



The Strategy for Research and Innovation for Smart Specialisation of the North-East Region

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Thanks for contributing:

- o The members of the North-East Academic Advisory Commission;
- o The members of the North-East Regional Innovation Consortium;
- o The representatives of the innovative sectoral ecosystems associated with North-East EDP

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Glossary of Terms

Cluster	Clusters are geographical concentrations of interconnected institutions and companies in a particular area. Clusters comprise a group of related industries and other entities that are important in terms of competition. These include, for example, providers of specialised inputs such as components, machines and services, or specialised infrastructure providers. Clusters often extend downstream to various distribution channels and customers and laterally to producers of complementary products and related industries through common qualifications, technologies or inputs. Finally, some clusters include government and other types of institutions – such as universities, standardisation agencies, think tanks, providers of professional training and employers' unions – providing specialised training, education, information, research and technical support. (Porter M., 1998).
Gross Domestic Product	Gross Domestic Product (GDP abbreviated) is a macroeconomic indicator that reflects the sum of the market value of all goods and services intended for final consumption, produced in all branches of the economy within a country within one year. It can also be calculated at the level of a region or locality.
Innovation	Innovation is an activity that results in a new or significantly improved product (good or service), or a new or significantly improved process, a new marketing method or a new organisational method. Innovation is based on the results of new technologies, technological developments, new combinations of existing technology or the use of other knowledge acquired by the company. Innovation must be new to the company, but it does not need to be new to the industry or the market. It does not matter whether the innovation initially occurred in the respondent companies or in other companies.
Innovative Companies	Innovative enterprises are companies that have launched new or significantly improved products (goods or services) on the market or have introduced new or significantly improved processes or new methods of organisation or marketing. The term covers all types of innovators, product innovators, process, organisational methods or marketing methods, as well as companies with unfinished or abandoned innovations, and refers to active companies.
Product Innovation	Product innovation means the placing on the market of a new or significantly improved good or service in terms of its characteristics, friendly use, components or subsystems.
Process Innovation	Process innovation corresponds to the implementation of a new or significantly improved production process, distribution method or support activity.
Organisational Innovation	Organisational innovation is a new method of organisation in company business practices (including knowledge management), job organisation or external relations that have never been used before by the company.
Marketing Innovation	Marketing innovation refers to the implementation of a new marketing concept or strategy, which differs significantly from the marketing methods existing within the company and which has never been used before.
Expenditures related to the RDI activity	Expenditures incurred in R&D units relate to current and capital expenditures within the activity sphere of those units. Based on their destination, the expenditures shall be: - current – payments made during a certain period within the units,

	<p>representing the cost of the labour force, materials and other current expenditure;</p> <ul style="list-style-type: none"> - capital (investment) – payments made during a certain period of the realisation of construction works, the purchase of appliances, instruments, machinery and equipment or other expenditures of this kind, aimed at increasing the volume of fixed assets.
R&D Personnel	<p>The R&D personnel is grouped by occupation as follows:</p> <ul style="list-style-type: none"> - researchers – specialists working on designing or creating knowledge, products and processes, new methods and systems. This category includes certified scientific researchers and other personnel categories with higher education who carry out direct R&D activity; - technicians and assimilated personnel – personnel with an average level of training or completed with specialised or other post-secondary training. They participate in the R&D activity by applying operational principles and methods directly under the control of the researchers; - other categories of employees – workers and secretarial and office personnel involved in the implementation of the R&D project.
Technology Transfer	<p>All activities carried out with or without a contractual basis, in order to disseminate information, advise, transfer knowledge, purchase specific machinery and equipment, for the purpose of bringing research results into the economic cycle, transformed into commercial products and services.</p>
Innovation and technology transfer infrastructure	<p>Represents all entities set up to capitalise on the results of research and technological development, such as innovative business incubators, technology transfer centres, technology information centres, industry liaison offices, science and technology parks. Through innovative activities, it contributes to increasing the quality and competitiveness of products, processes and services, creating new jobs and sustainable economic development in a competitive environment.</p>
Fundamental Research	<p>Activity performed mainly to gain new knowledge of phenomena and processes, as well as to formulate and verify hypotheses, conceptual models and theories.</p>
Applied Research	<p>Activity aimed primarily at using scientific knowledge for the improvement or development of new products, technologies and services.</p>
GDP expenditures on R&D activities	<p>Represents the total <i>intra muros</i> expenditure related to R&D activities carried out on national territory within a given time period compared to GDP. This type of expenditure takes into account actions financed from abroad but does not take into account R&D expenditure carried out outside the country. It is an indicator of international comparisons regarding the R&D system.</p>
Ex-ante Evaluation	<p>Evaluation conducted prior to the (practical) implementation of an action; related term - prior assessment.</p>
Ex-post Evaluation	<p>Evaluation of an action after its completion. Note: This type of assessment can be performed immediately after or long after the end of the action. The ex-post evaluation aims at identifying the success or failure factors, the sustainability of results and their impact, as well as to draw conclusions that can be generalised for other actions.</p>
Monitoring	<p>A continuous process of systematic information collection, according to chosen indicators, to provide managers with information on the progress achieved, objectives attained, and the use of the allocated funds.</p>
Impact	<p>Long-term, positive or negative <i>effect</i>, primary or secondary, directly or indirectly, intentionally or otherwise. There is also a discussion about an</p>

