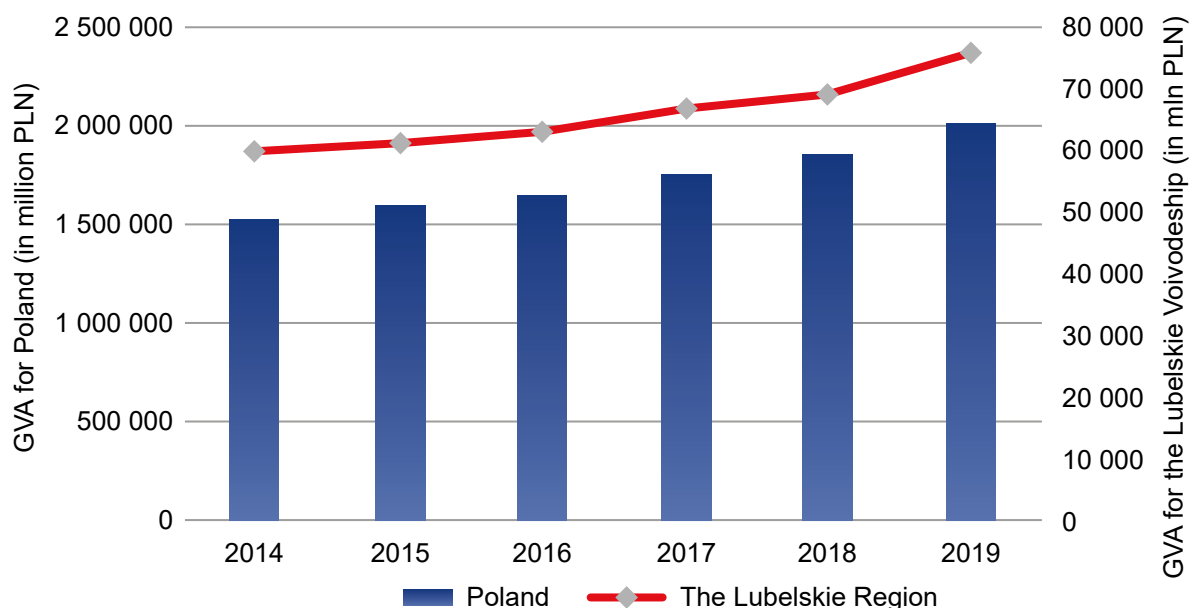


Source: own study based on CSO data – Estimates of gross domestic product by Region (data for 2019 according to preliminary estimates)

The total gross value added (GVA) in the Lubelskie Region in 2018 amounted to PLN 68,887,000,000, i.e. 3.7% of the country's GVA (similarly to the previous year, the Region ranked 10th in the country). The share of agriculture, forestry, hunting and fishing in the Region amounted to 5.2% of the GAV (in 2017, it was -6.4%), which is more than twice as high as compared to the country (2.5%). The share of financial and insurance activity as well as real estate market service was also higher, amounting to 9.2% for the Region and 9.0% for Poland. The share of gross value added for industry, however, was lower in Lubelskie and amounted to 20.8% (21.2%, in 2017), compared to -25.9% the country¹². According to preliminary CSO data, in 2019 the GVA of Lubelskie amounted to PLN 75,629,000,000, which caused an increase in the country's share in the GVA to almost 3.8%¹³.

¹² Methodological report as part of the study "Strategic directions of economic development of the Lubelskie Voivodeship in the context of the Regional Innovation Strategy", EU-CONSULT Sp. z o. o., November 2020

¹³ The CSO data, the Local Data Bank – <https://LDB.stat.gov.pl/LDB/metadane>

Chart 3. GVA in Lubelskie compared to the average for Poland

Source: own study based on the CSO data, the Local Data Bank – <https://bdl.stat.gov.pl/BDL/metadane>

In 2019, 268 EU regions were analysed in the context of selected areas and their economic performance. On this basis, an index of competitiveness of regions was established, in which attractive and stable conditions for enterprises and residents were assessed. The index for the Region was -0.68^{14} which means a decrease by 0.09 compared to 2016 (-0.59^{15}). The result for the Region on a scale from 0 to 100 was 34.66, thus placing Lubelskie on 209th position out of 268 analysed European regions (in 2016, it was 197th out of 263 regions, and 214th out of 268 in 2010). Among all the areas considered when determining the index value, Lubelskie the EU average only in two categories, namely higher education, and lifelong learning¹⁶.

What can steer the Region's economy to the path of sustainable development is undoubtedly an increase in the pace of introducing innovations by enterprises, mainly based on the regional research and development. In the long run it will increase the income of residents and improve their living conditions.

¹⁴ https://ec.europa.eu/regional_policy/en/information/maps/regional_competitiveness/ [access on: 18/11/2020]

¹⁵ https://ec.europa.eu/regional_policy/en/information/maps/regional_competitiveness/2016/ [access on: 18/11/2020]

¹⁶ Methodological report as part of the study "Strategic directions of economic development of the Lubelskie Voivodeship in the context of the Regional Innovation Strategy", EU-CONSULT Sp. z o. o., November 2020

AGRICULTURE AND THE AGRI-FOOD SECTOR

The Lubelskie Region is a typically agricultural area with a low level of industrialization and entrepreneurship. Its natural potential is much more favourable compared to others in Poland. The Region is considered to be one of the most important agricultural areas in the country due to its good natural conditions and, above all, large acreage of good and very good soil. Its main advantages include excellent soil and climate conditions, one of the largest share of agricultural land in Poland, a high quality rating of agricultural production space, and a position of a leading producer and supplier of agricultural and fruit produce.

The factor which, in turn, slows down the improvement of the area structure of farms and creates one of the Region's development barrier is an overestimated employment in agriculture, significantly exceeding the national average. The fragmented agricultural structure causes labour surplus in this area. Considerable fragmentation of acreage and large dispersion of buildings in rural areas adversely affect the possibility of locating many infrastructural and economic investment projects¹⁷. In terms of the number of farms, Lubelskie ranks second in the country (12.8% of all farms in Poland), right after the Mazowieckie Voivodeship and before the Małopolskie Voivodeship.

In 2019, the average area of an individual farm above 1 ha of agricultural land in the Lubelskie Region was 8.43 ha and it did not change much compared to 2018. There were 172,600 farms with agricultural land, including as many as 172,400 individual farms¹⁸. The share of people employed in agriculture has remained at similar level since 2010. In 2019, it was 35.8% (308,100 people), which accounted for 12.9% of domestic employment in this sector (the largest share in Poland)¹⁹.

The practice of excluding agricultural land from agricultural use in the Region is mainly intended for housing development, and to a lesser extent for industry purpose. This shows the diminishing role of industry in favour of services as a result of the decline in investors' interest in establishing business activity in Lubelskie, which is inversely proportional to the situation in the country. A significant part of land excluded from agricultural use is also intended for communication purposes²⁰.

In 2018, the share of the Lubelskie Region in the nationwide global agricultural production was 8.8%, therefore it was ranked third in the country. In the analysed year, the value of agricultural global production in the Region increased by 4.5% as compared to the previous year. In turn, the global production per 1 ha of arable land increased by 6.7%²¹. Cereals (26.5%), fruit (25.9%), edible legumes (15.8%) and industrial plants (15.5%) accounted for the largest share in crop production in the Lubelskie Region, while livestock constituted 53.6% (including pork, 55.7%) and cow's milk constituted 35.8% of global livestock production. In 2018, the Lubelskie Region was ranked third

¹⁷ The Prospective Diagnosis of the Lubelskie Voivodeship , the Marshal's Office of the Lubelskie Voivodeship in Lublin, Department of Regional Policy, Lublin, February 2019

¹⁸ Agriculture in the Lubelskie Voivodeship in 2019, Statistical Office in Lublin, Lublin 2020

¹⁹ Development Strategy for the Lubelskie Voivodeship 2030, project, Lublin, February 2021

²⁰ The Prospective Diagnosis of the Lubelskie Voivodeship , the Marshal's Office of the Lubelskie Voivodeship in Lublin, Department of Regional Policy, Lublin, February 2019

²¹ Methodological report as part of the study "Strategic directions of economic development of the Lubelskie Voivodeship in the context of the Regional Innovation Strategy", EU-CONSULT Sp. z o. o., November 2020

in the country in terms of commercial production (its share was 8.2%). Since 2007, the structure of commercial production has changed in favour of crop production. In 2018, it accounted for 62.3% (37% in the country) compared to 37.7% of the share of livestock production (63% in the country). From the point of view of economic efficiency, agricultural production specializations are a positive phenomenon and may not only help establish cooperation between farmers and other business partners, but also facilitate the development of industry technical infrastructure and knowledge transfer.

The crop structure in the region, just like in the country, is dominated by cereals, namely wheat and rye, which accounted for 74.4% of the total crops, followed by industrial plants. Nevertheless, considering the share of crops of agricultural plant products in the Lubelskie Region in national production, the crops of fruit from shrubs, berries and legumes have the highest percentage share in the market. Vegetable growing is concentrated mainly in the districts adjacent to the city centre of Lublin, with a better developed base as well as processing and trading network. Lubelskie is a leader in the country in terms of horticulture. The harvest structure is dominated by apples, which constitute 89.9% of the total fruit harvested from fruit trees²². In 2019, Lubelskie was ranked second in the country in terms of production of fruit from trees, and fruit farmers from the Region contributed to 15.3% of the national production. Only the Mazowieckie Voivodeship was ranked higher, with the share of 44.0% in national production. The Region supplies almost half of the fruit from shrubs and berry plantations (in this respect, it ranks first in the country with a share of 36.5% in 2019). In 2019, Lubelskie played a key role at national level in the production of such plants as hops (76.3% of domestic crops), tobacco (68.2%), edible legumes (33.3%), raspberries (71, 4%) and currants (37.0%). There are large herb plantations in the area (in the communes of Fajślawice, Łopiennik, Trawniki and Krasnystaw)²³.

The growing demand for good-quality food in recent years is conducive to the development of organic farms, which in turn is an opportunity for the Region to use the potential of agriculture both in the country and abroad. The development of organic farming is also an opportunity to increase the profitability of agricultural production, especially in relation to small and medium-sized farms. In 2019, 1,951 organic farms were registered in the Lubelskie Region (fifth place, 10.5% of the total in the country), where the area of arable land was 28,829 ha. Of these, 85% were certified farms (1,659 farms with a total arable area of 24,314 ha)²⁴. According to data of the Commercial Quality Inspection of Agricultural and Food Products, as of December 31, 2019, 2,067 organic producers and 87 organic food-processing plants operated in the Lubelskie Region, which accounted for 10.3% (fifth position) and 8.5% (fourth position) in the country, accordingly. The number of producers and food-processing plants increased compared to the previous year and was higher than in 2010 (by 2.7% and 141.7%, respectively)²⁵. Almost 2,000 certified farms have given up chemical pesticides and artificial fertilizers, shifting to only green fertilizers and

²² The Prospective Diagnosis of the Lubelskie Voivodeship, the Marshal's Office of the Lubelskie Voivodeship in Lublin, Department of Regional Policy, Lublin, February 2019

²³ Development Strategy for the Lubelskie Voivodeship 2030, project, Lublin, February 2021

²⁴ LDB, Ecological farms

²⁵ Data on organic farming, the Commercial Quality Inspection of Agricultural and Food Products <https://www.gov.pl/web/ijhars/dane-o-rolnictwie-ekologicznym> [access on: 19/11/2020]

minerals available in nature, and as for feeding animals, farmers primarily count on their own ecological feed. The largest nationwide organisation of agricultural producers with certified organic farms, namely the Polish Association of Ecological Farmers²⁶, operates in Lubelskie.

In terms of industrialization, the food industry is one of the main sectors in the region, with a 25% share in total industrial production. Agri-food processing plants, i.e. mills, flour, groat and pasta manufacturing companies, dairy cooperatives, butchers, sugar factories, cold stores and fruit and vegetable processing plants, account for the most numerous group of industrial plants in the Region. In addition, the agri-food sector includes distillery and tobacco plants as well as brewing, herbal, and bee-keeping plants. The leaders of the Lubelskie Voivodeship in the food processing industry include such companies as: Lubella Food Sp. z o. o. Sp. k. in Lublin (cereal products, a leading producer of pasta and breakfast cereals), PERŁA Browary Lubelskie SA (it maintains the brewing and distilling traditions), Lubelskie Zakłady Przemysłu Spirytusowego Polmos Lublin Sp. z o. o., which is a part of Stock Spirits Group Ltd. (a leading alcoholic beverage business operating in Central and Eastern Europe), Herbapol Lublin SA (herbal market), the Krasnystaw Sugar Mill, the Werbkowice Sugar Mill (branches of Krajowa Spółka Cukrowa SA, which is the largest in Poland and one of the largest sugar producers in Europe).

The agri-food sector is currently one of the fastest growing sectors of the economy of Lubelskie, which may be an important element in shaping the regional economy's specialization.

INDUSTRY

The Lubelskie Region is poorly industrialized. Its share in the national industrial production in 2019 amounted to 2.5% (the value is almost the same as it was in 2010); in terms of the value of this production, Lubelskie ranks 12th in the country. The beverage sector (11.9% of domestic production) as well as hard coal and lignite (10.2%) had the largest share in domestic production. Further positions were taken by other transport equipment (5.2%), chemicals and chemical products (5.1%), clothing (4.1%), leather and leather products (3.9%), food (3.7%) and furniture (3.5%)²⁷.

In 2019, 112,925 people were employed in industry in the Region²⁸, which accounted for 13.4% of all employed persons (compared to the national average, i.e. 20.7%)²⁹. In 2018, the average employment in industry was 99,658 people (including 89.7% in the private sector). Most people were hired in the manufacturing (74.7% of employees), with the highest average employment in the following industries: production of food products (19.4%), production of metal products (7.0%), production of machinery and equipment (6.7%) and furniture production (6.6%)³⁰.

²⁶ The Prospective Diagnosis of the Lubelskie Voivodeship, the Marshal's Office of the Lubelskie Voivodeship in Lublin, Department of Regional Policy, Lublin, February 2019

²⁷ Methodological report as part of the study "Strategic directions of economic development of the Lubelskie Voivodeship in the context of the Regional Innovation Strategy", EU-CONSULT Sp. z o. o., November 2020

²⁸ LDB, Employed (actual workplace) by sections, section groups and gender; section B, C, D and E of PCA 2007

²⁹ LDB, Percentage of employees by section groups; section B, C, D and E of PCA 2007

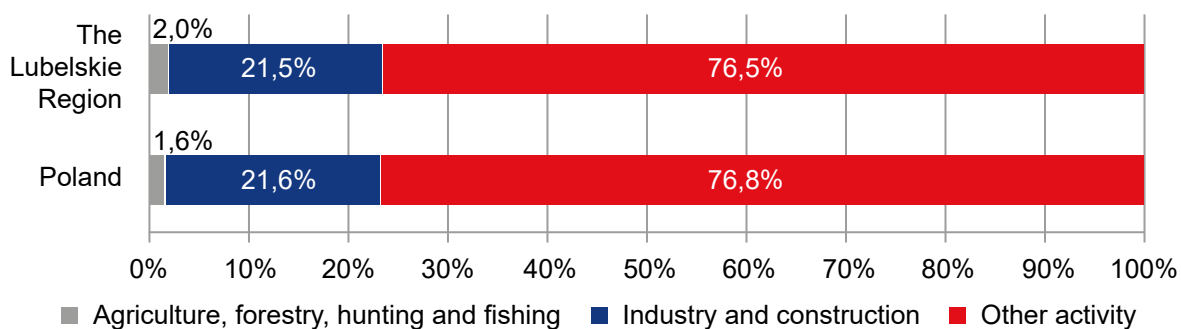
³⁰ Demographic situation of the Lubelskie Voivodeship in 2018, Statistical Office in Lublin, Lublin 2020

The value of the total industrial production sold in the Lubelskie Region in 2019 amounted to PLN 42,715,100,000, which was 2.6% of the value for the country, PLN 20,223 per capita (48.1% of the national average). In view of the size of enterprises, the highest share in the sold industrial production both in the Region and in the country, concerned entities employing 1,000 employees and more, and amounted to 34.3% for the Lubelskie Region and 37.2% for the country, respectively³¹.

The number of enterprises has increased over the last ten years. Constant growth in this area is extremely important as the development of micro-, small, and medium-sized enterprises contributes to an increase in income base of the Region, thereby stimulating development in the entire Region. The share of the SME sector in the sold industrial production remains more or less constant, but it is higher than in the country. The above facts show a relatively greater role of regional companies in shaping the development of the industrial sector, but also lesser importance of large entities, including foreign ones, whose role in the growth of innovation in the economy is often essential. The structure of the SME sector in the Region is the same as in the entire country, i.e. with a predominance of micro-enterprises (96.4%), followed by small and medium-sized enterprises (3.5%), and large enterprises (0.1%).

In 2018, 180,805 business entities were registered in the Region (4.1% of all entities in Poland). The sectoral structure of entities in the Region is similar to that in the country.

Chart 4. The structure of entities entered in the Registry of National Economy Entities in 2018 according to the Polish Classification of Activities 2007 in Poland and the Lubelskie Voivodeship



Source: Methodological report as part of the study "Strategic directions of economic development of the Lubelskie Voivodeship in the context of the Regional Innovation Strategy", EU-CONSULT Sp. z o. o.

The vast majority of companies (76.5%) are service providers. Activity of this type was conducted by companies in 2018 in the following industries: wholesale and retail, repair of motor vehicles, including motorcycles (32.5%), professional, scientific, and technical activities (11.3%) and other service activities and households with employees, households producing goods and providing services for their own needs (10.3%). These companies employed 200,872 people³².

³¹ LDB, Sold industrial production by size of economic entities

³² Methodological report as part of the study "Strategic directions of economic development of the Lubelskie Voivodeship in the context of the Regional Innovation Strategy", EU-CONSULT Sp. z o. o., November 2020

In 2019, 139,499 individuals were entered into the Registry of National Economy Entities in the Lubelskie Voivodeship, which is by 2.4% more than in the previous year and 10.3% more than in 2012. These enterprises accounted for 4.3% of all entities in the national economy (10th position in the country³³).

In the years 2012-2019, the largest increase in the number of entities was recorded in the following sectors:

- ◆ information and communication (80.7%), 3.1% of all entities conducted such a business activity,
- ◆ administration and support services (40.9%), constituting 2.5% of the total number of registered entities,
- ◆ production and supply of electricity, gas, steam, hot water, and air for air conditioning systems (35.7%, 0.2% among entities in the Region),
- ◆ professional, scientific, and technical activity (32.1%), conducted by 8.7% of entities,
- ◆ construction (31.7%), where 14.0% of all entities in the Region are involved.

On the other hand, the greatest decrease in business activity was recorded in the field of:

- ◆ agriculture, forestry, hunting and fishing (by 17.2%), constituting 2.0% of all entities in the Lubelskie Region,
- ◆ wholesale and retail trade; repair of motor vehicles, including motorcycles (by 11.3%), which accounted for 23.5% of all entities in the Region³⁴.

Enterprises registered in Lubelskie usually conduct their business activity in towns (39.3% of them are located in districts, including as much as 29.1% in Lublin) and in the Lublin district (9.4%). The smallest number of them is registered in the Włodawa and Parczew districts (1.8% in each of them)³⁵. There are also four economic zones operating in Lubelskie: the Euro-Park Mielec Special Economic Zone, the Euro-Park Wisłosan Special Economic Zone in Tarnobrzeg, the “Starachowice” SA Special Economic Zone and the Pomeranian Special Economic Zone. Lublin occupies a strategic position with regard to industrial activity in the Region, due to both a large number of industrial companies and, above all, due to the accumulation of innovative industries in the medium-high and high technologies sector in its area. Moreover, Puławy, Świdnik, Kraśnik, Biłgoraj and Łuków are important industrial centres of the Region. There is a noticeable trend of growing importance of medium-high and high technology industries, both in terms of the number of companies and their production. The Lublin subzone, which is an integral part of the Euro-Park Mielec Special Economic Zone bringing together 70 investors, operates in Lublin. Companies from the subzone produce aluminium profiles, windows, doors, blinds, roofs and covers for terraces and gardens, equipment for shops and warehouses, disinfectants, aircraft parts, precision tools, medical equipment, microbiological substrates, convection heaters, leather products, agricultural machinery, packages, electric motors, elevators, industrial washing machines, and others. Lublin is also a centre of the automotive and machine industry, where

³³ Ibidem.