	<p><i>institutional development impact</i>, which measures the effects of a development action, which affects, more or less, the ability of a country or region to use its own <i>resources</i> (human, financial and natural), in the most efficient, equitable and sustainable manner, such as:</p> <ol style="list-style-type: none"> a. better defined institutional mechanisms, more stable, transparent and effectively applied in a predictable manner, and/or b. institutional changes, adjusted according to the objectives and capacities of the institutions concerned.
Smart Specialisation	The process of economic transformation based on identifying the areas in which a region can benefit from the specialisation of innovation and research by creating new competitive advantages.
RIS3	The Strategy for Research and Innovation for Smart Specialisation
The Regional Consortium for Innovation	Advisory structure, without legal personality, coordinated by the RDA, consisting of representatives of academia, research, innovative enterprises, public authorities and civil society, with a role in the approval and monitoring of North-East RIS3, endorsement of regional framework documents developed for the programming of national or European funding, endorsement of the North-East RIS3 priority projects portfolio.
Academic Advisory Commission	Advisory structure, without legal personality, consisting of representatives of the regional academia whose main role is to support the RDA in the definition, review and evaluation of the North-East RIS3 and the priority projects portfolio.
Social Innovation	Social innovation refers to the development of ideas, services and models to better address social challenges with the participation of public and private actors, including civil society, with the aim of improving economic and social activities.

List of Abbreviations

ERA	European Research Area
SME	Small and medium-sized enterprises
CE	European Commission
JRC	Joint Research Centre, DG Regio
IT&C	Information Technology and Communications
GDP	Gross Domestic Product
RDA	Research Development Agency
VTE	Vocational and Technical Education
HEI	Higher Education Institution
RAEIS	Romanian Association for Electronic Industry and Software
EASSI	Employers' Association of Software and Services Industry
LPA	Local Public Administration
PPS	Purchasing Power Standard
CIF	Cost, Insurance and Freight
FOB	Free on Board
FDI	Foreign Direct Investment
North-East RIS3	Research and Innovation Strategy for Smart Specialisation of the North-East Region
RCI	The Regional Consortium for Innovation
AAC	Academic Advisory Commission
North-East RDB	North-East Regional Development Board
MPWDA	Ministry of Public Works, Development and Administration
ROP	Regional Operational Programme
IBPOR	Intermediate Body for ROP

Introduction

Since 2012, the European Commission has been promoting the smart specialisation strategy concept (S3), developed with the support of its Joint Research Centre (JRC), as an approach to national or regional public policies targeting innovative development, based on focusing investments in economic activity areas with a competitive advantage, skilled human resources and innovative potential with a critical mass, that can be harnessed for integration into global value chains and providing solutions to major societal challenges. Regions and Member States have started the process of developing and testing the first S3 based on their accumulated experience and expertise with innovation strategies (IS).

The first S3 “wave” was associated with the 2014-2020 Cohesion Policy programming framework. In the context of the economic crisis, which contributed to the contraction of the budget of the European Union, of speeding up the competition for resources and the need to stimulate development based on more focused strategies, the European Commission has decided that the existence of a smart specialisation strategy should be a prerequisite (ex-ante conditionality) for accessing the European Regional Development Fund (ERDF) targeting research, development and innovation, known as Thematic Objective 1.

Between 2014-2015, Romania prepared the 2014-2020 National Strategy for Research, Development, Innovation and Intelligent Specialisation (NSRDIIS). This document was the basis for the allocation of financial resources from Romania’s Operational Programmes targeting interventions corresponding to the Thematic Objective 1 – Research-Development-Innovation for the period 2014-2020, such as the Operational Programme for Competitiveness and the Operational Programme for Human Capital. Moreover, for programming the resources allocated to Axis 1, the Promotion of Technological Transfer Services from the Regional Operational Programme 2014-2020, starting with 2015, the Ministry of Regional Development, Public Administration and European Funds recommended to all regions in Romania to prepare a Regional Framework Document for Intelligent Specialisation. At that time, the only region that had developed the RIS3 was the North-East Region.

Approved in 2014, as part of the 2014-2020 North-East Regional Development Plan (regional economic development component), the North-East RIS3 was designed as a necessary tool for efficient (result/cost ratio) and effective (impact/objective ratio) investments in research, development, and innovation¹.

Starting with June 2016, the North-East RDA has initiated a comprehensive process for updating and reviewing the North-East RIS3, which took into account the evolution in the region's development, the need to reconfirm the smart specialisation sectors, the introduction of a continuous entrepreneurial discovery mechanism for governing and implementing the North-East RIS3, the information update on the demand and supply of innovation and technology transfer services, the definition of a strategy to promote technology transfer and to identify a portfolio of projects eligible for financing through ROP 2014-2020, Axis 1 – Promotion of Technology Transfer Services. The 2nd North-East RIS3 edition was approved on November 14 and December 7, 2017, respectively, by the Regional Innovation Consortium and the North-East Regional Development Council.

The current material, North-East RIS3 2021-2027 3rd Edition was developed by the North-East RDA within the framework of an extended regional partnership with relevant actors from academia, research institutes, business environment, local public administration and civil society, using the entrepreneurial discovery mechanism. This strategy aims at establishing the areas in which most of

¹ The version approved within the North-East RDC is available at www.adrnordest.ro

the investments under Policy Objective 1 of the Cohesion Policy "A More Competitive and Intelligent Europe" will be focused on, namely the fulfilment of the favourable condition² for the ERDF allocation within the Regional Operational Programme 2021 – 2027.

The steps taken for the drafting of this document were:

- a. gathering information on the regional economic context and innovation potential and shaping the evolution of the regional profile, using statistical data available for the 2013 - 2020 period;
- b. analysis and interpretation of collected data;
- c. revising the areas with potential for smart specialisation; updating their datasheets, analysing the results of the 2016 and 2017 EDP exercises, reviewing and revalidating the specialisation niches for each area in entrepreneurial discovery workshops;
- d. SWOT critical analysis at the domain level and defining the vision for the region's smart specialisation (sectoral and global), identifying the intervention needs and priorities for smart specialisation;
- e. correlating North-East RIS3 with European, national and regional strategic documents;
- f. updating the regional action plan;
- g. updating the governance, monitoring and evaluation mechanism;
- h. definition of the regional portfolio of priority projects.

The structure of the document is as follows:

Chapter 1 presents information on the regional economic context, following the main statistical macro and economic indicators, in a 5-year evolution, including the analysis of the regional innovation potential, the analysis of the dynamics of the regional entrepreneurial environment and that of the specialization potential.

Chapter 2 is dedicated to identifying the economic sectors with specialisation potential in the North-East region.

Chapters 3, 4, 5, 6 and 7 are dedicated to describing the mechanism governing the North-East RIS3 development process, presenting the global vision for the future of the region, the priorities for intervention and the proposed action plan.

Chapter 8 is dedicated to describing the monitoring and evaluation mechanisms that will be used to measure the achievement of the proposed targets and the evaluation of the results achieved.

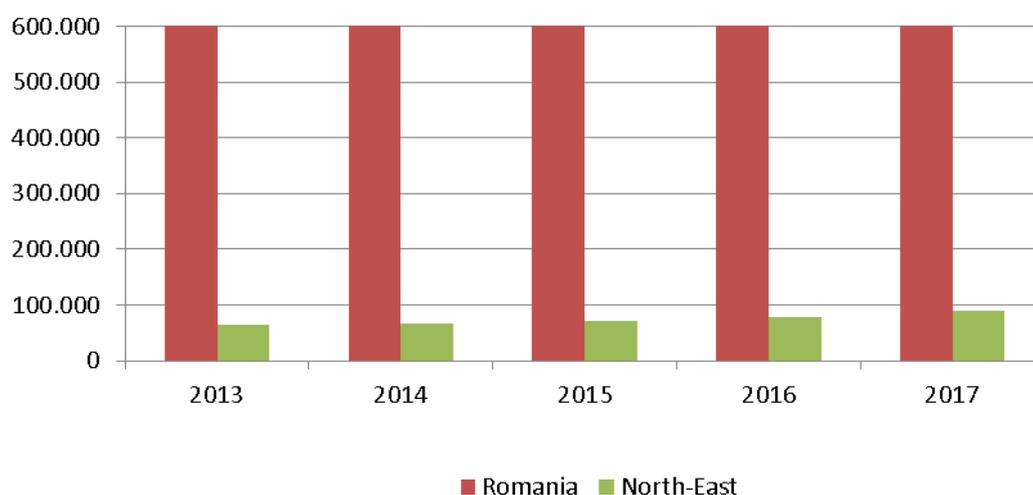
² The favourable conditions set out in the legislative package on the implementation of the European Funds under the 2021-2027 financial framework are laid down in the EC General Regulation; The favourable conditions are horizontal (the achievement of which the financing of all specific EFSI and sectoral objectives depends on, the achievement of which the financing of one or more specific objectives targeting specific sectors of intervention depends on). The favourable conditions should be agreed on with the EC as having been met before the transmission of the programmes, but these are also verified during their implementation. See further details in the MEF's Memorandum no. 20/4180TG/08.03.2018.

CHAPTER 1 – ANALYSIS OF THE REGIONAL CONTEXT AND INNOVATION POTENTIAL

A. The economic context of the North-East Region

The North-East Development Region recorded in 2017 a Gross Domestic Product (GDP) value of lei 88,847.7 million, which represents 10.36% of Romania's GDP and only 0.126% of the EU-28 GDP. At regional level, the value of this indicator increased by 36.22% in 2017 compared to 2013.