³⁴ Ibidem.

³⁵ Ibidem.

companies producing tractors, trailers, cars, fuel systems, engines, springs and springs, and smaller vehicle parts, operate³⁶.

According to the CSO data, in 2019 in Lubelskie, investment outlays in enterprises amounted to PLN 4,784,400,000, which accounted for 3.0% of investment outlays in the country. The industry had the largest share in the expenditure in the Region, i.e. 88.5% of total investments. The highest expenditure in the structure of capital expenditure on fixed assets was incurred on buildings and structures (59.7%) as well as machinery, technical equipment, and tools (35.0%)³⁷.

The analysis of data on innovativeness of industrial enterprises in the years 2016-2018 shows that the Region was at the forefront in terms of several indicators:

- innovative industrial enterprises in the years 2016-2018 broken down by regions (first place, 30.7%),
- industrial enterprises that introduced product innovations in the years 2016-2018 broken down by regions (first place, 22.2%),
- industrial enterprises that introduced business process innovations in the years 2016-2018 (first place, 24.5%) and industrial enterprises active in innovation in 2016-2018 (second place, 31.9%)³⁸.

The average share of innovative enterprises in the total number of enterprises in the Region in 2018 was 24.9% and was higher than for the country by 3.1% (and higher than in 2012 in the Region: by 11.3%). In 2019, the share of innovative enterprises in Lubelskie went down to 12.1%, which reflected the national trend (a decrease from 21.8% in 2018 to 15.4% in 2019)³⁹. On the other hand, the share of expenditure on innovative activities in enterprises operating regionally in total national expenditure amounted to 2%. Both industrial and service entities usually invested these funds in fixed assets, intangible assets (in order to conduct innovative activity) and research and development⁴⁰.

The Lubelskie Region is considered to be of little importance to foreign trade in the economy. Despite an increase in the value of trade, the Region's share in the country's trade remains at a very low level. In 2018, Lubelskie recorded the lowest share of exports in sales revenues (15.3%) compared to the national average (33.9%). At the same time, it should be emphasized that in the years 2012-2016, slight, yet positive, changes in foreign trade were recorded in the Region. During this period, exports increased by 19%, from PLN 9.7 billion to PLN 11.6 billion, the trade balance increased, and the level of imports was relatively constant⁴¹.

³⁶ Przyszłość zaczyna się tu... LUBLIN, COLLIERS INTERNATIONAL, POLAND 2020

³⁷ LDB, Investments and fixed assets, Investment outlays, Investment outlays by section of PCA 2007 (quarterly data), annual data

³⁸ Innovative activity of enterprises in 2016-2018, Central Statistical Office, Statistical Office in Szczecin, Warsaw, Szczecin 2019

³⁹ LDB, Innovative activity – indicators

⁴⁰ Methodological report as part of the study "Strategic directions of economic development of the Lubelskie Voivodeship in the context of the Regional Innovation Strategy", EU-CONSULT Sp. z o. o., November 2020

⁴¹ The Prospective Diagnosis of the Lubelskie Voivodeship, the Marshal's Office of the Lubelskie Voivodeship in Lublin, Department of Regional Policy, Lublin, February 2019

The Lubelskie Region, compared to others in the country, is classified as a place of overall low investment attractiveness. However, some districts considerably differ from others as in some of them the investment attractiveness index is the highest and in others it is the lowest. Towns that are likely to attract the most investment projects include Świdnik, Lublin, Zamość, Chełm, Kraśnik, Puławy, Lubartów, and Łęczna (town and commune). The worst situation is in the and Biała Podlaska and in the Chełm-Zamość subregions. The low position of the entire Region results from such factors as low level of social infrastructure (low supply of employees and college graduates), small market, relatively low level of entrepreneurship and limited transport accessibility⁴². In 2018, 481 entities with foreign capital were registered in the Region (including 346 micro-, 67 small, 40 medium and 28 large companies). In this regard, the Region was ranked 12th in the country, and the share of entities in Poland amounted to 1.7% (compared to 2010, the number of entities with foreign capital increased by 40.2%). In 2018, foreign capital invested in the Region came mostly from Luxembourg (PLN 343 million), France (PLN 209 million) and the Netherlands (PLN 105 million)⁴³. A gradual increase in investment projects implemented by companies with foreign capital in the Region is a positive sign. Growing interest of foreign investors is most likely the result of an increase in the quality of human capital, still lower wages than in more developed regions of the country, growing number of plots with preferential investment conditions, better technical infrastructure, and transport accessibility, as well as an increase in the knowledge of the Region's values thanks to promotional campaigns sponsored by the EU.

MINING AND THE POWER INDUSTRY

The resources of hard coal largely determine the importance of Lubelskie in terms of the mining and power industry. Entities operating in the mining and extractive industry account for 0.13% of all business entities in the Region. Thanks to the Lubelski Węgiel Bogdanka SA mine, Lubelskie plays a significant role in the country's overall hard coal mining (20% of resources). In the last decade, coal mining in the Lublin Coal Basin has been systematically growing. On the one hand, increasing the resource base in this area means the possibility of long-term planning and securing the mine development, thereby providing the basis for holding Bogdanka's position as one of the most important companies in the Region that contributes to its development⁴⁴. On the other hand, one should bear in mind the current global, in particular European, trend towards the reduction or elimination of carbon dioxide from energy sources (also known as decarbonization) and the related government plans to end coal mining in Poland by 2050. This is important for the Region also in the context of the number of people working in the mining and extractive industries, which constitute 1.0% of all employees in the Region's economy and 5.9% of those employed in the country (third place, after the Śląskie and Dolnośląskie Regions, 2018)⁴⁵. At the same time, bearing the need to reduce the impact of the energy sector on the environment

⁴² Investment attractiveness of regions and subregions of Poland 2016, ed. St. Szultka, Instytut Badań nad Gospodarką Rynkową, Gdańsk 2016

⁴³ Ibidem.

⁴⁴ The Prospective Diagnosis of the Lubelskie Voivodeship, the Marshal's Office of the Lubelskie Voivodeship in Lublin, Department of Regional Policy, Lublin, February 2019

⁴⁵ Development Strategy for the Lubelskie Voivodeship 2030, project, Lublin, February 2021

in mind, in order to maintain the importance of the mining sector in the national and regional economy, emphasis should be placed on the development and introduction of environmentally friendly technologies, as well as alternative forms of coal use⁴⁶.

In the Lubelskie Region, clay deposits for cement production have been exploited for many years. This mineral is mined in two deposits, i.e. "Chełm" and "Rejowiec" (9.1% of domestic production)⁴⁷. Lubelskie ranks third in the country in terms of sand and gravel deposits, following the Mazowieckie and Wielkopolskie Voivodeships. The raw material is mainly used in local construction and road construction. Sands and gravels are common in Lubelskie⁴⁸.

The Lubelskie Region draws its electricity mainly from sources outside its territory (only 20% of electricity comes from regional sources). The share of renewable energy in the total electricity production is growing year by year, from approx. 6% in 2015 to over 23% in 2019. This production accounts for 2.2% of the energy produced in the country from RES. The location of the Region is considered one of the best for solar energy use. One of the features that favour the development of the solar energy sector is the existence of large wastelands that can be used to build solar farms. Solar energy ranks as the top renewable energy source in the Region. Moreover, the potential of the Region's renewable energy in the production of electricity lies in the biomass from agriculture as post-production waste (residues) and as energy crops (growing plants specifically for energy use). There are 13 biogas plants in the Region, including two installations at landfills, four at sewage treatment plants and seven agricultural biogas plants⁴⁹. According to the 2016 estimates, Lubelskie is rich in biomass resources that could be used for energy purposes, thereby allowing the Region to gain a competitive advantage⁵⁰.

As global trends show, the decarbonization policy in the coming years will put a strong pressure on economies that base their energy sector on coal, natural gas, and crude oil. Technologies of obtaining energy from renewable sources will be strongly supported.

CONSTRUCTION

In 2019, 185,315 entities from the Lubelskie Region were entered into the Registry of National Economy Entities, which constituted 4.1% of their total number in Poland. Construction was ranked second in terms of the number of registered entities (14.0%), after wholesale and retail trade and repair of motor vehicles, including motorcycles (23.5%). Out of 16,610 newly registered business entities in 2019, the most entities were entered under the "Construction" section (24.4%), followed by "Wholesale and retail trade; repair of motor vehicles, including motorcycles" (16.1%)⁵¹. In 2019, Lubelskie, next to the Małopolskie and Podlaskie, recorded a noticeable increase in the share

⁴⁶ Ibidem.

⁴⁷ Ibidem.

⁴⁸ The Prospective Diagnosis of the Lubelskie Voivodeship, the Marshal's Office of the Lubelskie Voivodeship in Lublin, Department of Regional Policy, Lublin, February 2019

⁴⁹ Ibidem.

⁵⁰ Methodological report as part of the study "Strategic directions of economic development of the Lubelskie Voivodeship in the context of the Regional Innovation Strategy", EU-CONSULT Sp. z o. o., November 2020

⁵¹ Ibidem.

of investments in construction investments. This was mainly due to significant engineering projects, especially road ones⁵². Most of the entities conducting construction activity are located in the Lublin subregion. Private sector entities dominate in this industry. In 2018, the value of sales of construction production in Lubelskie amounted to PLN 5.1 billion, and a year later it increased to PLN 6.1 billion.

The Lubelskie Region, in the context of the development of the construction industry, stands out with its rich building material resources such as: limestone, marl, chalk, clay, construction and glass sand. Hence, there are cement plants and building materials plants producing traditional and clinker bricks, silicate products, cellular concrete and prefabricated concrete products established in the Region. A large number of entrepreneurs concentrated around the biggest construction cluster in Poland, i.e. the National Construction Cluster⁵³, is the industry's strong point. Competitive prices of construction works compared to prices in Poland and in other EU countries, in addition to a developed network of economic contacts between companies from the Region and partners from Eastern Europe, mainly from Ukraine and Belarus, also give Lubelskie a major advantage.

In terms of housing construction, the Lubelskie Region ranks 11th among all regions with the number of dwellings completed (7,309 in 2019), which constitutes 3.5% of all dwellings completed in the country. In terms of non-residential construction, it is worth noting that Lublin is the largest area of modern offices in the eastern part of the country. At the end of 2019, modern office space in the capital of the Voivodeship amounted to 191,300 m² (48 modern office buildings). The office market is dominated by local developers⁵⁴.

TRANSPORT INFRASTRUCTURE

Investment projects in transport infrastructure (roads, railways, airports) are of key importance for economic development as they facilitate trade and reduce transaction costs. EU funds constitute significant Sources of funding investment projects in this area.

Due to the transit location of the Lubelskie Region, communication routes running through its territory, play a significant role in servicing international transport between western and eastern Europe and the Far East, as well as between the Baltic countries and southern Europe. Therefore, it is necessary to create an efficient, well operating, integrated transport system with high capacity and technical parameters corresponding to European standards. There are three routes of international roads running through the Lubelskie: E30, E372 and E373. The S19 expressway, which is a part of the Via Carpatia road route running along the eastern border of the EU, is under construction. The project is to connect Lithuania, Poland, Slovakia, Hungary, Romania, Bulgaria, and Greece; Finland, Estonia and Latvia are going to join it⁵⁵. As the expressway network

⁵² The report entitled *The Year 2019 in Construction* is available at: <https://www.wielkiebudowanie.pl/go.live.php/PL-H901/raport-rok-2019-w-budownictwie.html> of November 15, 2020.

⁵³ Analysis of the construction industry in the Lubelskie Voivodeship. Final report on quantitative and qualitative research, Regional Labour Office in Lublin, Research and Analysis Department, Lublin 2017

⁵⁴ *Przyszłość zaczyna się tu...* LUBLIN, COLLIERS INTERNATIONAL, POLAND 2020

⁵⁵ <https://www.rynekinfrastruktury.pl/wiadomosci/drogi/lubelskie-via-carpatia-lublin--lubartow-z-przetargiem-na-wykonawce--72203.html> of November 30, 2020.

is currently under construction, the national road network is of great importance for international and interregional transport. Despite the fact that the condition of the surface of national roads in the Lubelskie Region has improved over the last decade, some sections of regional roads are in poor technical condition. Its number exceeds the average indicator for the country.

Three international railway lines run through the Region, i.e.:

- main railway line No. 2/E20, C-E20 Berlin-Warsaw-Terespol-Mińsk-Moscow, the Western Europe-Moscow train, with a wide track leading to the complex of reloading terminals in Małaszewicze, Poland's largest hub, also known as the "dry port", where goods, including fuels, transported between Poland and Eastern European countries are reloaded;
- the Łowicz-Skierniewice-Pilawa-Łuków No. 12/C-E20, which is the southern bypass of Warsaw (intended mainly for freight traffic);
- the Warsaw-Dorohusk No. 7/C28, which is the shortest railway connection between Warsaw and Kiev, important for passenger and freight traffic (electrified), with the wide track section (line No. 63) from Zawadówka (with a large fuel base) to the state border⁵⁶.

The Sławków-Sędziszów-Zamość-Hrubieszów-state border (Włodzimierz Wołyński, Kowel) line No. 65 also plays an important role in international traffic. This is called the Road-gauge Metallurgical Line. It enables transport between the Polish-Ukrainian railway border crossing in Hrubieszów and Silesia⁵⁷ without the need to reload goods at the border.

The fact that the Lubelskie Voivodeship borders with countries that are not members of the EU and has transit routes of international importance, makes it an area of prospective development of logistics infrastructure. In this respect, the capital of the region, Lublin, and the town of Świdnik with the aviation industry and a regional airport, which also serves as a border crossing and a freight terminal, are of vital significance. Chief asset of the latter is its central geographic location and convenient access to Lublin. The airport has significantly improved the transport accessibility, the attractiveness and competitiveness of the Region. Moreover, infrastructure that allows for the development of logistics in the Region is located in Dorohusk, Chełm and Hrubieszów and is connected with railway stations along with the transshipment infrastructure. The location at the eastern border of the European Union is the Region's asset as it is becoming more and more accessible and attractive area for road and rail carriers and forwarders. Transit traffic to border crossings and the TEN-T network of roads, railways, airports, and water infrastructure running through the Lubelskie provide favourable conditions for the development of intermodal transport. The border crossings themselves, play an important role as border traffic junctions, i.e.: Terespol, Dorohusk, Zosin and Hrebenne, annually handle approx. 40% (approx. 14.5 million) of the total border traffic on the eastern border of Poland, thereby making Lubelskie rank first among the regions from eastern Poland in this respect⁵⁸.

⁵⁶ The Prospective Diagnosis of the Lubelskie Voivodeship, the Marshal's Office of the Lubelskie Voivodeship in Lublin, Department of Regional Policy, Lublin, February 2019

⁵⁷ <https://www.lhs.com.pl/pl/kim-jestesmy/o-nas> of November 30, 2020.

⁵⁸ The Prospective Diagnosis of the Lubelskie Voivodeship, the Marshal's Office of the Lubelskie Voivodeship in Lublin, Department of Regional Policy, Lublin, February 2019

TOURISM

The Lubelskie Region, thanks to its ability to attract and receive tourists, may develop its tourism potential. Its chief assets include natural environment, cultural heritage resulting from the meeting of three religions or, finally, cyclical cultural events. Local tourism is based on cultural institutions (museums and places of martyrdom), sites of religious pilgrimage (Catholic, Orthodox and Uniate sanctuaries) and places where traditional folk culture cultivated. The Lubelskie Region is famous for attractions highly valued in the country such as the city of Lublin or the towns of Kazimierz Dolny or Zamość. In addition to urban centres, tourists often visit Janowiec with its award-winning Magic Gardens, Łęczyńsko-Włodawskie Lakeland with the Polesie National Park and lakes, and the Roztocze National Park with such towns as: Szczepieszyn, Krasnobród, Zwierzyniec and Susiec. Other valuable tourist areas are two UNESCO biosphere reserves, namely the *West Polesie* Cross-border Biosphere Reserve and the *Roztocze* Cross-border Biosphere Reserve. The city of Lublin is the place where the most important cultural and entertaining events in the Region are held. The number of participants of the Performers' Carnival, the Lublin Marathon, the Jagiellonian Fair and the European Festival of Taste amounted to nearly 500,000 people. The Polish Festival of Hop-growers and Brewers is the largest event organized regularly outside Lublin, in Krasnystaw. In 2018, the town was visited by approx. 60,000 people⁵⁹. The residents are becoming more and more aware of the need to take actions in the field of revitalization and conservation of monuments, environmental protection, construction of technical infrastructure, promotion of the area and to associate in supra-local tourist organisations. As far as peripheral villages are concerned, they arouse interest of city dwellers wishing to try alternative tourism (agritourism, ecotourism, tourism with ethnographic values) based on fine holiday tradition. This can be economically helpful especially to villages located in areas with unfavourable conditions for agricultural production, particularly in areas which receive protection because of their recognized natural, ecological, or cultural values, where it is not possible to build tourist facilities with larger cubic capacity⁶⁰.

Environmental elements, such as the lie of the land, surface waters, underground waters: mineral and thermal waters, climate, flora, and fauna, are of significant importance for the development of tourism. Natural assets of the Lubelskie Region include geological, geomorphological, and hydrographic peculiarities that play an important role in sightseeing tourism, as well as the presence of mineral waters, therapeutic mud, and climate. Roztocze and the Lublin Upland abound in numerous and efficient springs. It is estimated that about 1,500 springs are active in Lubelskie. In the area between Nałęczów and Kazimierz Dolny, there are mineral and thermal waters for both therapeutic and tourist use. Some areas in the Region are characterized by detailed local bioclimate, so peculiar that it can be described as a therapeutic climate. The bioclimate in the Krasnobród is mildly stimulating with therapeutic values, whereas weather conditions in Nałęczów are very favourable for people suffering from cardiovascular diseases. Both towns

⁵⁹ Methodological report as part of the study "Strategic directions of economic development of the Lubelskie Voivodeship in the context of the Regional Innovation Strategy", EU-CONSULT Sp. z o. o., November 2020

⁶⁰ The Prospective Diagnosis of the Lubelskie Voivodeship, the Marshal's Office of the Lubelskie Voivodeship in Lublin, Department of Regional Policy, Lublin, February 2019

have the status of health resorts.⁶¹ The following municipalities are also candidates for obtaining the health resort status: Biszczka, Janów Lubelski, Łuków and Susiec⁶².

According to the Local Data Bank, in 2019 a total of 478 tourist accommodation facilities operated in Lubelskie. Compared to 2010, their number increased by 156. Facilities located in the Region accounted for 4.3% of all objects in the country (a decrease from 4.5% in 2010), therefore the Lubelskie ranked tenth across the country. The largest number of facilities of this type operated in the Puławy (85) and Zamość (63) districts as well as in the city of Lublin (55), where, despite the third position in the ranking, most hotels and facilities of the highest standard were located (40 out of 192 in the entire Region)⁶³.

WASTE MANAGEMENT

In the Lubelskie and the Świętokrzyskie Voivodeships, a statistical inhabitant generates the least waste in the country. Compared to 2007, the amount of mixed municipal waste collected per one inhabitant decreased by nearly 12% in the Region⁶⁴. The share of separately collected waste in the total amount of waste generated in the Region increased from 4.4% in 2007 to 39.2% in 2019 and is higher than the national average⁶⁵. It is not without significance that at that time major changes took place in the entire waste management system, the aim of which was to reduce waste deposited in landfills and its re-use. Despite considerable changes in waste management, there has not been a radical reduction in the amount of waste in this area. However, positive effects in waste management are noticeable. In 2018, the Lubelskie Region was one of the regions where the increase in the amount of waste collected selectively was higher than the national average. As new waste treatment plants have been built and the principles of selective collection of municipal waste have been gradually introduced, the share of waste collected in a non-selective manner continues to decline. The amount of waste collected selectively has been increasing systematically and noticeably, which is consistent with the trend for the entire country⁶⁶.

HEALTH

The Lubelskie Region is known for its high availability of medical staff. In this respect, Lubelskie is above the national average. Specialists in the following fields make up the most numerous group: internal diseases, paediatrics, conservative dentistry with endodontics, family medicine, general surgery, obstetrics and gynaecology, anaesthesiology and intensive care, ophthalmology. In turn, specialists in the following fields are the least numerous group: children's lung diseases,

⁶¹ Ibidem.