In 2017, the contribution to the national GDP places the North-East region in the 5th position (10.36%), followed by the regions of South-East (10.25%), West (9.43%) and South-West-Oltenia (7.45%).

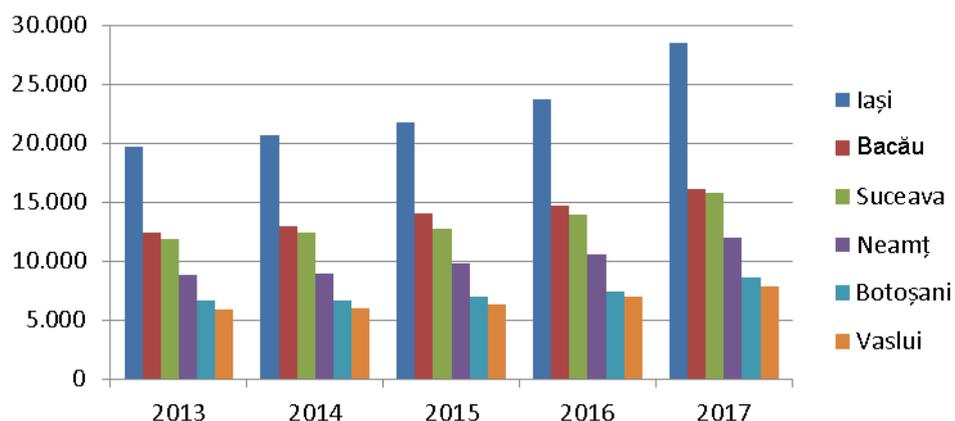


Gross Domestic Product at national level and of the North-East Region in the period 2013-2017, million lei
Source: National Institute of Statistics (NIS), Tempo Online, 2020, "GDP by macro-regions, development regions and counties - calculated according to NACE Rev.2 - ESA 2010" indicator

The real GDP growth rate in Romania over the period 2013-2017 recorded positive values and steady growth, with an annual growth rate of 7.1% in 2017, with Romania ranked second after Ireland among the EU's component countries.

The 6 counties that make up the North-East region have a different contribution to regional GDP. Therefore, in 2017 only 2 of them have *significant economic performance* in this respect, i.e. the counties of Iasi and Bacau, whose results are significantly higher than the other 4 counties: Suceava, Neamt, Botosani and Vaslui.

In the analysed period, 2013-2017, the highest GDP growth was recorded in Iasi county (45.22%) followed by Neamt and Suceava counties.

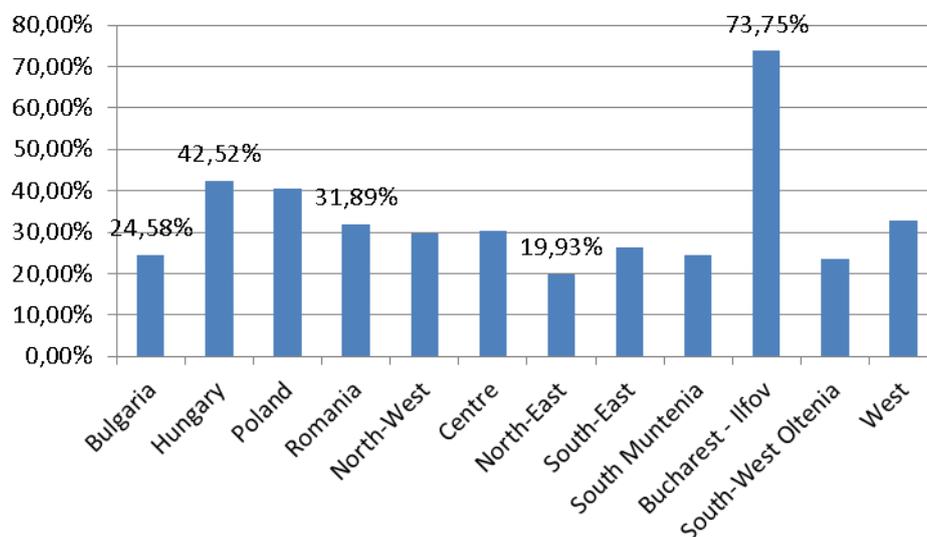


Gross Domestic Product at county level in the period 2013-2017, million lei

Source: National Institute of Statistics (NIS), Tempo Online, 2020, "GDP by macro-regions, development regions and counties - calculated according to NACE Rev.2 - ESA 2010" indicator

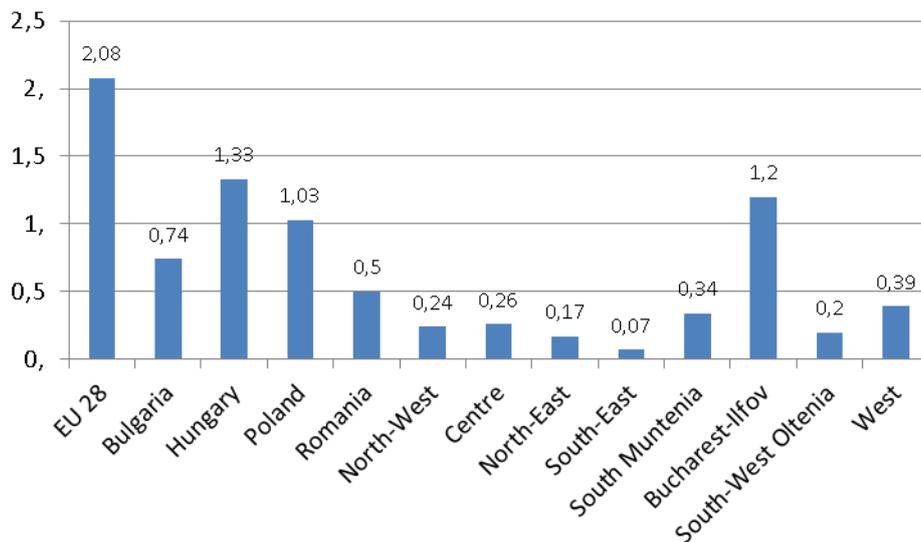
The Gross Domestic Product per capita, at standard purchasing power parity (SPP), is considered to be the most appropriate indicator for assessing the development level. In 2017, the region ranked lowest in the national ranking under this indicator, as the GDP per capita (11,900 SPP/inhabitant) accounted for only 39.53% of the EU-28 average (30,100 SPP/inhabitant). Looking at the time profile of this indicator, it can be noted that the North-East Region experienced an increase in the Gross Domestic Product per capita at the parity of standard purchasing power (SPP) over the period 2013-2018, starting from 9,100 SPP/inhabitant in 2013 to 12,800 SPP/inhabitant in 2018 (increase by 40.66%).

Looking at the GDP/capita expressed in SPP, it is noted that in 2011 the North-East region is placed on the last position among the EU regions, with a value of 7,400 SPP/inhabitant. Between 2013 and 2016, the last positions were occupied by three regions of Bulgaria (Severozapaden, Severen tsentralen, Yuzhen tsentralen), followed by the North-East Region. In 2018, four regions in Bulgaria were last-placed (Severozapaden, Severen tsentralen, Yuzhen tsentralen, Severiztochen), followed by the North-East region, with a value of this indicator of 12,800 PPS/inhabitant.



GDP per capita, 2017, as a percentage of the EU-28 average

Source: Eurostat, 2020, "Gross domestic product (GDP) at current market prices by NUTS 2 regions" indicator



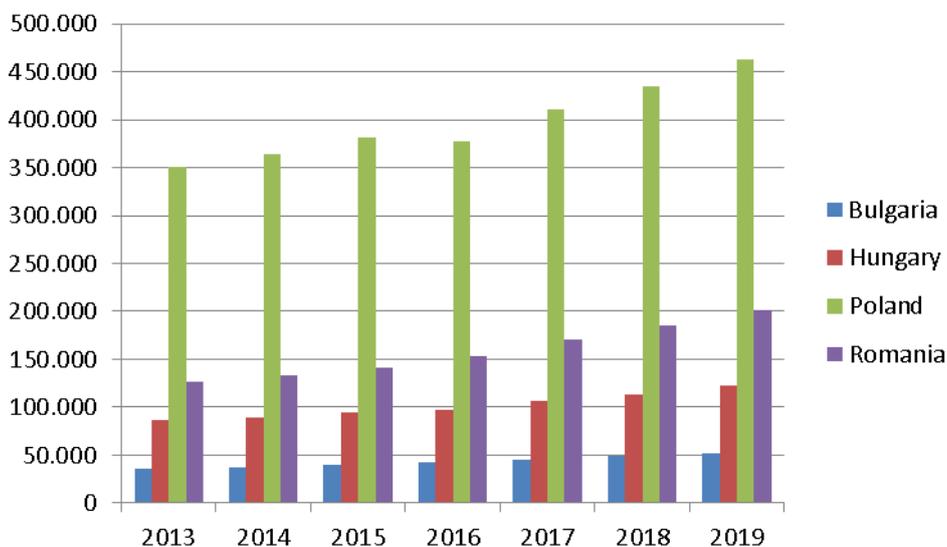
Share of R&D expenditure in GDP, 2017, in percentage

Source: Eurostat, 2020, "Gross domestic expenditure on R&D" and "Intramural R&D expenditure (GERD) by NUTS 2 regions" indicators

In 2017, Romania recorded a GDP per capita of EUR 9,600, representing 31.89% of the EU-28 average, while it was channelling resources into the R&D activity to 0.50% of the GDP. The share of national R&D expenditure has slightly increased since 2016, when it stood at 0.48%. However, the share of R&D expenditure has remained relatively constant over the last decade.

At the level of the North-East Region, the share of R&D expenditure from GDP has a descending trend. In 2017, the region was on the second-last position with 0.17% and the GDP/capita was EUR 6,000.