⁶² Development Strategy for the Lubelskie Voivodeship 2030, project, Lublin, February 2021

⁶³ Methodological report as part of the study "Strategic directions of economic development of the Lubelskie Voivodeship in the context of the Regional Innovation Strategy", EU-CONSULT Sp. z o. o., November 2020

⁶⁴ Ibidem.

⁶⁵ Development Strategy for the Lubelskie Voivodeship 2030, project, Lublin, February 2021

⁶⁶ The Prospective Diagnosis of the Lubelskie Voivodeship, the Marshal's Office of the Lubelskie Voivodeship in Lublin, Department of Regional Policy, Lublin, February 2019

neuropathology, marine and tropical medicine, clinical genetics, endocrinology and diabetology, children's urology, clinical immunology, children's cardiology, plastic surgery, and gynaecological endocrinology. The ageing of the medical staff is a disturbing phenomenon as 11.5% of all specialist physicians practising in the Region are physicians over 65 years of age. Apart from the necessity to quickly bring in younger medical staff on the market, there is also a need to take actions to handle the shortage of specialist doctors⁶⁷.

Inpatient health care in the Region is provided in general hospitals and in long-term care facilities (such as care and treatment facilities, nursing and care facilities, hospices). In 2019, in the Lubelskie Region there were on average 47 beds per 10,000 inhabitants in general hospitals, compared to the national average of 43 beds. This is one of the best results in the country⁶⁸. On the other hand, in terms of inpatient health care provided in long-term care facilities, the availability of beds in such facilities in Lubelskie is low.

The equipment in some health care facilities, especially modern equipment, and apparatus, remains insufficient. Investment projects executed as part of the Regional Operational Programme of the Lubelskie Voivodeship contribute to the improvement of the situation as far as the equipment is concerned. It is necessary to strengthen the infrastructure and human resources potential of the health care system in the areas of priority for the Lubelskie Region, i.e. cardiology, oncology, aortic and peripheral vascular diseases, including arterial hypertension. It is also necessary to increase the availability of long-term and hospice care services, and as part of this, to strengthen health care for the elderly, chronically ill patients and people requiring palliative care. At the same time, senior care should take a community form (mental health patients should be moved out of state-run institutions and into locally funded community mental health centres)⁶⁹. It is also critical to support the process of de-institutionalization of community psychiatric care (especially for children and adolescents), which can be combined with the development of spa and sanatorium services, e.g. the Psychiatric Hospital in Radechnica.

As many as 30% of entities from the health sector operating in the Region are located in Lublin, the home of the General Ophthalmology Clinic specializing in rare eye diseases and the Department of Oncology, Haematology and Paediatric Transplantology of the Medical University of Lublin, which have been included in the European Reference Networks (ERNs) as unique expert centres in Poland. In addition, the University Children's Hospital in Lublin is the only centre in Europe and the second in the world offering experimental stem cell therapy for patients with cerebral palsy. Patients from all over Poland also get the help of specialists treating rare vascular diseases. The Independent Public Clinical Hospital No.1 in Lublin is a leading centre in Poland specializing in the treatment of congenital vascular lesions⁷⁰.

There are also hospitals and health resorts operating in the Lubelskie Region, including: spa hospitals and sanatoriums in Nałęczów, the Tuberculosis and Lung Diseases Sanatoriums

⁶⁷ Ibidem.

⁶⁸ LDB, Beds in general hospitals – indicators

⁶⁹ The Prospective Diagnosis of the Lubelskie Voivodeship, the Marshal's Office of the Lubelskie Voivodeship in Lublin, Department of Regional Policy, Lublin, February 2019

⁷⁰ Przyszłość zaczyna się tu... LUBLIN, COLLIERS INTERNATIONAL, POLAND 2020

in Poniatowa and Adampol, the Rehabilitation Sanatorium for children in Krasnobród, the Institute of Natural Medicine in Nałęczów, the Treatment Centre (of skin diseases) in Tuligłowy⁷¹.

DIGITALIZATION

Despite the progress of digitalization, there are areas in the Region with no internet access, which has a negative impact on stimulating economic growth. In order to counteract digital exclusion, the Government of the Lubelskie Voivodeship has executed the project called *Eastern Poland Broadband Network – Lubelskie Voivodeship*. It provided telecommunications operators with favourable conditions to develop networks to offer the inhabitants of the Region better access to broadband Internet. As part of the project, 2,908,651 km of optical fibre network, 298 distribution nodes and 14 backbones were built⁷².

The Lubelskie Voivodeship also took part in projects aimed at increasing the number of public services provided entirely electronically. The regional infrastructure created as a result of these actions is being constantly updated, modernized, and expanded adequately to current needs and technological development.

According to the data from 2018, Lubelskie was ranked first in terms of the number of regional government hotspots, i.e. physical locations where people may obtain Internet access, typically using Wi-Fi technology, via a wireless local-area network. There is 1,034 hotspots in the Region⁷³.

In 2019, Lubelskie was one of the three regions (next to Kujawsko-Pomorskie and Świętokrzyskie) in which all public administration units used the electronic inbox available on the ePUAP platform to provide electronic services⁷⁴.

Thanks to the execution of ICT projects, the participation of enterprises using the Internet in contacts with public administration has increased significantly. Entrepreneurs use e-administration primarily to download and return forms and obtain information.

Actions in the field of digitalization of the Region are concentrated primarily in Lublin, which is one of the It centres in the country. Currently, there are over 6,000 people employed in this industry. The following companies are based in Lublin: Sollers Consulting, Billennium, Asseco Business Solutions, Comarch. It companies mainly specialize in business solutions, It outsourcing, dedicated It systems, mobile applications, web application/consulting, the IoT solutions, It for medicine, web design/marketing/e-commerce⁷⁵. Lublin is the home to one of the best developed It environments in Poland, namely the Lublin It Upland. It is a project aimed at creating favourable conditions for the It industry to develop in the city by promoting

⁷¹ The Prospective Diagnosis of the Lubelskie Voivodeship, the Marshal's Office of the Lubelskie Voivodeship in Lublin, Department of Regional Policy, Lublin, February 2019

⁷² Ibidem.

⁷³ Ibidem.

⁷⁴ Społeczeństwo informacyjne w Polsce w 2020 (Information society in Poland in 2020); study by the Central Statistical Office, Statistical Office in Szczecin, Warsaw, Szczecin 2020.

⁷⁵ Przyszłość zaczyna się tu... LUBLIN, COLLIERS INTERNATIONAL, POLAND 2020

cooperation between the science and business sectors, including by matching It graduates with IT/ICT companies⁷⁶.

A significant number of people studying science in Lublin choose IT. The following universities offer this field of study: the Lublin University of Technology, the Maria Skłodowska-Curie University, the John Paul II Catholic University of Lublin, the University of Economics and Innovation, and the University College of Entrepreneurship and Administration in Lublin. The number of people enrolled in It studies in the capital of the Voivodeship is over 30% higher than the average for 12 metropolises in the country. The above factor, combined with lower salaries in the It sector compared to the average for metropolitan areas, enhances the investment attractiveness of the entire Region⁷⁷.

At the same time, over 6,000 of households in Lubelskie were covered by the project of counteracting digital exclusion as part of Measure 8.3 of the Operational Programme Innovative Economy, initiated by the Marshal's Office of the Lubelskie Voivodeship in partnership with communes and districts from the Region. The project was implemented in three editions (2010-2015) and covered 81 communes in the Lubelskie Voivodeship. This is one of the largest undertakings in the fight against digital exclusion in Poland, carried out in the previous EU financial perspective⁷⁸.

EDUCATION

The Lubelskie Province has a relatively large educational potential at the professional and secondary level. In the 2018/2019 school year, about 7,000 students studied at first-cycle industry schools, most of them studied engineering and technology (43.5%). The number of technical secondary school students was about 31,000, the highest number of which (over 8,000) studied in engineering and technical fields and 6,600 students in the fields of services for population and ICT. About 14,000 students attended post-secondary schools, most of them in the fields of services for population (25.5%), medical (22.4%) as well as business and administration (18.2%). Between the 2018/2019 and 2010/2011 school year, the number of technical secondary schools in the Lubelskie Region decreased by 20.2%, while the number of students studying there decreased by 2.6%⁷⁹.

In the 2018/2019 school year in Lubelskie, there were 16 universities with 69,854 students. Compared to the previous year, their number decreased by 3.6%. This decline characteristic of the whole country. Most of the students (41.5%) attended universities, 11.5% chose technical universities, 10.8% agricultural ones, and 10.1% studied at medical universities. Scholarships were awarded to 28.6% of students in the region, most often to students at agricultural universities (32.3%) and colleges (32.0%)⁸⁰. In 2018, Lubelskie was ranked third in terms of the number

⁷⁶ Report on the condition of Polish metropolises: Lublin, PWC, 4th edition 2019

⁷⁷ Ibidem.

⁷⁸ The Prospective Diagnosis of the Lubelskie Voivodeship, the Marshal's Office of the Lubelskie Voivodeship in Lublin, Department of Regional Policy, Lublin, February 2019

⁷⁹ Methodological report as part of the study "Strategic directions of economic development of the Lubelskie Voivodeship in the context of the Regional Innovation Strategy", EU-CONSULT Sp. z o. o., November 2020

⁸⁰ Demographic situation of the Lubelskie Voivodeship in 2018, Statistical Office in Lublin, Lublin 2020

of ministerial scholarships awarded for outstanding achievements per 10,000 students (i.e. 7.3, while the country average is 5.6 scholarships)⁸¹. In the 2018/2019 school year, 8,076 students received post-graduate education in the Region (20.0% more than in the previous year)⁸².

Lublin is the main academic centre of the Region. There are nine universities in the city, five of them are public. Both domestic and foreign students receive education there. In the internationalization ranking, Lublin occupies first place together with Warsaw (10% of students are foreigners)⁸³.

In order to improve the innovativeness of the regional economy, higher education at doctoral level is also important, including implementation doctorate programmes. Currently, five universities in the Lubelskie Region and three institutes offer doctoral studies, namely the Institute of Agrophysics in Lublin, the National Veterinary Research in Puławy, the Institute of Soil Science and Plant Cultivation – State Research Institute in Puławy, where a total of 2,600 PhD students receive education, which accounts for 6.7% of doctoral students country-wide. With such a result the Region is ranked seventh in the country. In terms of the fields of education, a low number of people attend technical doctoral studies (5.7%) compared to doctoral students of humanities (54.0%). From among twenty institutions with the largest number of doctoral students in 2018, the John Paul II Catholic University of Lublin ranked third (1,316)⁸⁴.

THE R&D&I SECTOR

Innovations on a national or even European scale are not evenly distributed in the regions. They tend to be spatially concentrated. Even regions with similar innovation capacity show different degrees of economic growth. In June 2019, the European Commission published the Regional Innovation Scoreboard for 238 EU regions as well as Norway, Serbia, and Switzerland⁸⁵. In terms of innovation, the Lubelskie Region took 213th place out of 238 analysed regions and 10th place among all regions in the country (out of 17). The Voivodeship joined the group of modest innovators in Europe along with three other Polish regions: Kujawsko-Pomorskie, Świętokrzyskie and Mazowieckie.

On the other hand, according to the ranking called *Millennium Index 2019 – Regional Innovation Potential*, the Lubelskie Voivodeship was ranked sixth in the country. Despite a drop in the ranking by one position compared to the previous year, Lubelskie is still one of the regions that have significantly improved their innovative potential over the last five years. It was overtaken by the Mazowieckie, Małopolskie, Dolnośląskie, Pomorskie and Śląskie Voivodeships. A strong academic centre is an innovation stimulus in the region. Innovation is also fostered by high

⁸¹ Higher education in Poland in 2012-2018, Report prepared for the Ministry of Science and Higher Education, OPI, Warsaw 2019

⁸² Methodological report as part of the study “Strategic directions of economic development of the Lubelskie Voivodeship in the context of the Regional Innovation Strategy”, EU-CONSULT Sp. z o. o., November 2020

⁸³ Przyszłość zaczyna się tu... LUBLIN, COLLIERS INTERNATIONAL, POLAND 2020

⁸⁴ Higher education in Poland in 2012-2018, Report prepared for the Ministry of Science and Higher Education, OPI, Warsaw 2019.

⁸⁵ The ranking covered 17 Polish regions (16 regions and a statistically separated capital district).

level of cooperation of enterprises at the level of clusters and other forms of cooperation, such as science and technology parks, industrial parks located in Lublin, Puławy, Świdnik and innovation centres⁸⁶.

In 2019, research and development activity was conducted by 263 entities in the Region (7.8% more than in 2018 and approximately four times more than in 2010). These units accounted for 4.5% of the total number in the country, thus ranking tenth. The value of expenditure on R&D in the Region is PLN 986,500,000 (an increase by 22.3% compared to 2018 and by 172.4% compared to 2010). The value of outlays constituted 3.3% of the value country-wise, which gave the Region the ninth position among all regions. In relation to GDP, the ratio of the value of expenditure on research and development was 1.1% (compared to 1.3% for Poland), which means that Lubelskie was ranked sixth in this respect. Most of the funds were spent on basic research, but it should be emphasized that over the last few years the percentage of expenditure on development has increased significantly (in 2018 it was 27.6%, i.e. 12.6 pp more than in 2015)⁸⁷.

R&D activity is conducted mainly at universities, research institutes and research and development units. Enterprises come out poorly in this respect. Lublin (along with Świdnik) and Puławy show the research and development potential of Lubelskie. Big public universities located in Lublin and public research institutes in Lublin and Puławy are of the greatest importance for the regional R&D potential. As for private entities, WSK PZL – Świdnik SA plays the most fundamental role.

The most important entities conducting research and development activity in the Region include the following units:

- ☀ Lublin
 - ☀ The Maria Curie-Skłodowska University in Lublin
 - ☀ The Medical University of Lublin
 - ☀ The University of Life Sciences in Lublin
 - ☀ The Lublin University of Technology
 - ☀ The John Paul II Catholic University of Lublin
 - ☀ The Lublin Branch of the Polish Academy of Sciences
 - ☀ The Institute of Agrophysics of the Polish Academy of Sciences
 - ☀ The Institute of Rural Health in Lublin
- ☀ Puławy
 - ☀ The Institute of Soil Science and Plant Cultivation – State Research Institute
 - ☀ The National Veterinary Research Institute
 - ☀ The Biological Threats Identification and Countermeasure Centre of the Military Institute of Hygiene and Epidemiology
 - ☀ The Research Institute of Horticulture apicultural Division in Skierniewice
 - ☀ The Łukasiewicz Research Network – New Chemical Syntheses Institute

⁸⁶ The *Millennium Index 2019 – Regional Innovation Potential* ranking is available at <https://www.bankmillennium.pl/documents/10184/27565853/Indeks+Millennium+2019.pdf>

⁸⁷ Methodological report as part of the study “Strategic directions of economic development of the Lubelskie Voivodeship in the context of the Regional Innovation Strategy”, EU-CONSULT Sp. z o. o., November 2020

- * The Echo-Son SA Experimental Plant (the Institute of Fundamental Technological Research of the Polish Academy of Sciences is the main shareholder of Echo-Son SA).
- * The Research and Development Centre of Grupa Azoty Zakłady Azotowe “Puławy”
- ☀ Świdnik
 - * The Research and Development Centre WSK PZL-Świdnik SA⁸⁸

The structure of expenditure on research and development in the Lubelskie Region broken down into sectors is inversely proportional to the national structure. The vast majority of expenditure, i.e. less than 64%, is incurred on the higher education sector, approx. 36% of it is incurred on the enterprise sector, while in Poland, the outlays on higher education constitute 37%, and on the enterprise sector – 63%. Considering the above, the factor which inhibits the development of the Region is undoubtedly lower, much lower than the national average, expenditure on research and development incurred by enterprises.

In 2019, 11.4% of industrial enterprises from the Region invested in innovative activity (most of them were big companies, of which 54% made such outlays). The companies allocated PLN 657,640,000 to R&D (76.1% of this amount came from entities employing at least 250 employees). These companies primarily invested in new or improved business processes as well as products⁸⁹. The average share of innovative enterprises in the total number of enterprises in Lubelskie is 12.1%. In this respect, the Region ranks 11th, along with the Zachodniopomorskie.

The financial condition of enterprises from Lubelskie and the tendency to invest in R&D are much poorer than in more economically developed regions. This may be partially due to the unfavourable structure of local companies in terms of size, where entities employing more than 250 employees are rare. Despite the weak position in the country, a fundamental increase in expenditure on R&D in enterprises from PLN 42,700,000 in 2008 to PLN 350,100,00 in 2019 is undoubtedly a positive sign. The growing pool of funds for research and development results in an increase share of net revenues from sales of high and medium-high technology products in total net sales revenues.

In terms of fields of science, the largest part of funds is allocated to research in engineering and technical sciences (30.0%, compared to 50.6% in the country), followed by agricultural sciences (16.7%, compared to 4.6%) and natural sciences (16.8%, compared to 22.6%). It should be emphasized that in 2010, in Lubelskie, major expenditure was incurred on research in the field of agricultural sciences (38.0%).

The number of people working in the area of research and development in the Region is over 5,300, of which over 75% work in higher education, and over 22% in enterprises. Year by year, the number of people working in the R&D sector is slightly increasing. Employment in the R&D sector in the case of internal staff in 2019 amounted to 5,372 jobs and grew compared to the previous year (by 17.5%). The Lubelskie Voivodeship was ranked eighth country-wise in this respect (with a 3.5% share in Poland). The percentage of people hired in the R&D sector

⁸⁸ The Prospective Diagnosis of the Lubelskie Voivodeship, the Marshal's Office of the Lubelskie Voivodeship in Lublin, Department of Regional Policy, Lublin, February 2019

⁸⁹ Methodological report as part of the study “Strategic directions of economic development of the Lubelskie Voivodeship in the context of the Regional Innovation Strategy”, EU-CONSULT Sp. z o. o., November 2020

compared to the employed in general was 1.1% (1.2% for Poland). Such employees occupied mainly the positions of researchers (69.1%). Most of them had a doctoral degree, but compared to 2010, it was the number of associate professors that increased the most. These people were generally employed in the higher education sector (75.6%)⁹⁰.

In 2019, the Patent Office of the Republic of Poland received 277 applications from Lubelskie (including 217 applications from entities based in Lublin), which constitutes over 7% of all patent applications in the country and gives the Region sixth place. The PORP granted 216 patents for the reported inventions. Both the number of applications and the number of granted patents in the Region were lower than in 2018, but higher than in 2017. According to *The 2019 Annual Report* of the Patent Office of the Republic of Poland⁹¹, the Lublin University of Technology is one of the leaders from among domestic and foreign entities that have been granted patents. The University received only three patents less than the leader of the ranking, i.e. the West Pomeranian University of Technology in Szczecin.

There are approx. 150 institutions and business environment organisations operating in the Region, including clusters, chambers, local development agencies, local action groups, guilds. As far as development of innovation is concerned the role of such innovation centres as technology parks or technology incubators, is fundamental⁹². There are research laboratories, academic career offices and knowledge and technology transfer centres operating at universities, i.e.: the Knowledge Transfer Centre of the Medical University of Lublin, the Centre for Innovation and Technology Transfer of the Lublin University of Technology, the Technology Transfer Centre of the University of Life Sciences in Lublin, the Knowledge and Technology Transfer Centre at the MCSU, ECOTECH-COMPLEX at the MCSU, the Knowledge Transfer Centre at the John Paul II Catholic University of Lublin. The Puławy Science and Technology Park and the Lublin Science and Technology Park⁹³ play a crucial role.