The Gross Value Added (GVA) is the value created by the factors of production in the period 2013-2019, following the same line as the nominal value of the GDP. This indicator provides a correct radiography of the structure of the economy by industry as compared to the GDP, as the taxes, fees or subsidies can alter the importance of the sectors.

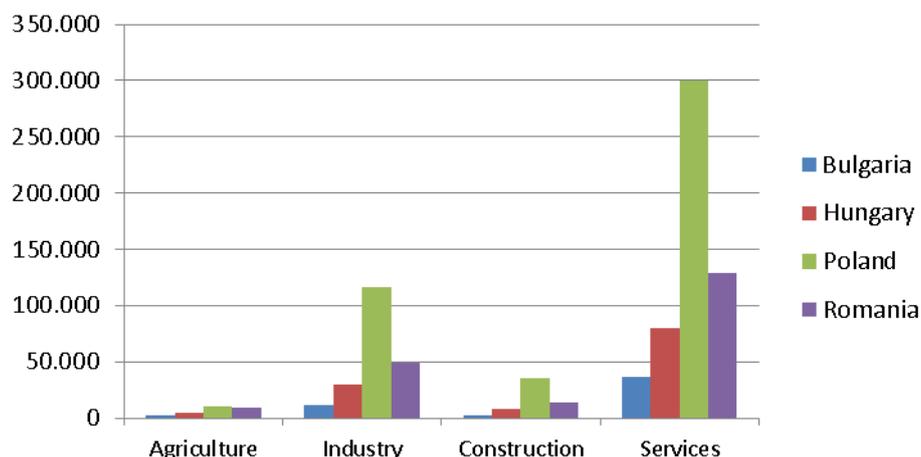


Gross Value Added in million euro compared to EU-28 countries, 2013-2019

Source: Eurostat, 2020, calculations based on the "Gross Value Added and income by A*10 industry breakdowns" indicator

In 2013, the Gross Value Added registered in Romania represented 1.04% of the EU-28 level and in 2019 it represented 1.37% of the EU-28 level. Compared to 2018, Romania registered an increase of 8.87% in 2019.

In the 2013-2019 interval, the trend is slightly increasing for the analysed countries.

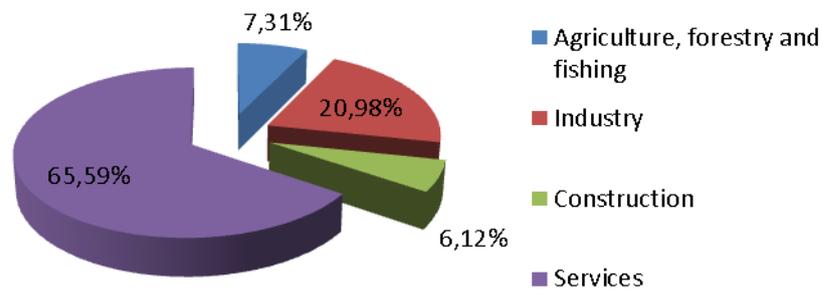


Sector contribution to GVA in million euro compared to EU-28 countries, 2019

Source: Eurostat, 2020, calculations based on the "Gross Value Added and income by A*10 industry breakdowns" indicator

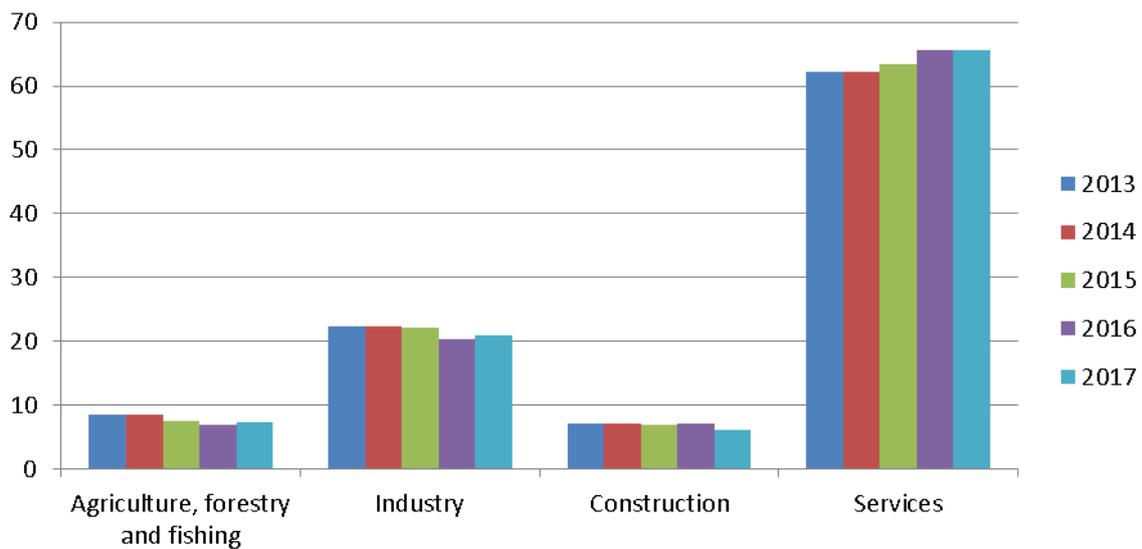
In the above graph we note that both in Romania and in the other countries we analysed, GVA is made up of services, in a significant proportion.

At regional level, in 2017 the service sector accounted for the highest contribution to gross value added at a level of 65,59%, slightly above the national level (63,32%) and 3,46% more than the 2013 level. Next is the industry, with a 20.98% contribution, a level that is 5.24% lower than the existing situation at national level, and 1.40% below the level recorded in the region in 2013. Although one third of the region's occupied population is employed in agriculture, the sector's contribution to RGVA is only 7.31% (down 1.14% compared to 2013), due to the low level of productivity, the high level of subsistence farming and self-consumption. At the same time, the level is 2.54% higher than the national level.



Contribution of the economic sectors to GVA in the North-East Region, 2017, %³

Source: NIS, Tempo Online, processed on the basis of data from the NIS National Regional Accounts publication 2016-2017



The evolution of the economy sectors contribution to the North-East Region GVA in 2013-2017, in percentage

Source: NIS, Tempo Online, processed on the basis of data from the NIS National Regional Accounts publication 2016-2017

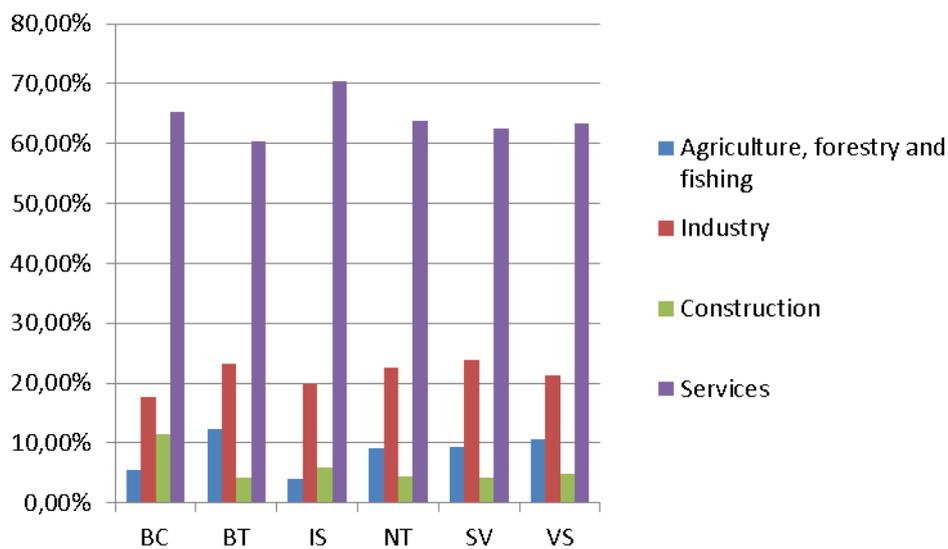
Following the evolution over time (2013-2017) of the contribution made by each economic sector to the Regional Gross Added Value, it can be concluded that:

- The contribution of agriculture was in the 7-9% range, driven mainly by the annual climate conditions, down by 1.14% in 2017 compared to 2013;

³ The latest available data on the sector's contribution to GDP/county GVA are at 2017 level

- The contribution of industry was in the 20-23% range, with a 1.14% decrease in 2017 compared to 2013;
- The contribution of constructions has fallen from 7.03% to 6.12%;
- The contribution of services increased from 62.31% in 2013 to 65.59% in 2017.

By analysing at county level the contribution of each sector to the Gross Added Value, it is found that in the counties of Botosani, Suceava, Vaslui and Neamt the contribution of agriculture and industry to the county economy exceeds the value recorded at regional level. By contrast, for the constructions sector, Bacau county provides higher contributions to the county economy than the sector's contribution to the regional economy. In the case of services, the counties of Iasi and Bacau are noticed by high contributions to the county economy, higher or almost equal to both the regional and the national level.



The contribution of the economy sectors to the North-East Region GVA in 2017, in percentage

Source: NIS, Tempo Online, processed on the basis of data from the NIS National Regional Accounts publication 2016-2017 indicator

By analysing the evolution of the contribution of the economy sectors to the GVA of each county in the North-East Region in 2017 compared to 2016, the following points are made:

- The reversal of the economic sector contributions to the county GVA: services are on the rise in most counties and tend to achieve the majority over the other sectors. In the services sector, Suceava county has the highest increase (1.87%) and Iasi county has the highest decrease (1.43%);
- The contribution of agriculture is growing slightly in most counties, except Iasi county;
- The contribution of industry is growing slightly only in Bacau and Iasi counties, with the rest of the counties falling;
- The contribution of constructions has decreased in all the counties of the region.