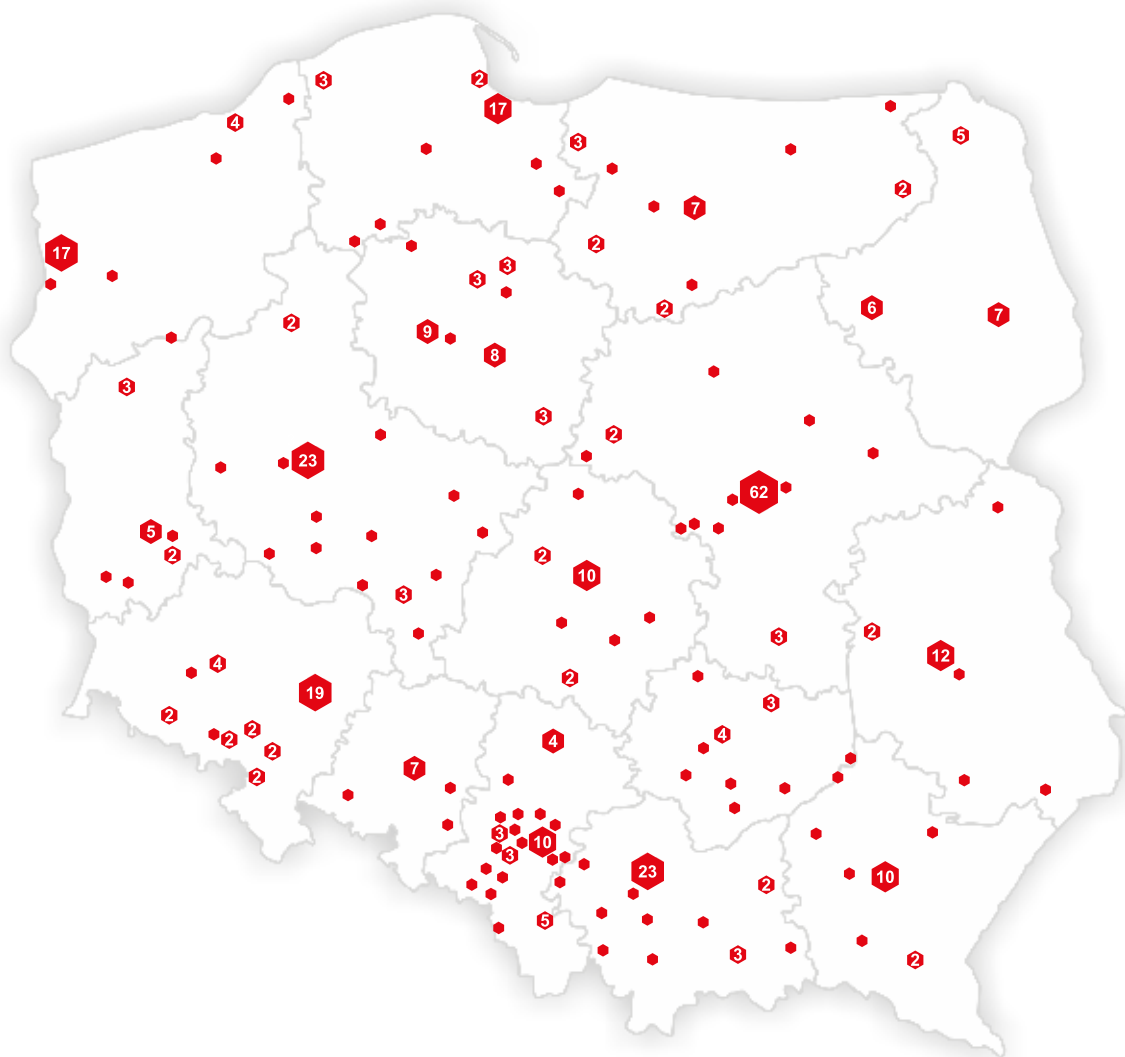
⁹⁰ Methodological report as part of the study "Strategic directions of economic development of the Lubelskie Voivodeship in the context of the Regional Innovation Strategy", EU-CONSULT Sp. z o. o., November 2020

⁹¹ The 2019 Annual Report, Patent Office of the Republic of Poland, available on the website: https://uprp.gov.pl/sites/default/files/inline-files/Raport%20roczny%202019_1.pdf

⁹² <http://www.invest.lubelskie.pl/pl/otoczenie-biznesu> [access of: 22/11/2020]

⁹³ Ibidem.

Map 1. Innovation and business centres in Poland in 2017.



Source: Ośrodki innowacji i przedsiębiorczości w Polsce, Raport 2018., ed. A. Bąkowski, M. Mażewska, Stowarzyszenie Organizatorów Ośrodków Innowacji i Przedsiębiorczości w Polsce, Poznań-Warsaw, 2018

Regional enterprises closely cooperate within approx. 20 cluster initiatives. According to data published by the Central Statistical Office, in 2016-2018 the highest percentage of industrial enterprises that undertook this type of cooperation (8.1%), as well as the second highest share of service companies involved in clusters (4.1%) were recorded for the Region⁹⁴.

Start-up platforms also play an important role in pro-innovation activities for the Region, including:

- **Samsung Incubator**, a technology incubator operating in cooperation with the National Research Institute of NASK and the Lublin University of Technology in the area of cybersecurity;

⁹⁴ Innovative activity of enterprises in 2016-2018, Central Statistical Office, Statistical Office in Szczecin, Warsaw, Szczecin 2019

- **Unicorn Hub Start Platform** run by the OIC Poland foundation and focused on the following industries: IT/ICT, Medicine/Public health, Smart City/Transport;
- **IDEALIST Start Platform** in Energia Sp. z o.o. Science and Technology Park in Lublin; industry specializations: ICT, energy, tourism/medicine/health;
- **Eastern Business Accelerator Start Platform** at the Puławy Science and Technology Park; industry specializations: ecology, food and agri-food products, ICT.

Their actions are primarily intended to support young entrepreneurs in developing their own business and implementing innovative projects and ideas.

II. Update of the Regional Innovation Strategy of the Lubelskie Voivodeship 2030

The main stages of work on updating the *Regional Innovation Strategy of the Lubelskie Voivodeship 2030* were indicated in the document called *Principles, Mode, and Schedule for Updating the Regional Innovation Strategy of the Lubelskie Voivodeship 2030*, adopted by the Resolution of the Lubelskie Voivodeship Parliament No. XVII/287/2020 of July 27, 2020. Three main stages of work are mentioned therein: preparatory, diagnostic, and conceptual and acceptance. Also, an activity schedule for each stage is defined. While the characteristics of the preparatory and acceptance stages mentioned in the above-mentioned document does not require additional explanations, the diagnostic and conceptual stage must be described in detail to show the complexity of the process as well as the multidimensionality of actions taken.

According to the document called *Principles, Mode, and Schedule for Updating the Regional Innovation Strategy of the Lubelskie Voivodeship 2030*, there are four analytical and conceptual areas singled out as part of the diagnostic and conceptual stage. These areas cover actions that summarize the effects of this stage. An analysis of the context and innovative potential of the region, analysis of challenges including bottlenecks of innovation diffusion, definition of the vision and directions of innovation development and areas of smart specialisation, and an update of the RIS LV monitoring system, considered key activities of the update process, were performed by the Lublin Centre for Research on Innovation in cooperation with experts for updating the strategy, external contractors, the Task Team for RIS Update and the Innovation Council.

These works, coordinated by the Lublin Centre for Research on Innovation, arranged in a logically interrelated sequence of research actions, included:

- ① Analysis of detailed issues in the areas of smart specialisations in the Lubelskie Region;
- ② preparation of the *Synthesis of recommendations from international projects regarding RIS3, executed by the RIS Managing Authority of the Lubelskie Voivodeship in the years 2016-2020*⁹⁵;
- ③ *Analysis of challenges, including bottlenecks in the diffusion of innovation in the Lubelskie Region*;
- ④ a study called *Strategic directions of economic development of the Lubelskie Voivodeship in the context of the regional innovation strategy*;
- ⑤ conceptual and advisory expert work.

⁹⁵ The table *Recommendations from international projects related to RIS3, executed by the RIS Managing Authority of the Lubelskie Voivodeship in the years 2016-2020* constitutes Attachment No. 2 to the Strategy.

Annotation 1)

The work carried out as part of the analysis of detailed issues in the areas of smart specialisations of Lubelskie included an analysis performed by the Lublin Centre for Research on Innovation and its modification as a result of consultations with the Task Team for RIS Update and the Innovation Council.

The main assumption of the analysis was to change the way of detailing the areas of smart specialisations from the way that is based on PCA codes to the one that points out thematic issues, allowing for a more precise description and definition of the scope of smart specialisation. For this reason, the basic unit for the entire analysis process was a “detailed issue” representing a challenge, a problem, a development niche. The need for change resulted directly from an entrepreneurial discovery process conducted in the Region. Previous areas of smart specialisations indicated in the *Regional Innovation Strategy of the Lubelskie Voivodeship 2020* (Bioeconomy, Medicine and Health, Low-carbon energy, IT, and automation) were the analysis’ starting point.

The analysis included three stages: (1) analysis of strategic documents, (2) analysis of research and implementation and implementation issues settled/to be settled as part of projects financed under Regional Operational Programme of the Lubelskie Voivodeship, Smart Growth Operational Programme, Eastern Poland Operational Programme and (3) analysis of the Region’s scientific and economic potential in relation to detailed issues defining the areas of smart specialisations.

(1) The analysis of strategic documents is primarily a comparative analysis of RIS LV 2020 with the material for updating the Development Strategy of the Lubelskie Voivodeship (*Prospective Diagnosis of the Lubelskie Voivodeship: Synthesis, Conclusions and Recommendations for Updating the Development Strategy of the Lubelskie Voivodeship, Development Strategy of the Lubelskie Voivodeship 2030 – Suggested Directions of Development*), and then a comparative analysis of selected detailed issues with the list of National Smart Specialisation, areas of smart specialisations indicated by other regions, recommendations listed in the domain reports of the Polish Agency for Enterprise Development research project called *Monitoring of National Smart Specialisation*, information materials and reports on smart specialisations presented by the S3 Platform and Elt Food and Elt Health thematic platforms. Then, the method of categorizing detailed issues was verified to differentiate between domain and horizontal issues (trends in economic transformation – green, digital) and in relation to the relationship between smart specialisations and areas of strategic intervention in accordance with a new paradigm of conducting development policy, i.e. sustainable and intelligent development. The works at this stage finished with an attempt to systematize detailed issues by distinguishing thematic subgroups. They also constituted a starting point for the second stage, i.e. a comparative analysis of the list of detailed issues grouped by category and subcategory with a quantitative list of projects under axes I and III of the ROP LV 2014-2020.

(2) The second stage was dedicated to an in-depth analysis of applications for funding research and implementation and implementation projects under the ROP LV 2014-2020, the Smart Growth Operational Programme and the Eastern Poland Operational Programme. It included

the identification of issues in the area of It and automation settled/to be settled under priority axis I and III of the ROP LV 2014-2020 and verification of lists of projects submitted under the ROP LV 2014-2020, the SG OP and the EP OP in terms of detailed issues, absent in previously identified areas of smart specialisations.

(3) The third stage took the form of a complementary study; its purpose was to provide arguments that strengthen/weaken the significance of a given issue/group of detailed issues in the process of updating the RIS LV. It included three independent studies: (a) an analysis of the POLON system data and university rankings in terms of innovation, effectiveness of studying and scientific potential, including the fields of study/research of the Lublin universities, (b) an analysis of the sectors of the regional economy in terms of share in exports, in the value of sold production of industry, the share of revenues from the sale of new or significantly improved products and services in total sales, (c) an analysis of innovation diffusion barriers based on the SWOT analysis of the economic, scientific, technological and institutional potential of the Lubelskie included in RIS LV 2020.

The final result of the entire analysis was the list of detailed issues grouped by category and subcategory, constituting the starting point for further analytical and consultative work, which, following consultation with the team of experts, the Board of the Lubelskie Voivodeship, the Task Team for RIS Update and the Innovation Council, was modified in accordance with reported comments.

Annotation 2)

The synthesis of the RIS3 recommendations included in projects executed by a unit responsible for managing the Regional Innovation Strategy of the Lubelskie Voivodeship in the years 2016-2020 is a supplementary document to the Analysis of detailed issues in the areas of smart specialisations in the Lubelskie Region. It was not included in the above-mentioned document due to the need to emphasize methodological approaches appropriate for the recommendations, used in projects supporting the process of entrepreneurial discovery, creation, and evaluation of RIS3 in the Region, in most cases executed within the INTERREG programme. The synthesis of the recommendations concerned the implementation of the following international projects: HESS, BRIDGES, EMPINNO, SMART_WATCH, ELISE, CLUSTERS. It was necessary to separate individual projects, showing the specificity of their approach and the scope of their impact, so as to properly read the recommendations included therein, including the context of the project. The separation of this document initiates the process of cataloguing the effects of execution of international projects supporting the process of entrepreneurial discovery. Special attention should be paid to the use of recommendations, catalogued within the above-mentioned synthesis, in the process of analysing challenges, including the analysis of bottlenecks in the diffusion of innovation in the Lubelskie Region.

Annotation 3)

A review of reports of European institutions and international consulting companies on megatrends and development challenges, as well as national and regional reports on innovation systems was the starting point for the analysis of challenges, including bottlenecks, in the diffusion of innovation in the Lubelskie Region, performed by an external contractor. On this basis,

the analysis of external conditions, i.e. political, economic, social, and technological (PEST analysis) as well as the analysis of strengths, weaknesses, opportunities, and threats (SWOT analysis) were updated. Following the update and the results of reports on international projects and the Lublin Centre for Research on Innovation's studies on the regional innovation system, bottlenecks of such a system have been identified.

It is important that the bottlenecks have been identified at such a level of detail that actions aimed at overcoming or reducing them can be assigned (i.e. actions that may be the subject of intervention at the regional level). As part of the above-mentioned work, a feedback element is expected, i.e. after performing the bottleneck analysis, the PEST and SWOT analyses were verified. The list of bottlenecks of the regional innovation system was also compared with the list of bottlenecks identified in national documents (the Productivity Strategy 2030).

Annotation 4)

The purpose of the study entitled *Strategic Directions of Economic Development of the Lubelskie Voivodeship in the Context of the Regional Innovation Strategy* was to define strategic directions of the Region's development based on its scientific, technological, economic, educational, and institutional potential. An important intermediate goal was to develop the Business Technology Roadmap (BTR) for selected directions of scientific and economic development of the Lubelskie Voivodeship.

The study was divided into four parts:

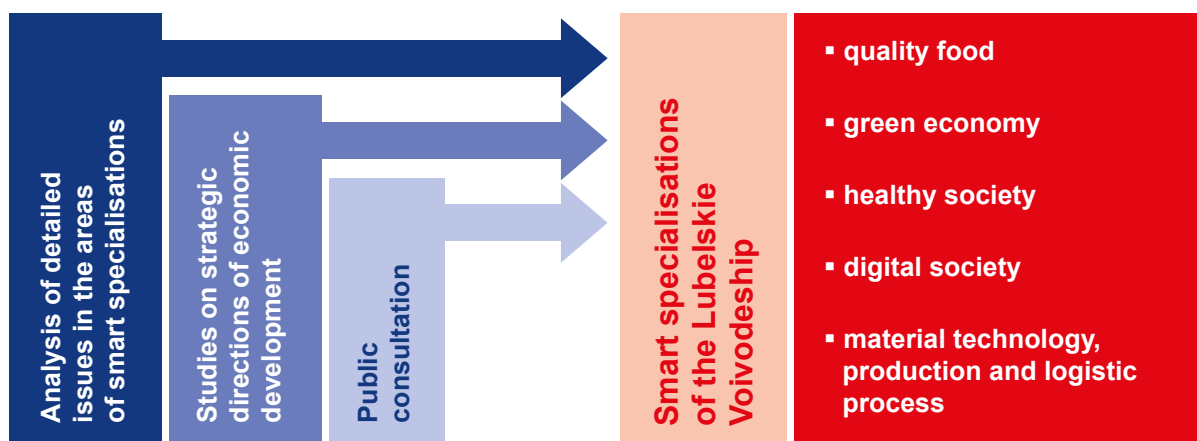
- I. collecting data on the development of indicators to describe the socio-economic situation of the Lubelskie Region, with particular emphasis on the Region's potential in the areas of smart specialisations;
- II. obtaining information on directions of economic development of the Lubelskie Region based on the scientific, technological, economic, educational, and institutional potential in the context of updating the areas of regional smart specialisations, from various groups of stakeholders (research participants);
- III. developing scenarios for economic development of the Lubelskie Region in stakeholder groups during the SmartLab workshops;
- IV. verifying the developed scenarios during workshop and expert panels, estimating regional potentials and factors ensuring their implementation.

Annotation 5)

The analytical and conceptual work coordinated by the Lublin Centre for Research on Innovation required not only consultation, which were the main activity of the team of experts for updating the RIS in relation to the research processes indicated in items 1-3. They primarily required the synthesis of two research orders: one based on secondary data (research indicated in points 1-3) and the other based on primary data (research on strategic directions of economic development). The results of the work developed by a team of experts for the RIS update provided the basis for prioritizing the key directions of scientific and economic development and

preparing recommendations for the Board of the Lubelskie Voivodeship to select/update regional smart specialisations by 2030. The task of the team of experts was also to develop a system to monitor and evaluate the Regional Strategy of the Lubelskie Voivodeship 2030, which is the culmination of the strategy implementation system. Also, such a system would determine the effectiveness of the original model of the entrepreneurial process, developed by the Lublin Centre for Research on Innovation.

The results of the update of the Regional Innovation Strategy of the Lubelskie Voivodeship 2030 are shown in the diagram below.



III. Identifying bottlenecks in the regional innovation system

In the regional innovation system, a diffusion of innovation, i.e. dissemination of new products or services on the market, is an important element determining the system effectiveness⁹⁶. Innovation diffusion is effective when an innovation is better than the existing solutions, but also compatible with the previously used solutions, thus facilitating the user learning processes. It should stand out with low complexity, easy testability, and observability (imitation of other users satisfied with the innovation)⁹⁷. The processes that limit the system's ability at a given time or problems that delay the diffusion of innovation processes are called bottlenecks. Their identification at the stage of planning the introduction of innovation allows for the development of tools and measures to ease the failure of the diffusion process.

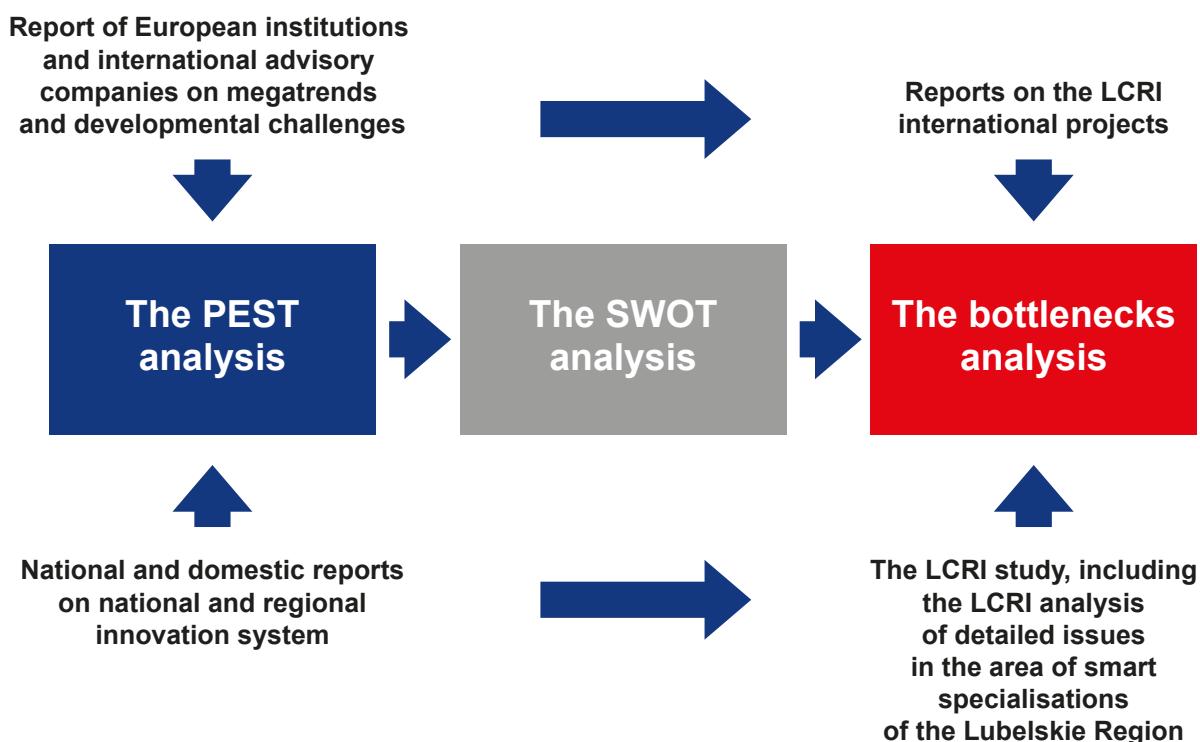
This *Analysis of Innovation Diffusion Bottlenecks* covers the following elements:

- updating the analysis of external conditions supporting the development of areas of smart specialisations of the Lubelskie Voivodeship included in the *Regional Innovation Strategy 2020* (PEST);
- updating the SWOT analysis of the economic, scientific, technological, and institutional potential included in the *Regional Innovation Strategy of the Lubelskie Voivodeship 2020*;
- developing a synthesis of recommendations regarding the regional innovation strategy, resulting from the execution of the following international projects by the Lublin Centre for Research on Innovation: HESS, BRIDGES, EMPINNO, SMART_WATCH, ELISE, CLUSTERS;
- identification of challenges, including bottlenecks, of innovation diffusion based on research carried out/commissioned by the LCRI: analysis of detailed issues in the areas of smart specialisations of the Lubelskie Voivodeship and research on strategic directions of economic development of the Lubelskie Voivodeship in the context of the regional innovation strategy;
- updating the regional analysis of challenges and bottlenecks in diffusion of innovation supplementing the elements of an analysis performed at the national level to the extent necessary (the Strategy for Responsible Development).

⁹⁶ Report entitled *Analysis of challenges, including bottlenecks in the diffusion of innovation in the Lubelskie Region*, commissioned by the Lubelskie Voivodeship, December 2020

⁹⁷ K. Klincewicz, *Dyfuzja innowacji. Jak odnieść sukces w komercjalizacji nowych produktów i usług*, Wydawnictwo Wydziału Zarządzania UW, Warsaw 2011

Picture 1. The course of the process of updating PEST and SWOT analyses and identifying bottlenecks



Source: the report entitled *Analysis of challenges, including bottlenecks in the diffusion of innovation in the Lubelskie Region*, commissioned by the Lubelskie Voivodeship, December 2020

3.1. Analysis of political, economic, social and technological factors (PEST)

This part shows the results of the update of the analysis of external conditions supporting the development of the areas of smart specialisations of the Lubelskie Voivodeship included in the *Regional Innovation Strategy of the Lubelskie Voivodeship 2020* (the PEST analysis). In order to identify current, external factors affecting the regional innovation system (the so-called megatrends), the reports of the European Commission and renowned research organisations, advisory and consulting companies were reviewed and analysed.

Contrary to the PEST analysis from the *Regional Innovation Strategy of the Lubelskie Voivodeship 2020*, the PEST factors have been presented without distinguishing individual areas of specialisations. This is due to the fact that many of the factors identified in the RIS LV 2020 are duplicated and distinguishing them at the level of individual areas of specialisations is not advisable (e.g. in each of the areas of specializations it has been indicated that they are of vital importance, fit into priorities set out in the strategic documents of the European Union, stand out with growing demand, have a chance to receive grants from the European funds, create new jobs).

The updated PEST analysis emphasizes the global and national external conditions that affect the regional innovation system, which should also be reflected in updated areas of smart specialisations (especially with regard to political and technological trends).

Political, economic, social, and technological factors affecting the regional innovation system are presented in Table No. 1.

Table No. 1: Analysis of political, economic, social, and technological factors (the PEST analysis)

Political	Economic	Social	Technological
Increasing economic and political role of Asian and African countries, including in the field of R&D&I	Economic slowdown due to the coronavirus pandemic	Ageing of the population in Europe (with population growth in Asia and Africa)	Increasing pace of technological progress
Growing R&D&I activity of Eastern European countries (Ukraine, Belarus)	Europe first – reconstruction of the industrial potential (base) and economic patriotism	International and domestic migrations, especially of qualified employees	Growing importance of cybersecurity
Development of international R&D&I cooperation partnerships, including European partnerships	Skilled labour shortages, especially in developed countries and regions	Growing social stratification between the rich and the poor	Growing use of Big data and blockchain
Shifting European funds to commercialization aspects (R versus D&I)	Growing demand for basic resources such as water, food, energy, land, and raw materials	Changes in attitudes in terms of environmental impact (environmental trend)	Progressive automation and robotization (Industry 4.0, IoT)
Growing importance of horizontal priorities: Green Deal and Digital Agency	Growing importance of cooperation in the field of innovation (open innovation, knowledge transfer)	Growing demand for high qualifications and interdisciplinarity	Dissemination of digitalization and artificial intelligence in various spheres of life (e.g. education, health)
Concentration of public funds for R&D&I on key thematic areas (smart specialisation, KETs, European partnerships)	Development of new cooperation models, especially digital ones	Robotization of industry (replacing people with robots)	Growth in importance of the economies of scale (the so-called “critical mass”) in scientific research, especially basic one
Support under the new perspective 2021-2027 – new SG OP and ROP	Dissemination of digital solutions, also in the public sector	Increase in the number of inhabitants of cities and suburban areas (urbanization)	Growth in importance of international links in the field of science value chain
Support for economies under the reconstruction fund (NRP 2021-2026)	Departure from a coal-based economy (mining, automotive – transport)	Social lock-in effect as a result of pandemic (socio-psychological aspects)	Growth in importance of interdisciplinarity of research

Political	Economic	Social	Technological
Adapting public research organisations to R&D&I priorities under parametric assessments (2017-2021 and 2022-2025)	Growing importance of Poland as a place of high-quality service outsourcing (Oncoarendi, Selvita)	Development of new forms of employment, especially during the COVID-19 pandemic (e.g. remote work)	
Growing importance of medical research (COVID-19, ABM, WIB)		Employment growth in the health services sector (combined with ageing populations)	
Progressing consolidation processes in the national R&D&I sector (Łukasiewicz, PAN, university federations)		Increase in connections – networking of citizens (shifting activity to the virtual world)	
		New patterns in health care and lifestyle (generation Z)	

Source: the report entitled *Analysis of challenges, including bottlenecks in the diffusion of innovation in the Lubelskie Region*, commissioned by the Lubelskie Voivodeship, December 2020

3.2. Strengths, weaknesses, opportunities and threats analysis (SWOT)

Table 2 presents an update of the analysis of strengths, weaknesses, opportunities, and threats (the SWOT analysis) of the economic, scientific, technological, and institutional potential included in the *Regional Innovation Strategy of the Lubelskie Voivodeship 2020*.

For each of the strengths and weaknesses, the sectors they relate to are indicated, i.e.:

- SBEI – the sector of science and business environment institutions,
- E – the enterprise sector,
- PA – the public administration sector.

The SWOT analysis was performed on the basis on the *Analysis of detailed issues in the areas of smart specialisations of the Lubelskie Region* and the *Synthesis of recommendations resulting from international projects regarding RIS3, executed by the RIS Managing Authority of the Lubelskie Voivodeship in 2016-2020*, prepared by the LCRI.

Some of the strengths and weaknesses identified in the *RIS 2020* are still valid and have therefore been included in the updated analysis (after rewording) or moved to bottlenecks.

[STRENGTHS] The current strengths of the sector of science and business environment institutions include:

- *relatively high employment in the field of R&D,*
- *concentration of the R&D potential of the science sector in the areas of smart specialisation,*
- *the existence of strong research teams in several centres that are highly rated at the European level,*
- *recently developed research infrastructure supporting technology transfer as well as better equipment in laboratory equipment.*

In the case of strength that regards an increasing awareness and openness of the administration to creating new solutions, the wording was changed to: *activity involving the introduction of instruments of innovation policy and international cooperation on the part of the administration.* International cooperation is particularly important from the perspective of deep involvement of regional government employees in international projects related to research and innovation.

In the case of strengths, the following was added:

- ◆ *a large number of foreign students (and their share compared to the total number of students in the country) – this factor makes the Lubelskie Region stand out, which was proven by the HESS project results,*
- ◆ *developing urban potential: Lublin – Puławy – Biała Podlaska – Chełm – Zamość (Lublin is a leading city in the Voivodeship in terms of R&D&I, however, the town of Puławy as well as the developing towns of Chełm, Zamość and Biała Podlaska also have a great potential (mainly thanks to the State University of Applied Sciences) – no other Region of Eastern Poland nor many other regions in Poland, where R&D activity usually is taken in the capital of the region, have such potential,*
- ◆ *high potential (human resources, infrastructure, wide range of education offer and research in all disciplines) of public research organisations (universities, institutes).*

[WEAKNESSES] In the sector of enterprises, the following weaknesses remain valid:

- *low level of technological entrepreneurship,*
- *low propensity for innovations (changed to low potential for adapting knowledge and implementing innovative solutions in enterprises – this factor also includes the dominance of imitation, which is considered a bottleneck),*
- *relatively low propensity for cooperation between entrepreneurs and entrepreneurs and research organisations,*
- *the structure of education and additional training as well as retraining is inconsistent with the needs of enterprises in the region.*

With regard to the sector of science and the business environment, 9 weaknesses were identified in the SWOT analysis of 2014 (the highest number compared to other sectors). The following weaknesses are valid:

- ◆ *low efficiency of BEI and clusters* – other factors concerning BEI and clusters were shifted to the level of bottlenecks, *i.e. the offer of BEI services is insufficiently adapted to the needs of entrepreneurs, the system of institutions funding innovations from extra-budgetary funds is poorly developed, the access to support for innovation and entrepreneurship centres in the Region outside the LFA is difficult,*
- ◆ *a small number of spin-off and spin-out companies compared to the number of academic employees* – in the updated version it is recognized as *a low level of technological entrepreneurship.*

As for four factors identified as science sector weaknesses, namely: (1) *low level of social capital,* (2) *attachment to stereotypes and reluctance to change the academic staff,* (3) *low degree of networking and* (4) *the universities' orientation mainly to the didactic function,* one factor was formulated: *low involvement of science sector entities in applied research and knowledge transfer* (the constituent factors are included in the bottlenecks).

Based on the results of international projects in which the Lubelskie Voivodeship participated (e.g. the HESS project), the below weakness was added: *low internationalization of research organisations.* Moreover, a weakness related to *low investment attractiveness of the Region* was added; it limits the inflow of capital from outside the Lubelskie and makes it difficult for enterprises operating in the Region to invest.

As far as public administration is concerned, both weaknesses are present, while the SWOT analysis also includes the dispersion and lack of coordination of activities in the area of the regional innovation system; the other weakness (*i.e. relatively low staff and organisational capacity of the regional administration*) was shifted to the bottlenecks (the factors causing dispersion and lack of coordination are manpower and organisational shortages).

[OPPORTUNITIES] Opportunities related to the inflow of European funds, in particular the 2021-2027 new financial perspective (possibly also funds from the National Reconstruction Programme), the priority treatment of regions of Eastern Poland and the increasing importance of international cooperation in research and innovation remain valid (in relation to the RIS LV 2020). Based on regional analyses and the results of international projects, the following opportunities were added: *an increase in demand for high-quality food, digitalization, an increase in demand for high-quality medical services, increase in the popularity of renewable energy sources (e.g. photovoltaics, biogas) and transit location of the Region.*

[THREATS] As for threats, the unfavourable demographic and migration trends remain valid. Due to their importance and different nature, it was decided to break them down into two separate threats; more attention should be paid to the problem of migration of qualified employees (also known as brain drain), competition from other regions, unstable and inconsistent legal system in the field of R&D&I (e.g. possible changes in the parametric evaluation system) and excessive taxation (e.g. possible tax changes related to the effects of the COVID-19 pandemic).

The new factors included: economic slowdown caused by the COVID-19 pandemic (socio-economic effects difficult to predict in terms of scale and duration, which may adversely affect operations of regional enterprises) and migration of added value from traditional industries to digital ones (for regions dominated by traditional industries, it means the so-called “industrial exclusion”).

Table No. 2: Analysis of strengths, weaknesses, opportunities, and threats (the SWOT analysis)

STRENGTHS	WEAKNESSES
<ul style="list-style-type: none"> ■ (SBEI) Great potential (human resources, infrastructure, wide range of education offer and research in all disciplines) of public research organisations (universities, institutes) ■ (E, SBEI) Access to qualified human resources and competitive labour costs, especially in the field of IT ■ (PA) Introducing instruments of innovation policy and international cooperation on the part of the administration (the Marshal’s Office of the Lubelskie Voivodeship, the Lublin City Hall) ■ (SBEI, PA) Substantial number of foreign students (and their ration to total students nationwide) ■ (PA, SBEI, E) Developing urban R&D potential: Lublin-Puławy-Biała Podlaska-Chełm-Zamość ■ (E, SBEI) Great potential of the Region in the production and R&D in the agri-food area (natural conditions, R&D facilities, enterprises, especially SMEs) ■ (SBEI, E) High quality of medical services and availability of medical staff 	<ul style="list-style-type: none"> ■ (E, SBEI) Low propensity for cooperating between entrepreneurs and entrepreneurs and research organisations ■ (E, SBEI) Low level of technological entrepreneurship (university spin-offs and spin-outs) ■ (SBEI) Low internationalization of research organisations ■ (PA, E, SBEI) Lack of coordination and dispersion of actions in the area of the regional innovation system ■ (PA, E, SBEI) Low investment attractiveness ■ (E, SBEI) Low potential for adapting knowledge and implementing innovative solutions in enterprises ■ (SBEI) Low efficiency and effectiveness of BEI and clusters’ operations ■ (SBEI, E) The structure of education and additional training as well as retraining is inconsistent with the needs of enterprises in the region ■ (SBEI, PA) Modest involvement of the science sector entities in applied research and knowledge transfer

Explanations:

SBEI – the sector of science and business environment institutions

E – the enterprise sector

PA – the public administration sector

OPPORTUNITIES	THREATS
<ul style="list-style-type: none"> ■ Targeting structural funds for development purposes, including R&D&I (NRP, ROP, European programmes) ■ Status of Eastern Poland – additional funding ■ Growing importance of international cooperation in the field of R&D&I in areas of smart specialization ■ Increased involvement of domestic enterprises in R&D ■ Increased demand for quality food ■ Digitalization of traditional industries that dominate the region ■ Increased demand for high-quality medical services ■ Increased popularity of RES (e.g. photovoltaics, biogas) ■ Transit location of the Region (international transit routes + airport) and the proximity of Ukraine and Belarus 	<ul style="list-style-type: none"> ■ Economic slowdown due to the pandemic (the scale, duration and economic effects are difficult to determine) ■ Population decline (population ageing) ■ Migration of graduates and qualified employees (also known as brain drain) ■ Migration of added value from traditional industries to digital ones (also known as “industrial „exclusion” and the marginalization of regions dominated by traditional industries) ■ Competition from other regions (others develop faster) ■ Decarbonization (the reduction or elimination of carbon dioxide from energy sources)

Source: the report entitled *Analysis of challenges, including bottlenecks in the diffusion of innovation in the Lubelskie Region* commissioned by the Lubelskie Voivodeship, December 2020

3.3. Identification of bottlenecks and measures to prevent them

Research carried out by the LCRI/commissioned by the Lubelskie Voivodeship, namely: analysis of detailed issues in the areas of smart specialisations of the Lubelskie Region and research on strategic directions of economic development of the Voivodeship in the context of the regional innovation strategy were the starting point for identifying the challenges. They were compared with recommendations proposed as part of international projects (synthesis of recommendations regarding the regional innovation strategy resulting from the execution of the following international projects by the LCRI: HESS, BRIDGES, EMPINNO, SMART_WATCH, ELISE, CLUSTERS.

Table 3 presents a list of weaknesses and bottlenecks, as well as their effects and measures to prevent them.

The analysis shows a high convergence of challenges and bottlenecks identified at the national level with the challenges and bottlenecks identified at the regional level. This is fully justified as the regional innovation system in the Lubelskie Voivodeship is a part of the national innovation system. Nevertheless, at the regional level, bottlenecks detailed to this Region have been identified. Their prevention will require the involvement of regional authorities and

the support from national authorities (especially through appropriately designed interventions under operational programmes for 2021-2021 and the NRP 2021-2026).

Table No. 3. List of bottlenecks and recommendations of measures to address them

Weaknesses in the SWOT analysis	Bottlenecks	Effect	Recommendations from reports	Recommendations supplementing the reports
Lack of coordination and dispersion of actions in the area of the regional innovation system	1. Lack of awareness of the role of innovation in local and regional development on the part of the administration 2. Financial constraints and staff limitations in the field of R&D&I support on the part of public and regional government administration	Dispersion of actions within the regional innovation system, lack of identified common priorities and no focus on them. Strategies “on paper”, not in action	BRIDGES (5 – stakeholders’ map)	Action: – promotional and information campaigns among regional government officials (the level of districts, communes, and cities) popularizing research and innovation (e.g. innovative public procurement, tax relief for R&D) – regional GovTech – digitalization of regional government units based on solutions offered by regional SMEs (https://www.gov.pl/web/govtech/misja) – securing funds for the operations of R&D&I units at the regional level
Lack of coordination and dispersion of actions in the area of the regional innovation system	3. Inefficient communication between local authorities, science, industry, and society (citizens)	Poor adjustment of public intervention to real needs of regional transformation; lack of stakeholders’ involvement in the above-mentioned processes	BRIDGES (3 – data collection and dissemination, 5 – stakeholders’ map, 6 – design of interventions based on Design Thinking) EMPINNO S3 (9 – information gathering system, 10 – stakeholders’ involvement in the RIS monitoring) SMART_WATCH (12 – the RIS observatory) CLUSTERS3 (13 – increasing the role of clusters in EDP) HESS (20 – detailing regional specializations in cooperation with stakeholders)	Actions: – reorganisation of the entrepreneurial discovery process through interactive workshops (based on Design Thinking, Smart Labs, etc.) in accordance with reports from international projects – continuous informing of stakeholders, especially citizens, about the effects of the RIS LV, e.g. social and economic results of projects presented on websites or regional meetings (describing and presenting the effects of projects from the perspective of their impact based on the example of the European Institute of Innovation and Technology)

Weaknesses in the SWOT analysis	Bottlenecks	Effect	Recommendations from reports	Recommendations supplementing the reports
Lack of coordination and dispersion of actions in the area of the regional innovation system	4. Poor integration of systems and initiatives to support innovation undertaken by public administration and other support institutions (at national/regional/local level)	Poor use of synergy effects between actions undertaken at different levels of intervention (country/region)		Actions: – intensification of cooperation and involvement within national initiatives (especially activation of regional experts in relations with the Ministry of Development, Labour and Technology, e.g. as part of the National Revenue Administration, the Future Industry Platform Foundation, and the Ministry of Education and Science)
Low propensity for cooperation between entrepreneurs and entrepreneurs and research organisations	1. Focus of academic staff on teaching and publishing activity (parametric evaluation criteria) 2. Little involvement of research organisations in application research and development works (a lot of basic research), in particular in competition funding for R&D&I (e.g. the NCBR, the National Fund for Environmental Protection and Water Management (NFEP&WM), the Medical Research Agency (MRA))	Insufficient identification of research organisations as key components (driving forces) of the innovation system in Lubelskie. Disproportions between the production base and R&D in the areas of smart specializations of the Region		Actions: – promoting implementation research and commercialization by universities (e.g. through bonus regulations) – creating databases of R&D projects and results by research organisations (in accordance with the descriptions used e.g. by the ELT in the context of socio-economic impact) – introducing initiation systems to execute joint projects with enterprises at the level of research organisations (e.g. following the example of the Łukasiewicz Challenges) – supporting research workers in filing applications to the NCBR, the NFEP&WM, the MRA (at the university level and possibly at the inter-university level)

Weaknesses in the SWOT analysis	Bottlenecks	Effect	Recommendations from reports	Recommendations supplementing the reports
Limited investment attractiveness of the region	1. Incomplete road and rail infrastructure 2. Lack of jobs for qualified personnel in the Region. Stereotype of the eastern Region as unattractive for qualified employees	Little importance of industry and services in generating GDP and added value. Consolidating the structure of the region's economy with a predominant share of traditional industries (labour-intensive and with low added value). Migration of workers, especially those aged 25-34 with university education		Actions: – modernizing public infrastructure (transport, culture, entrepreneurship in accordance with the provisions of public aid) – supporting the creation of new jobs in companies or the so-called placement (internships) – in accordance with the provisions of public aid – conducting promotional and information (image) campaigns changing the perception of the Region (nationwide)
Low efficiency of BEI and clusters' operations	1. Offer of BEI services inadequately adapted to the needs of entrepreneurs	No measurable effects in knowledge transfer and commercialization of R&D results.		Action: – BEI integration and certification (Ministry of Development, Labour and Technology) – active inclusion of BEI in the process of entrepreneurial discovery (ultimately, the workshop and Smart Labs leader should be BEI)
Low efficiency of BEI and clusters' operations	2. Poorly developed system of institutions funding innovations from extra-budgetary funds	Dependence of BEI on public funds (no financial sustainability mechanisms)		Action: – inclusion of public-private partnerships at the European level (e.g. establishing contact and cooperation with the EIt communities and the EIC based on the experience of cooperation between EIt Urban Mobility and the City of Lublin)
Low efficiency of BEI and clusters' operations	3. Difficult access to support for innovation and entrepreneurship centres in the Region outside the LFA	Uneven development of enterprises in the Region (more difficult access to services for enterprises outside bigger urban centres)		Action: – digitalization of BEI (virtual Lublin BEI) – integration of BEI as part of EDIH initiatives (the MDL&T and EC competition in 2021)

Weaknesses in the SWOT analysis	Bottlenecks	Effect	Recommendations from reports	Recommendations supplementing the reports
Modest involvement of the science sector entities in applied research and knowledge transfer	1. Low level of use of the university's R&D infrastructure 2. Informal, unregistered knowledge transfer by hiring research unit employees in enterprises 3. Attachment to stereotypes, reluctance to change and low level of mobility and entrepreneurship among the academic staff members	Irregularities in the management of intellectual property of research organisations (informal transfer of knowledge as an act to their detriment).		Actions: – inventorying and mapping research and technological infrastructure in the Region (plus possibly developing a service offer) – popularizing information on IP management regulations among research workers and SMEs
Low potential for adapting knowledge and implementing innovative solutions in enterprises	1. Lack of knowledge about benefits of new solutions, especially in the field of digital transformation 2. Avoiding taking risks (a preference for reliable, stable, and proven solutions)	The lock-in effect as part of current specializations of the region, mainly in traditional industries. Marginalization within global value chains (relying mainly on low labour costs and natural resources)	BRIDGES (2 – auto diagnostic tool, 4 – hackathon) EMPINNO S3 (7 – implementation of smart labs) ELISE (15 – use of BMC to identify common solutions)	Actions: – promoting pro-innovation attitudes among SMEs, research workers and students (dedicated promotional campaigns, mainly via the Internet; games and simulation films) – popularizing good practices in the field of innovation and start-ups (successes of regional SMEs and start-ups) – networking and starting the Living Labs/ Smart Labs (e.g. in accordance with the reorganized EDP)
Low potential for adapting knowledge and implementing innovative solutions in enterprises	3. Domination of purchasing finished products, machines and devices and introducing new products/services (mainly on the company's scale) over innovative actions on a national or global scale (imitation vs. own innovations)	Little meaning of industry and services in generating GDP and added value Consolidating the structure of the region's economy with a predominant share of traditional industries (labour-intensive and with low added value). No job offer for qualified employees (migration of employees, especially those aged 25-34 with higher education)	ROSIE (17 – innovation brokers) HESS (22 – introduction of new tools for funding R&D&I cooperation)	Actions – portfolio of instruments supporting science-business cooperation: – launching regional innovation vouchers (“first contact”) – promoting joint R&D projects co-financed from the national level or co-financed at the regional level (“proven partners”) – establishing R&D centres in enterprises within the national or regional level (“close cooperation”)

Weaknesses in the SWOT analysis	Bottlenecks	Effect	Recommendations from reports	Recommendations supplementing the reports
Low level of technological entrepreneurship (a small number of spin-off/out companies)	1. Small number of PhD students in technical faculties 2. Small number of implementation doctorates	Incomplete use of the intellectual potential of the Region and the correlation between the results of R&D works and implementations as well as new jobs in the region	HESS (21 – popularization of implementation doctorates)	Actions: – popularization of implementation doctorates and master’s theses among universities, research organisations and enterprises (good practices and successes, contract templates) – launching a regional path to support doctoral studies in line with smart specializations from ROP 2021-2027 funds (with a commercialization path based on the model of granting the intellectual property license to start-ups established by PhD students)
Low internationalization of research organisations (universities operate mainly regionally)	1. Low level of networking of research organisations on a European scale (e.g. activity in international organisations/platform) 2. Lack of experience in filing applications in foreign competitions 3. Lack of solutions motivating employees of research organisations to engage in international projects	Insufficient identification of research organisations as key components (driving forces) of the innovation system in the Region Disproportions between the production and the R&D base in the areas of smart specializations of the region	ELISE (16 – internship; the Study on international cooperation)	Actions: – promoting international cooperation of universities and research organisations by the regional government, e.g. through international projects under the Interreg – exchanging good practices dedicated to applications in international competitions (joint, regional projects) – introducing (real) bonus systems for participation in international projects at universities and in research organisations
The structure of education and additional training as well as retraining is inconsistent with the needs of enterprises in the region	1. Unsatisfactory educational offer in the area of developing entrepreneurial and innovation skills 2. Profile of education at the higher level with a small share of graduates with technical education	Insufficient identification of research organisations as key components (driving forces) of the innovation system in the region. Disproportions between the production base and R&D in the areas of smart specializations of the Region	ROSIE (19 – curricula in responsible research and innovation)	Actions: – teaching entrepreneurship according to the MIT, IESE or Elt models (practitioner-led classes based on case studies, simulation games, participant observation and practice), e.g. https://sea.innoenergy.com/course/managing-innovation-and-entrepreneurship/info ; https://learning.climate-kic.org/en/programmes-and-courses/sustainable-business-models-ii

Source: the report entitled *Analysis of challenges, including bottlenecks in the diffusion of innovation in the Lubelskie Region* commissioned by the Lubelskie Voivodeship, December 2020

IV. Objectives, actions, sources of funding

The Lubelskie Region is a part of a complex system and must fit into a number of existing phenomena and processes occurring globally or in Europe, such as unfavourable demographic processes leading to the ageing of the population, changes in the economy structure with the growing role of services and advanced technologies sector, and the decreasing role of agriculture and traditional industries, as well as unexpected phenomena such as the COVID-19 epidemic.

The main challenges faced by the Voivodeship authorities include what economic areas to choose and what kind of products from the Region will be in demand in the country and abroad in the upcoming years. These may include personalized, quality food products, tourist or health services, highly processed products, and finally natural raw materials. It is extremely difficult to indicate which of them are the most promising for the Region, all the more so as the intensive exploitation of raw materials and the development of industry may significantly threaten the promotion and perception of Lubelskie as a Region offering traditional local products, ecological crops, or exceptional tourist values. The Voivodeship authorities may choose one or the other direction of development or choose the third path towards sustainable development. Wider openness to interregional as well as international cooperation due to the fact that the market and domestic demand will always be limited is necessary for the Lubelskie to develop.

One should also be aware that the directions of economic development and innovation cannot be imposed; they are, to a greater or lesser extent, the result of free interaction between producers and consumers, research units and business, and reflect the internal potential of the Region and social challenges. Regional authorities may, however, create favourable conditions for detailed industries to develop, expand infrastructure, promote certain brands, products, and the Regional image, provide incentives for investors, encourage and support cooperation between scientific institutions and entrepreneurs. This is what smart specialisations of the Voivodeship set out in this document are for, in addition to the goals of scientific-research cooperation and innovation policy and the implementation tools.

The keynote that has always been behind the creation of a new document entitled *The Regional Development Strategy for the Lubelskie Voivodeship 2030* describing the RIS LV 2020 update was the assumption that it is not the number of goals and priorities or the complexity of the document, but simplicity and condensed form that should be its determinants.

In reference to this assumption, the main objective of the RIS LV 2030 was formed:

Main objective

Increasing the scale and scope of innovative solutions implemented in the Region's economy using local research and development base, which will contribute to an increase in the quality of life of the Region's inhabitants

This objective is to be achieved by undertaking all types of actions and initiatives within two detailed objectives, which were indicated in the updated RIS LV 2020 as priority ones, and which remain valid, namely:

Detailed objective I	Detailed objective II
Increasing the ability of entities from the science and research sector to spread and commercialize knowledge, especially in the areas of regional smart specialisations	Increasing the ability of commercial entities to spread and absorb knowledge and implement innovations, especially in the areas of regional smart specialisations

One should also be aware that in a properly operating innovation system, business environment institutions and an efficient public administration also play an important role but taking measures to strengthen their role should be viewed as auxiliary through the prism of the two detailed objectives presented above.

As part of the objectives set out above, the following actions and initiatives are planned to be undertaken to strengthen the regional innovation system, in particular in connection with the following operational objectives: 3.1 *Using the research and development potential of scientific units and supporting the transfer of knowledge and technology* and 3.2 *Supporting the competitiveness and innovation of enterprises of the RIS LV 2030*:

- identifying and supporting the development of new, prospective industries based on detailed resources of the region;
- stimulating the implementation of innovative solutions, developing knowledge diffusion mechanisms thanks to multi-sectoral cooperation;

- promoting international cooperation between universities, research organisations and enterprises, exchanging good practices in the development of joint applications in international competitions;
- taking inventory and mapping the research and technological infrastructure in the Region and developing a service offer in this area;
- increasing the level of implementation of research and development results and innovative solutions in companies;
- development and application of effective instruments to support innovation and scientific and economic competitiveness of the Region;
- including innovation into national and international chains and networking the cooperation of scientific and research units and economic entities from the Region;
- increasing the level of innovation of already operating companies;
- fulfilling the research and development potential of companies by creating and expanding the R&D infrastructure in enterprises;
- increasing the efficiency of using scientific and research infrastructure to conduct research and implementation works;
- increasing the possibility of funding development and implementation works performed by companies, research units and their consortia under industrial research application projects;
- launching instruments supporting selected elements of the innovation process, such as the purchase of services necessary to develop innovation (e.g. innovation vouchers);
- developing technological entrepreneurship;
- supporting spin-out and spin-off companies;
- supporting start-up companies;
- networking and launching Living Labs/Smart Labs;
- developing knowledge and competences of academic-research and industrial staff for the transfer of knowledge in scientific and economic activity;
- promotional and information campaigns popularizing research, development, and innovation with the involvement of regional stakeholders.

The use of the entire spectrum of methods and means within the regional innovation system is to contribute to an increase in the effective use of endogenous potentials of the Lubelskie Region. The number of products and services with high added value should be increased in the Region. As a consequence, Lubelskie will become much more open to innovation and better scientifically and economically connected with other actors of the national and global system.

The main financial sources of support for innovation in the Region, apart from the state budget, funds from the Government of the Lubelskie Voivodeship and private funds, always include the EU funds from:

- the Regional Operational Programme of the Lubelskie Voivodeship (at the regional level);
- the Operational Programme Eastern Poland (at the macro-regional level);
- the Smart Growth Operational Programme (mainly), the Digital Poland Operational Programme and the Knowledge, Education, Development Operational Programme (at the country level)⁹⁸;
- programmes managed directly by the European Commission, including the Horizon Europe programme (at the European Union level).

The scope and amount of funds in the above programmes will be the result of the negotiations on the shape of the new programming period 2021-2027, conducted during the development of the RIS LV 2030.

⁹⁸ The names of the national programmes were not known as of February 28, 2021. The programmes will have a similar thematic scope to those from the 2014-2020 perspective, therefore the above list included the names from previous programmes.

V. Implementation system

5.1. Institutional system

The following entities, described in detail below, provide the institutional basis for the implementation of the Regional Innovation Strategy of the Lubelskie Voivodeship 2030:

- the Board of the Lubelskie Voivodeship;
- the Council for Innovation – an opinion-making and advisory body appointed by the Board of the Lubelskie Voivodeship dealing with innovation policy, bringing together entrepreneurs and company representatives, business-related organisations, science and research units, universities, science and technology parks, non-governmental organisations, representatives of public administration;
- the RIS LV 2020 Managing Authority – this function is performed by (i) the Department of Economy and Entrepreneurship Support by the Marshal's Office of the Lubelskie Voivodeship in Lublin, indicated by the Board of the Region, and (ii) an organisational unit designated within it, namely the Lublin Centre for Research on Innovation.

In the course of the work on the RIS LV 2030, close cooperation with stakeholders was expected, i.e. with external entities and institutions provided with conditions and opportunities to participate in the process, discuss the provisions of the document and provide substantive support. The cooperation took the form of meetings and face-to-face talks, but due to the COVID-19 epidemic, they were mainly on-line. Electronic devices and solutions were used, e.g. the updated strategy draft was made available on the Marshal's Office website and comments, opinions and suggestions could be made by all interested parties remotely. When developing the strategy, specialists, and external experts from the scientific community as well as practitioners in this field were engaged as needed. Their role and tasks were specified on individual terms depending on the nature and issues of the analysed thematic areas.

5.2. Model of entrepreneurial discovery process – regional innovation laboratory

The Regional Innovation Strategy of the Lubelskie Voivodeship 2020 established new tools supporting an increase in the level of innovation and competitiveness of the Region. According to the Strategy, pilot programmes were to be systematically continued based on key principles of the entrepreneurial discovery process, such as the process continuity and its iterative and experimental nature. This assumption was reflected in the direct RSI LV 2020 declaration, which reads as follows: "Pilot programmes initiate a regional innovation laboratory for systematic search for solutions (directions and types of actions, detailed projects) that will better adapt the directions

and forms of intervention to the changing needs and challenges related to the development of regional areas of smart specialisation”.

This declarative statement, fulfilled to a large extent by the execution of projects related to the innovation ecosystem (financed under the INTERREG Programmes), projects supervised by the European Commission (the HESS project) or the Polish Agency for Enterprise Development (the Reg_Lab project), shows the direction of the self-evolution of the entrepreneurial discovery model. The model, based on pilot programmes developed in the umbrella initiative formula, is transformed as a result of the entrepreneurial discovery process into a systemic solution taking the form of a REGIONAL INNOVATION LABORATORY.

The REGIONAL INNOVATION LABORATORY defines the model of the entrepreneurial discovery process for the *Regional Innovation Strategy of the Lubelskie Voivodeship 2030* in the following dimensions:

- ① sources of information on innovation and development factors,
- ② a laboratory understood as a space and discovery method,
- ③ tools developed to implement the identified solutions.

1. Sources of information on innovation and development factors

The sources of information that constitute the starting point for the entrepreneurial discovery process and initiate the next step of this process in the new updated Regional Innovation Strategy, can be divided as follows:

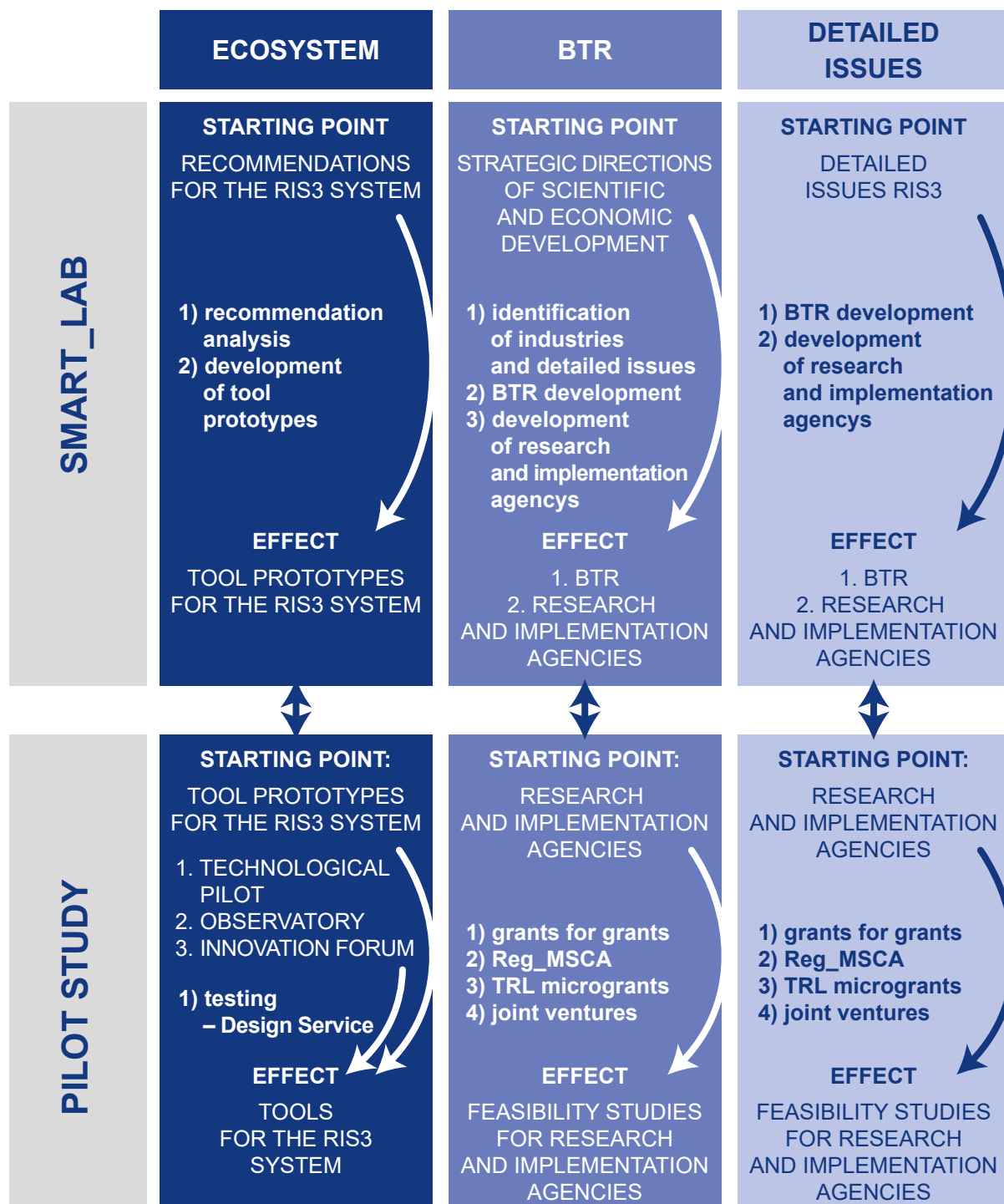
- Ⓐ recommendations regarding the RIS3 innovation ecosystem, resulting from the execution of international projects financed under the INTERREG Programmes and projects supervised by the European Commission (the HESS project) and the PAED (the Reg_Lab project) listed in the *Synthesis of recommendations from international projects regarding RIS3, executed by the RIS Managing Authority of the Lubelskie Voivodeship in 2016-2020*,
- Ⓑ a list of detailed issues grouped by category and subcategory, resulting from the analysis performed by the Lublin Centre for Research on Innovation in the areas of regional smart specialisations,
- Ⓒ a map of strategic directions of economic and scientific development of the Lubelskie Voivodeship together with the Business Technology Roadmap (BTR) for selected directions developed under the *Strategic directions of economic development of the Lubelskie Voivodeship in the context of the regional innovation strategy*.

Distinguishing these sources is important because each of them has a separate operation path – a method of discovering within the LABORATORY, developed depending on the level of maturity of a solution from a given source and the need to involve detailed EDP instruments.

2. Regional Innovation Laboratory as the space and EDP method

The space of the REGIONAL INNOVATION LABORATORY is divided into two functional modules: (1) SMART_LAB and (2) PILOT STUDY (horizontal layout) and three paths: (1) ECOSYSTEM, (2) BTR and (3) DETAILED ISSUES (vertical layout), which are the result of modifying the functional modules to the needs of the EDP information sources.

The following diagram shows the REGIONAL INNOVATION LABORATORY model:



THE SMART_LAB MODULE is a space to further specify, define innovative issues/solutions in an open expert formula. This module will be executed on the basis of an original method developed by the Polish Agency for Enterprise Development as part of a project aimed at monitoring national smart specialisation.

THE PILOT MODULE comes down to experiments and tests; it assumes that the effects achieved under the SMART_LAB module will be taken over and the work on prototypes of tools developed under the EDP model will be initiated (the EDP is based on pilot projects such as the RSI LV 2020). The process of experimenting under the PILOT module will be carried out in accordance with two key principles of the design service methodology, i.e. (1) customer/user orientation and (2) iteration of the process based on a quick transition from insight identification to prototype and prototype validation leading to a new improved solution.

THE ECOSYSTEM PATH

Recommendations regarding the entrepreneurial process of discovering, programming, implementing, evaluating, and monitoring the RIS3 are the starting point for the ECOSYSTEM path. They result from the execution of international projects financed under the INTERREG Programmes and projects supervised by the European Commission (the HESS project) and the PAED (the Reg_Lab project). The list of these recommendations, included in the *Synthesis of recommendations from international projects regarding the RIS3, executed by the RIS Managing Authority of the Lubelskie Voivodeship in 2016-2020*, will be subject to further analysis from the perspective of their relevance and possibility of implementation in the SMART_LAB workshop formula. The work will result in prototypes of tools supporting the entrepreneurial discovery process. The tools will be tested under the PILOT module.

Due to the fact that the entrepreneurial discovery process is continuous and iterative, the ECOSYSTEM path will have an additional starting point powered by the following prototypes of tools supporting the EDP:

- 1 the Technological Pilot is a tool supporting the transfer of knowledge and technologies as well as the development of science-business cooperation developed under the Reg_Lab project financed by the Polish Agency for Enterprise Development as part of the Gov_Lab pilot;
- 2 the RIS3 regional industry observatories system is a tool supporting the RIS3 monitoring developed under the SMART_WATCH project (Interreg Central Europe Programme);
- 3 the Innovation Forum is an effective dialogue tool as part of the entrepreneurial discovery process; it engages the RIS3 stakeholders and additionally serves the purpose of increasing the share of qualitative data in the strategy monitoring process (the tool is developed under the EMPINNO project financed by the Interreg Baltic Sea Region Programme using the experience of similar events so far).

The above tool prototypes will be tested as part of the PILOT STUDY module, in accordance with the Design Service method, and will be financed from funds allocated for the implementation of the EDP under the ROP LV 2021-2027.

THE BTR PATH

A map of strategic directions of economic and scientific development of the Lubelskie Voivodeship is the starting point for the BTR path. As part of thus identified strategic directions, it is necessary to distinguish industries/areas for which the Business Technology Roadmap will be developed. It will be the first, preparatory stage of the SMART_LAB module. The main stage of the above-mentioned module is oriented at the development of BTR. It will cover the preparation of domestic and global market characteristics for selected industries/areas, the definition of their development potential and the construction of development scenarios, which will be reflected in the roadmap constituting the starting point for the third stage of the SMART_LAB module, i.e. the development of research and implementation agency.

It should be emphasized that the implementation of the SMART_LAB module as part of the BTR path will result in:

- road maps for the development of markets and technologies, detailing the strategic directions of scientific and economic development of the region, thereby updating the list of detailed issues defining the areas of smart specialisations in the Region;
- research and implementation agencies developed as part of a given BTR, constituting the starting point for the PILOT module.

The experimenting as part of the BTR path will not be oriented at testing prototypes of tools supporting the EDP, but at applying tools programmed under the new financial perspective 2021-2027 to research and implementation agencies (grants for grants, TRL microgrants, internationalization programmes for key research directions). Tools successfully tested under the ECOSYSTEM path will also be applied to these agencies. The test will result in feasibility studies for research and implementation agencies.

THE DETAILED ISSUES PATH is a path for which a list of detailed issues grouped by category and subcategory, constituting an appendix to the updated *Regional Innovation Strategy of the Lubelskie Voivodeship 2030*, is the starting point. The development of BTR will be the first stage of the SMART_LAB module for this path. It will cover the preparation of domestic and global market characteristics for selected issues, the definition of their development potential and the construction of development scenarios, which are reflected in the roadmap constituting the starting point for the second stage of the SMART_LAB module, i.e. the development of research and implementation agencies. As in the case of the BTR path, the implementation of the SMART_LAB module will result in both road maps for the development of markets and technologies that update the list of detailed issues defining the areas of smart specialisation, as well as research and implementation agencies that constitute the starting point for the PILOT STUDY module. The path of conduct as part of the PILOT STUDY module will look the same as in the case of the BTR path.

3. Tools supporting the entrepreneurial discovery process

While the SMART_LAB module fall within the limits of the budget dedicated to the EDP funding in the Region, the PILOT STUDY module, due to its experimental nature, requires external funding that may come from both the Regional Operational Programme of the Lubelskie Voivodeship as well as national or European programmes.

At the stage of the RIS LV 2030 update, it was assumed that the instruments of the entrepreneurial discovery process would include at least four tools supporting the EDP in the Region:

- ⓐ the *grant for grants* programme to support the formation of consortia and the filing of applications for funds under the Horizon Europe programme;
- ⓑ *Reg_MSCA*, a systemic project of internationalization of the Region's key research directions, based on the Marie Skłodowska-Curie Actions initiative;
- ⓒ TRL micro-grants programme supporting an increase in the level of technological readiness of solutions subject to regional research and implementation agencies;
- ⓓ a joint undertaking formula that combines the funding of research and implementation agencies at regional and national level with the involvement of the supply and demand side.

The above-mentioned tools do not close the list of instruments set by the Regional Innovation Laboratory. Due to the process and self-evaluation nature of the Laboratory, the list will be extended with undertaking tested in the PILOT STUDY module as part of the ECOSYSTEM path. The testing of prototypes of solutions will also include the search for funding sources that go beyond the means allocated for funding the EDP in the Region.

VI. Monitoring and evaluation system

The Regional Innovation Strategy of the Lubelskie Voivodeship 2030 is one of the strategies implementing the *Development Strategy of the Lubelskie Voivodeship 2030*, therefore the RIS LV 2030 monitoring and evaluation system is an integral part of the DSLR 2030 monitoring and evaluation system.

The monitoring system of the *Regional Innovation Strategy of the Lubelskie Voivodeship 2030* was developed as a result of experiences related to monitoring the implementation of the current RIS LV 2020, especially in the context of ensuring coherence within the multi-level management system for smart specialisations areas.

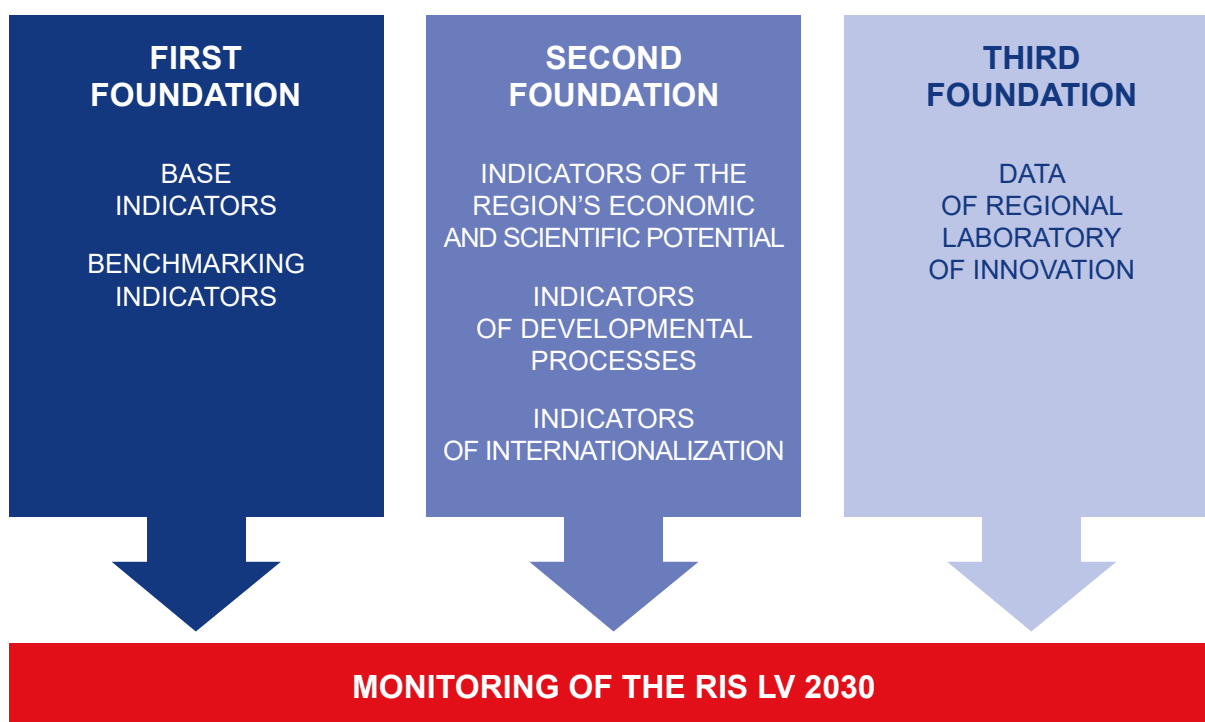
The key documents include:

- *System of monitoring and evaluation of the Regional Innovation Strategy of the Lubelskie Voivodeship 2020* (2016);
- *Preparation of data on selected monitoring indicators of the Regional Innovation Strategy of the Lubelskie Voivodeship 2020* (2018);
- *Monitoring report of the Regional Innovation Strategy of the Lubelskie Voivodeship 2020* (2019);
- *Analysis of detailed issues carried out by the Lublin Centre for Research on Innovation Lublin Centre for Research on Innovation in the area of smart specializations of the Lubelskie Voivodeship* (2020);
- *Synthesis of recommendations from international projects regarding RIS3, executed by the RIS Managing Authority of the Lubelskie Voivodeship in the years 2016-2020* (2020).

In view of conclusions from the above documents, it was assumed that the RSI LV 2030 monitoring system will be based on three foundations (Fig. 2):

- ◆ FIRST FOUNDATION – base indicators defined at the level of the DSLR 2020 monitoring system and benchmarking indicators defined in the RIS LV 2020,
- ◆ SECOND FOUNDATION – indicators assigned to three concept categories, distinguished as a result of the application of the reduction-classification method,
- ◆ THIRD FOUNDATION – data obtained as a result of the implementation of the Regional Innovation Laboratory.

Picture 2. RSI LV 2030 monitoring system



THE FIRST FOUNDATION includes:

■ **base indicators:**

- ① GDP per capita (%),
- ② employment rate of people aged 15-64 according to EAs (%),
- ③ unemployment rate of people aged 15+ according to EAs (%),
- ④ structure of the employed (actual jobs) in individual economic sectors: agriculture, industry, construction, market services, non-market services (%),
- ⑤ gross value added per 1 person employed in agriculture in relation to the national average (%),
- ⑥ share of university graduates in mathematics, science, technology, and medicine in the total number of university graduates (%),
- ⑦ share of people aged 25-64 learning and training in the total population of this age (lifelong learning for adults) (%),
- ⑧ share of expenditure on research and development in the Region's GDP (%),
- ⑨ percentage of patents granted in the Region per total number of patents in Poland (%),
- ⑩ the number of SMEs per 1,000 inhabitants in total (number);

■ **benchmarking indicators** (resulting from the *Regional Innovation Scoreboard*):

- ① PhD students (number),
- ② expenditure of the enterprise sector on R&D as % of GDP (%),
- ③ expenditure on innovative activity in industrial enterprises and the service sector other than R&D (%),
- ④ innovative (small) industrial SMEs cooperating with others as percentage of total enterprises (%),

- ⑤ innovative (medium) industrial SMEs cooperating with others as percentage of total enterprises (%),
- ⑥ innovative (small) SMEs from the service sector cooperating with others as percentage of total enterprises (%),
- ⑦ innovative (medium) SMEs from the service sector cooperating with others as percentage of total enterprises (%),
- ⑧ number of applications for inventions in the PORP (number),
- ⑨ number of utility model applications in the PORP (number),
- ⑩ protection rights for utility models granted by the PORP per 100,000 population (number),
- ⑪ patents granted by the PORP for 100,000 inhabitants (number),
- ⑫ small innovative industrial enterprises as percentage of all enterprises (%),
- ⑬ medium innovative industrial enterprises as percentage of all enterprises (%),
- ⑭ human resources in science and technology core (HRSTC) as a percentage of human resources in science and technology (HRST) (%),
- ⑮ share of net revenues from the sale of innovative products for the export market in total net revenues (%),
- ⑯ share of net revenues from the sale of innovative products for the market in total net revenues from sales in industrial enterprises (%).

THE SECOND FOUNDATION includes:

■ **indicators of the economic and scientific potential of the Region:**

- ① average number of research and development employees, broken down into regional areas of smart specialisations (people),
- ② share of people working in sectors and fields considered as regional areas of smart specialisations (%),
- ③ investment outlays on fixed assets – machines and technical equipment in total (PLN thousand),
- ④ share of people employed in R&D in the total number of employees (%);

■ **development process indicators:**

- ① total expenditure on innovative activities (PLN thousand),
- ② total expenditure on R&D in the Region (PLN million),
- ③ outlays on R&D activity from own resources of enterprises in total (PLN thousand),
- ④ share of research and development employees in total number of employees in the R&D sector in the Region's total economy (%),
- ⑤ number of patents granted by the PORP (number),
- ⑥ number of patent applications broken down into regional areas of smart specialisations (number),
- ⑦ number of patents granted by the PORP per 1 million inhabitants (number),
- ⑧ number of applications for inventions filed by scientific units of the Polish Academy of Sciences, research institutes, universities (number);

- internationalization indicators:
 - ① share in exports of highly processed goods in total exports (%),
 - ② share in exports of highly processed goods broken down into regional areas of smart specialisations (%),
 - ③ total number of enterprises conducting export activity (number),
 - ④ number of enterprises conducting export activity broken down into regional areas of smart specialisations (number),
 - ⑤ share of net revenues from the sale of innovative products in total net revenues from sales in industrial enterprises (%),
 - ⑥ share of revenues earned in regional areas of smart specialisations from the sale of new or significantly improved products/services in total revenues from the sale in regional areas of smart specializations (%),
 - ⑦ the structure of revenues earned in regional areas of smart specialisations from the sale of new or significantly improved products/services, broken down into individual regional areas of smart specializations (%).

THE THIRD FOUNDATION includes data from functional modules: Smart_Lab and Pilot Study conducted as part of the Regional Innovation Laboratory. In particular, the results of qualitative research conducted as part of modules listed below will be considered:

- ① Smart_Lab,
- ② Technological Pilot,
- ③ Observatory,
- ④ Innovation Forum.

The monitoring process is one of the basic stages of the implementation of any strategy, including the RIS LV 2030. Its main purpose is to acquire, analyse and synthesize data that provide information on current progress in implementing its goals. Thus, monitoring plays a diagnostic, corrective, promotional and motivating role.

The RIS LV 2030 monitoring is based on systemic observation and analysis of data obtained under its three foundations.

As far as the first and second foundations are concerned, the monitoring indicators are quantitative. Their measurement will be based on the assessment of current values of individual indicators (in a given year of implementation) in relation to their base and target values. This approach makes it possible to determine the dynamics of changes in individual indicators and the degree of achieving their target levels, and thus the degree of achieving the assumed goals of RIS LV 2030.

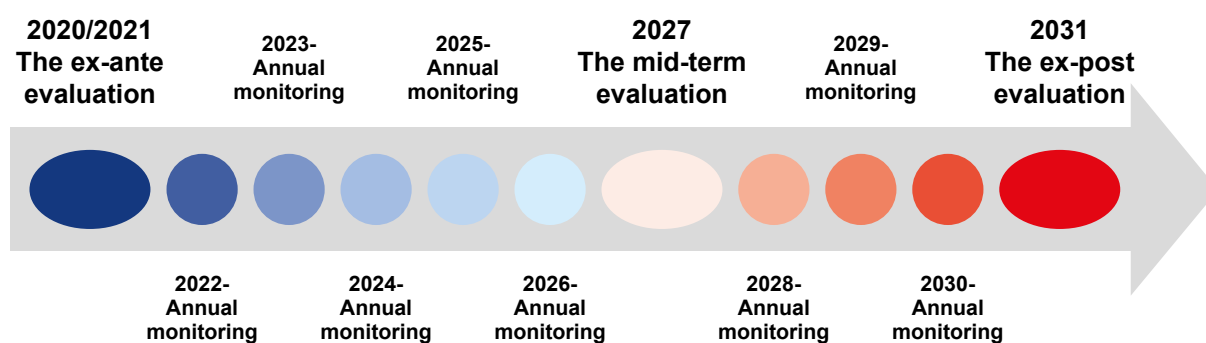
As for the third foundation, data will come from qualitative research to be conducted as part of: the Smart_Lab, Technology Pilot, Observatory, and Innovation Forum. They will lead to ongoing (on an annual basis) monitoring of qualitative processes and phenomena, difficult to capture only with quantitative indicators.

Information on the base and target values of indicators, data sources and the method of obtaining information will be the subject of a separate document in the form of a detailed description of the *RIS LV 2030 Monitoring System*.

The *Monitoring Report* will be the key document created in the monitoring process. It will be drafted on an annual basis. This document, together with conclusions and recommendations, will be presented to the Board of the Lubelskie Voivodeship. The monitoring will be conducted within the LCRI.

The RIS LV 2030 evaluation system is based on a participatory and democratic evaluation model that guarantees the continuation of the entrepreneurial discovery process. The evaluation process will use the following types of evaluation: ex-ante, mid-term, and ex-post. The evaluation study will be carried out in cycles illustrated in the chart below.

Picture 3. The RIS LV 2030 monitoring and evaluation cycle



The ex-ante evaluation is an analysis to assess the current status of the RIS 2020 implementation and the results of the RIS 2030 update process and will also formulate target values for the RIS 2030 indicators on this basis. This evaluation will be carried out at the end of 2020 and the beginning of 2021.

The mid-term evaluation will be carried out in 2027 and will depend on the pace of launching EU funds. Its purpose will be to assess the extent to which the RIS 2030 will be implemented.

The ex-post evaluation will be carried out in 2031. Its role will be to obtain an answer to the question whether the goals (values of indicators) set out in the RIS 2030 have been achieved, and to assess the effects of the RIS 2030 implementation. It should also constitute the basis for the next ex-ante evaluation related to the update of the RIS LV 2030 for the following years.

It is expected that the evaluation research will be carried out by an external evaluation company.

List of cited references

- Analysis of the construction industry in the Lubelskie Voivodeship. Final report on quantitative and qualitative research*, Regional Labour Office in Lublin, Research and Analysis Department, Lublin 2017
- Analysis of the potential of regions in the field of research, development, and innovation (RDI)*, Ministry of Funds and Regional Policy, presented at the meeting of regional representatives on October 20, 2020
- Investment attractiveness of regions and subregions of Poland 2016*, ed. St. Szultka, Instytut Badań nad Gospodarką Rynkową, Gdańsk 2016
- Data on organic farming*, the Commercial Quality Inspection of Agricultural and Food Products, available at: <https://www.gov.pl/web/ijhars/dane-o-rolnictwie-ekologicznym> [access on: 19/11/2020]
- The Prospective Diagnosis of the Lubelskie Voivodeship*, the Marshal's Office of the Lubelskie Voivodeship in Lublin, Department of Regional Policy, Lublin, February 2019
- Innovative activity of enterprises in 2016-2018*, Central Statistical Office, Statistical Office in Szczecin, Warsaw, Szczecin 2019
- Organic farms*, Local Data Bank, 2020
- European Regional Competitiveness Index https://ec.europa.eu/regional_policy/en/information/maps/regional_competitiveness/ [access on: 18/11/2020]
- The Millennium Index 2019 – Regional Innovation Potential*, available at <https://www.bankmillennium.pl/documents/10184/27565853/Indeks+Millennium+2019.pdf> [access on: 18/11/2020]
- Investments and fixed assets, Investment outlays, Investment outlays by section of PCA*, Local Data Bank (quarterly data), annual data, 2007
- K. Klincewicz, *Dyfuzja innowacji. Jak odnieść sukces w komercjalizacji nowych produktów i usług*, Wydawnictwo Wydziału Zarządzania UW, Warsaw 2011
- Percentage of employees by section groups; section B, C, D and E of PCA*, Local Data Bank 2007
- PKP Linia Hutnicza Szerokotorowa spółka z o.o. <https://www.lhs.com.pl/pl/kim-jestesmy/o-nas> [access on: 30/11/2020]
- Employed (actual job) by sections, section groups and gender; section B, C, D and E of PCA*, Local Data Bank 2007
- Total Gross Domestic Product*, Local Data Bank, December 2020
- Przyszłość zaczyna się tu... LUBLIN, COLLIERS INTERNATIONAL, POLAND 2020*

- Report entitled *Analysis of challenges, including bottlenecks in the diffusion of innovation in the Lubelskie Region*, commissioned by the Lubelskie Voivodeship, December 2020
- Methodological report as part of the study called *Strategic directions of economic development of the Lubelskie Voivodeship in the context of the Regional Innovation Strategy*, EU-CONSULT Sp. z o. o.
- Report on the condition of Polish metropolises*: Lublin, PWC 4th edition 2019
- The 2019 Annual Report, Patent Office of the Republic of Poland*, available on the website: https://uprp.gov.pl/sites/default/files/inlinefiles/Raport%20roczny%202019_1.pdf, [access on: 30/11/2020]
- The *2019 in construction* report available at: <https://www.wielkiebudowanie.pl/go.live.php/PL-H901/raport-rok-2019-w-budownictwie.html> [access on: 15/11/2020]
- Ośrodki innowacji i przedsiębiorczości w Polsce*, ed. A. Bąkowski, M. Mażewska, Stowarzyszenie Organizatorów Ośrodków Innowacji i Przedsiębiorczości w Polsce, Poznań-Warsaw, 2018 (report)
- Demographic situation of the Lubelskie Voivodeship in 2018*, Statistical Office in Lublin, Lublin 2020
- Agriculture in the Lubelskie Voivodeship in 2019*, Statistical Office in Lublin, Lublin 2020
- Infrastructure Market, the Lubelskie Voivodeship. Via Carpatia Lublin – Lubartów z przetargiem na wykonawcę <https://www.rynekinfrastruktury.pl/wiadomosci/drogi/lubelskie-via-carpatia-lublin--lubartow-z-przetargiem-na-wykonawce--72203.html> [access on: 30/11/2020]
- Information Society in Poland in 2020*; study by the Central Statistical Office, Statistical Office in Szczecin, Warsaw, Szczecin 2020.
- The *Strategy for Responsible Development up to 2020* (including the perspective up to 2030) (Official Gazette, 2017, item 260).
- Development Strategy for the Lubelskie Voivodeship 2030, draft, Lublin, February 2021
- Higher education in Poland in 2012-2018*, report prepared for the Ministry of Science and Higher Education, Warsaw 2019
- Resolution No. 8 of the Council of Ministers of February 14, 2017 on the adoption of the *Strategy for Responsible Development up to 2020* (including the perspective up to 2030) (Official Gazette, 2017, item 260).
- Resolution No. 102 of the Council of Ministers of September 17, 2019 on the adoption of the *National Strategy of Regional Development 2030* (Official Gazette, 2019, item 1060).
- The Act of June 5, 1998 on Regional Government (Journal of Laws of 2020, item 1668).
- The Act of December 6, 2006 on the Principles of Development Policy (Journal of Laws of 2019, item 1295, as amended).
- <http://www.invest.lubelskie.pl/pl/otoczenie-biznesu> [access on: 22/11/2020]

Attachment No. 1. Smart specialisations of the Lubelskie Voivodeship – list of detailed issues

I. QUALITY FOOD

- 111** Innovative actions to improve soil fertility and productivity
 - 112** High-quality sowable, propagation and planting material with increased resistance to diseases and pests as well as agricultural drought conditions
 - 113** Safety and improvement in quality of plant raw materials in the use of fertilizers and plant protection products
 - 114** Innovative technologies and machines for agriculture, including precision one
- 121** Healthy food, including organic, traditional, and regional food
 - 122** Innovative distribution networks for healthy, local, and seasonal food also known as food cooperatives
 - 123** Technologies of agri-food processing that reduce energy and water consumption
 - 124** Technologies increasing the quality, durability, functionality and safety of plant and animal products
 - 125** Sustainable production, processing, and storage
 - 126** Innovative systems, software, intelligent methods, and tools to manage and monitor the course of the production process and assess the quality of raw materials and finished products
 - 127** Developing tools, modern research techniques and food quality markers
 - 128** Innovative systems, circuits, sensors, and electronic and photonic detectors for agricultural and food applications
 - 129** Digital technologies, including It solutions for data collection and analysis supporting production processes in the agri-food sector
 - 130** Food transport and storage technologies
 - 131** Innovative marketing models in the promotion of quality food

II. GREEN ECONOMY

- 211** Efficient resource management including processing, production, sale, use and waste management
 - 212** The use of biomass to produce materials that can replace other non-renewable raw materials
 - 213** Lowering the amount of greenhouse gas emissions in the industry
 - 214** Technologies and systems counteracting environmental threats and monitoring the level of pollution
 - 215** Biodegradability of raw materials and optimization of post-production waste management (technologies, processes, products)
 - 216** Zero waste food
 - 217** Biotechnologies in engineering and environmental protection
 - 218** Innovative systems, circuits, sensors, and electronic and photonic detectors for environmental protection applications
 - 219** Methods of soil protection and reclamation and sewage treatment
 - 220** Economical and effective water management
 - 221** Clean coal technologies
 - 222** Bioactive substances intended for the production of plant protection products, fertilizers, and medicines, including veterinary drugs
 - 223** (Bio)polymers and (bio)materials
-
- 231** Increasing the use of renewable energy sources
 - 232** Energy from waste and alternative fuels
 - 233** Improvement of energy conversion efficiency
 - 234** Innovative energy generation, management, transmission, and distribution systems
 - 235** Intelligent solutions in power grids
 - 236** Methods and technologies of energy storage
 - 237** Smart metering and smart energy meters
 - 238** Modern heating and cooling systems
 - 239** Insulation systems promoting energy efficiency
 - 240** Energy distribution systems in buildings
 - 241** Intelligent, energy-saving lighting systems
 - 242** Development of infrastructure promoting electromobility

III. HEALTHY SOCIETY

- 311** Promoting healthy lifestyle, including the development of the wellness industry
 - 312** Preventing civilization diseases and counteracting epidemiological threats, including new innovative methods of treatment and prevention
 - 313** Tourism, including health tourism
 - 314** Use of natural resources (values) of the Region in health resorts
 - 315** Development of services and products aimed at elderly people with disabilities helping them to live independently and actively
 - 316** New medicines, innovative dietary supplements, functional foods, and foodstuffs for particular nutritional uses
 - 317** Innovative cosmetics
 - 318** Innovative biologically active substances as potential new generation medicines
-
- 321** Diagnostics and gene therapy
 - 322** Personalized medicine
 - 323** Integrated medical care
 - 324** Minimally invasive surgery
 - 325** Regenerative medicine and tissue engineering
 - 326** Translational medicine
-
- 331** Telecare and telemedicine
 - 332** Modern material technologies and materials in medicine and rehabilitation
 - 333** Medical It tools to collect and analyse medical data for diagnostic, therapeutic and rehabilitation purposes
 - 334** Innovative systems, circuits, sensors, and electronic and photonic detectors for medical applications
 - 335** Biosensors
 - 336** Artificial intelligence algorithms for medical use
 - 337** Medical robotics
 - 338** Virtual reality and simulation technologies in medicine

IV. DIGITAL SOCIETY

- 411 Collecting and storing data, digitizing resources, clouds
 - 412 Applications and market potential analysis
 - 413 Design, management, optimization, and control of production processes
 - 414 Technologies and systems for providing services to business
 - 415 Technologies and smart telecommunications and ICT systems, including the Internet of Things
 - 416 Systems for sales and customer service, e-shopping platforms, telemarketing
 - 417 Payment and financial systems and services (e-commerce)
-
- 421 Systems used in transport, including traffic control systems
 - 422 Intelligent unmanned aerial vehicles
 - 423 Numerically controlled systems and devices
-
- 431 Security and cyberspace protection systems
 - 432 Cyber-security of power systems
 - 433 Failure prediction and prevention systems
 - 434 Spatial navigation and monitoring systems, including solutions used in closed facilities
 - 435 Integrated building management systems
 - 436 Non-invasive measurement and detection systems
 - 437 Design, including interior and building design
 - 438 Virtual reality and simulation technologies
-
- 441 Use of ICT for education development (digital skills) to create conditions for remote (distance) education
 - 442 Innovative products and technologies used in culture and national heritage promotion as well as the protection of collections and their conservation
 - 443 Innovative products and technologies used in sports, entertainment, advertising, and multimedia
 - 444 Development of software and technologies related to artificial intelligence and machine learning

V. MATERIAL TECHNOLOGIES, INDUSTRIAL AND LOGISTIC PROCESSES

- 511** Materials with increased construction and insulation parameters, durability, and high resistance to wear and degradation factors
 - 512** Low-waste technologies and production lines used in production processes
 - 513** Innovative machines and devices that reduce energy and labour consumption in production and increase work safety
 - 514** Technologies and production lines for the production of materials and products with the use of additional raw materials, by-products, and waste
 - 515** Modern technologies and materials for the aviation sector
 - 516** Mechanical engineering in the field of modern manufacturing methods
 - 517** Innovative methods and tools used to assess the quality of products
-
- 521** Modern technologies of road and bridge construction
 - 522** Innovative load-bearing structures using modern construction materials, including composites
 - 523** Technologies and systems promoting rational use of heat and water in production processes
 - 524** Reuse of building materials and elements (recycling in construction)
-
- 531** Innovative roof coverings and technologically advanced windows and doors
 - 532** Innovative systems, circuits, sensors, and electronic and photonic detectors to be used in production and logistics processes, energy, and construction
 - 533** Innovative VR technologies to be used in production processes and construction
-
- 541** Industrial and service automation
 - 542** Intelligent packaging for monitoring the quality and content of the environment
 - 543** Intelligent warehouses with highly automated logistics processes
 - 544** Modern packaging, including biodegradable and reusable
 - 545** Management of technological and logistic processes, including supply chain control
 - 546** Systems and solutions used in forwarding and dispatching services

Attachment No. 2. Table of recommendations from international projects regarding the RIS3, executed by the Managing Authority of the Regional Innovation Strategy of the Lubelskie Voivodeship in the years 2016-2020

Item No.	Recommendation	Area	Project name	Reference	Application/ implementation	Scoring proposal
1	The use of key enabling technologies (KETs) in the process of redefining areas of smart specializations and modifying innovation policy implementation tools	innovation policy planning	<i>BRIDGES</i>	<i>Action plan of Lubelskie Voivodeship, Poland</i>	A joint venture of the Lubelskie Voivodeship and the NRDC "Lublin Upland of Photonic Technologies"	8
2	Implementation of the AUTODIAGNOSTIC TOOL good practice, a tool for (i) assessing the readiness and openness of companies from the bioeconomy sector to implement innovative solutions and for (ii) identifying companies with the greatest innovative potential	knowledge and technology transfer	<i>BRIDGES</i>	<i>Action plan of Lubelskie Voivodeship, Poland</i>	Enterprises operating in the field of bioeconomy as part of the project was carried out using the AUTODIAGNOSTIC TOOL have been analysed	5
3	Strengthening the RIS3 monitoring system by: – increasing the share of qualitative data in the RIS3 monitoring system – stakeholder involvement in the RIS3 monitoring process (dialogue conducted in the entrepreneurial discovery process) – the use of digital tools to obtain data from the end users of the entrepreneurial discovery process	the RIS3 monitoring system entrepreneurial discovery process (EDP)	<i>EMPINNO Monitor S3 SMARTWATCH</i>	<i>EMPINNO RIS3 Monitoring Testing Plan BOOSTING SMART_WATCH – policy recommendation</i>	Recommendation in progress Innovation Forums organized as part of the EMPINNO project and continued in the Emplnno Monitor S3 project in the area of bioeconomy, with particular emphasis on the food sector	10

Item No.	Recommendation	Area	Project name	Reference	Application/ implementation	Scoring proposal
4	Introducing solutions that improve cooperation between science and business, such as hackathon within smart specializations or brokerage meetings dedicated to technological offer	knowledge and technology transfer	EMPINNO	<i>Feedback Paper Document – Lubelskie Voivodeship</i>	Technological Pilot – a prototype of a brokerage tool developed by the MOLR employees as part of the REG_LAB project (pilot of the GOV_LAB programme implemented by the PAED, the purpose of which was to use the Design Service methodology in creating public policies by regional government units)	7
5	Introduction of solutions supporting the implementation and monitoring of the RIS3: <ul style="list-style-type: none"> – development of an interactive map of smart specializations stakeholders according to <i>The SevenInnovationGaps Model</i> – implementation of good practices aimed at strengthening/developing institutions/groups that support cooperation within smart specializations (greater inclusion of various stakeholder groups in the process of entrepreneurial discovery) 	entrepreneurial discovery process (EDP) the RIS3 monitoring system	EMPINNO	<i>Feedback Paper Document – Lubelskie Voivodeship</i>	Innovation Forums organized as part of the EMPINNO project and continued in the Emplnno Monitor S3 project in the area of bioeconomy, with particular emphasis on the food sector	8

Item No.	Recommendation	Area	Project name	Reference	Application/ implementation	Scoring proposal
6	Designing public interventions using the Design Thinking/ Service Design approach focusing on the needs of the end user Appointing key employees in the Office responsible for communication with external stakeholders within individual smart specialization	innovation policy planning entrepreneurial discovery process (EDP)	EMPINNO	<i>Feedback Paper – Detailed Part of the Lubelskie Voivodeship</i>	Technological Pilot – a prototype of a brokerage tool developed by the MOLR employees as part of the REG_LAB project (pilot of the GOV_LAB programme implemented by the PAED, the purpose of which was to use the Design Service methodology in creating public policies by regional government units)	9
7	Strengthening the process of entrepreneurial discovery using the smart lab formula – increasing cooperation between stakeholders in the area of smart specializations by coordinating the work of thematic groups	entrepreneurial discovery process (EDP)	EMPINNO	Feedback Paper – Detailed Part of the Lubelskie Voivodeship	Participation of LCRI representatives in smart labs organized by the PAED as part of the <i>Monitoring of National Smart Specializations</i> project The inclusion of the smart lab formula in studies carried out/commissioned by the LCRI on determining the strategic directions of the economic development of the Region and the potential of the cosmetics industry in Lubelskie	10

Item No.	Recommendation	Area	Project name	Reference	Application/ implementation	Scoring proposal
8	Introduction of a three-stage system for collecting information under the RIS3 monitoring: a) an auditorium questionnaire distributed at various meetings or through a mobile application b) quasi individual in-depth interviews with selected entrepreneurs operating in the Lubelskie Region c) computer-assisted interviews collected on the basis of a questionnaire made available electronically (CAWI survey) d) the use of (mobile) applications supporting the organisation of collective events	the RIS3 monitoring system	EMPINNO	<i>Feedback Paper – Detailed Part of the Lubelskie Voivodeship</i>	The information collection system tested during the organisation of the Innovation Forums under the EMPINNO project and the Emplnno Monitor S3 project	4
9	Increasing the use of qualitative data in the RIS3 monitoring system by: – extending thematic areas; – increasing participation in the process of monitoring the discussion formula (expert panels, workshops, open discussions); – increasing the involvement of stakeholders during meetings, forums and discussion panels and the role of their opinions in the monitoring process thanks to the development of dedicated tools such as surveys or mobile application	the RIS3 monitoring system	EMPINNO Monitor S3	EMPINNO RIS3 Monitoring Testing Plan	Recommendation in progress Developing by the project partner, by the Foundation for Lubelskie Development, a pilot tool involving stakeholders in the RIS3 monitoring process	7

Item No.	Recommendation	Area	Project name	Reference	Application/ implementation	Scoring proposal
10	Harmonization of monitoring systems in the regions that might significantly enhance partner activities of cross-border and supra-regional nature	the RIS3 monitoring system	SMARTWATCH	<i>Regional Observatories supporting the development of smart specializations Project SMART_watch Interreg Central Europe</i>	Recommendation in progress. The Lubelskie Voivodeship signed an agreement on joining the network of regional observatories (the Cooperation Agreement)	3
11	Implementation of the project of the RIS3 observatory model developed as part of the SMART_WATCH project by: – changing the perspective/priorities of the RIS3 monitoring system from the system focused on observation of products and settlement of activities to the one oriented towards achieving results in a structured way (in terms of innovation, specialization) and launching processes and continuous modification of the context – strengthening the infrastructure of the RIS3 monitoring system	the RIS3 monitoring system	SMARTWATCH	<i>Regional Observatories supporting the development of smart specializations Project SMART_watch Interreg Central Europe</i>	Recommendation in progress. The Lubelskie Voivodeship signed an agreement on joining the network of regional observatories (the Cooperation Agreement), and obtained 4 BEI Declaration of Intent under the aforementioned agreement on joining the Regional Observatory supporting the development of smart specialization	8

Item No.	Recommendation	Area	Project name	Reference	Application/ implementation	Scoring proposal
12	Increasing the role of clusters in the process of updating and implementing the RIS3	innovation policy planning	CLUSTERS3	<i>Policy Learning Document PEER REVIEWS Summary</i>	Inclusion of clusters that bring together economic entities from the Lubelskie Region within the EDP in the field of: – defining the research agency for the joint venture called the Lubelskie Photonic Technology Upland, – building the life science ecosystem, – redefining the key specializations of the region, i.e. bioeconomy	7
13	Strengthening the multidisciplinary and grass-roots approach in the process of selecting specializations and programming strategic undertakings	entrepreneurial discovery process (EDP)	CLUSTERS3	<i>Policy Learning Document PEER REVIEWS Summary</i>	Inclusion of clusters that bring together economic entities from the Lubelskie Region within the EDP in the field of: – defining the research agency for the joint venture called the Lubelskie Photonic Technology Upland, – building the life science ecosystem, – redefining the key specializations of the region, i.e. bioeconomy	7

Item No.	Recommendation	Area	Project name	Reference	Application/ implementation	Scoring proposal
14	Strengthening the dialogue between research units and enterprises using the Business Model Canvas tool, aimed at increasing the ability to create and apply innovative solutions by enterprises	entrepreneurial discovery process (EDP)	ELISE	ELISE – Lubelskie Action Plan	The NLAB Polish-American acceleration programme – Nevada – Lubelskie Acceleration Bridge – implementation of two editions of the programme	8
15	Strengthening international cooperation in the field of scientific research, based on Le Studium good practices, aimed at increasing the effectiveness of the use of structural funds to build scientific excellence in the Region	entrepreneurial discovery process (EDP)	ELISE	ELISE – Lubelskie Action Plan	International cooperation programme with the Centre – val de Loire (France) in the area of research and development in the field of cosmetology – under development	8
16	Strengthening cooperation between business and science using an innovation broker function	knowledge and technology transfer	ROSIE	Report on the pilot phase implementation – The 2nd Stage of the Responsible Innovation Programme under WPT3 Pilot Action	Technological Pilot – a prototype of a brokerage tool developed by the MOLR employees as part of the REG_LAB project (pilot of the GOV_LAB programme implemented by the PAED, the purpose of which was to use the Design Service methodology in creating public policies by regional government units)	8

Item No.	Recommendation	Area	Project name	Reference	Application/ implementation	Scoring proposal
17	Creating an interdisciplinary team for responsible innovation cooperating with the MOLR	the innovation ecosystem, institutional dimension	ROSIE	<i>Responsible Innovation Road Map</i>	The recommendation is not addressed directly to the RIS MA but is a part of the RIS management system. The solution was tested under the project in the Regional Stakeholder Group formula	3
18	Cooperation with universities to develop curricula for students in the field of responsible innovation	competences for the innovation ecosystem	ROSIE	<i>Responsible Innovation Road Map</i>	Pilot study on the solution implemented as part of the project in cooperation with the Lublin University of Technology	4
19	Redefining (detailing, prioritizing detailed issues) smart specializations of the Region, in particular bioeconomy – strategic recommendation	entrepreneurial discovery process (EDP)	HESS	<i>HESS – the Lubelskie Final Report</i>	Recommendation implemented in the form of the <i>Analysis of detailed issues performed by the Lublin Centre for Research on Innovation in the Areas of Smart Specializations of the Lubelskie Voivodeship</i> and an attempt to systematically change the scope and description of the LV smart specialization	10

Item No.	Recommendation	Area	Project name	Reference	Application/ implementation	Scoring proposal
20	Implementation of actions strengthening cooperation between research units and enterprises: – at the regional level in the area of bioeconomy – at the national level in the field of photonics	entrepreneurial discovery process (EDP)	HESS	<i>HESS – the Lubelskie Final Report</i>	Recommendation in progress. The inclusion of the smart lab formula in studies carried out/commissioned by the LCRI on determining the strategic directions of the economic development of the Region	8
21	Introducing new funding tools for scientific and business cooperation in the field of research consortia, competence centres and public-private partnerships	entrepreneurial discovery process (EDP)	HESS	<i>HESS – the Lubelskie Final Report</i>	Recommendation in progress. Planning tools for the model of the entrepreneurial discovery process under the RIS of the Lubelskie Voivodeship with the possibility of funding from the Regional Operational Programme of the Lubelskie Voivodeship	10