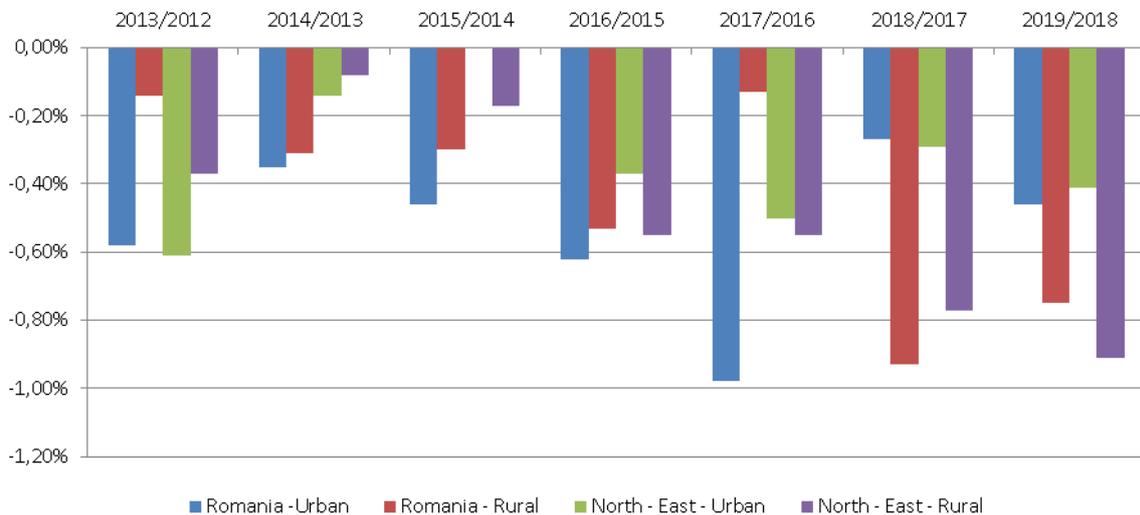
B. Demographic trends

According to the statistical data available in the Tempo Online database, on 1 January 2019, the North-East Region had a resident population of 3,198,564 inhabitants, representing 16.48% of the

total population of the country. In this respect, the *North-East region has the largest number of inhabitants* out of the eight development regions.

Compared to the 2011 Population Census data, the region's population fell by 3.14%.

The following graph shows the population evolution over the 2012-2019 period at national and regional level, by total and by residence average, according to statistical data.



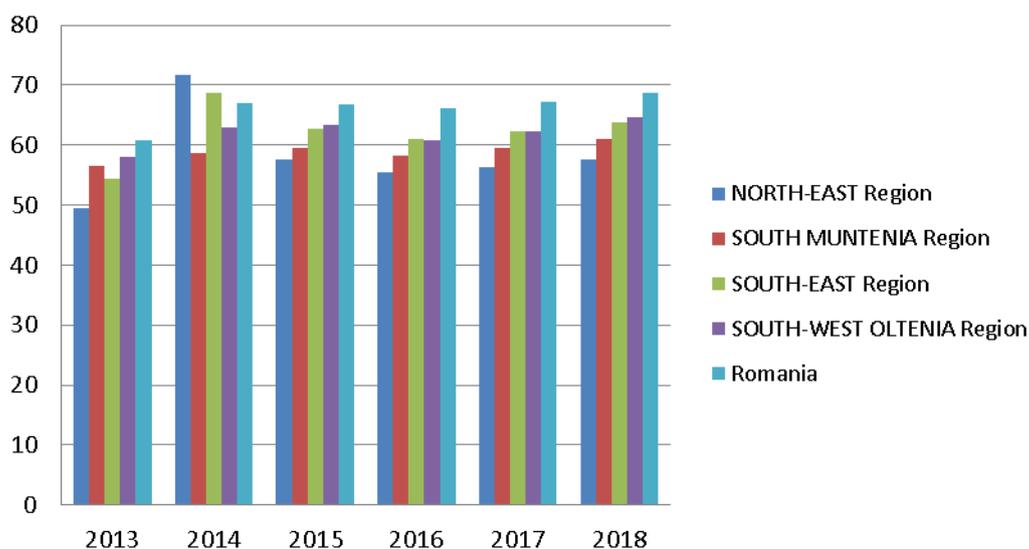
Population growth rate in Romania and the North-East Region by residence environment, 2012-2019, %
Source: NIS, Tempo Online, 2020, "Resident population on January 1st by age and age groups, gender and residence environment, macro-regions, development regions and counties" indicator and processing based on data

Overall, for the North-East Region, there is an annual trend of slight population decline. For resident environments, the decrease is smaller in urban environments.

In 2018, the region had an average population density of 88 inhabitants/sq. km, above the country average (83.1 inhabitants/ sq. km). The county of the region with the highest density is Iasi with 146.8 inhabitants/sq. km and the lowest density is recorded in Vaslui, with 71.4 inhabitants/sq. km. Compared to other regions with similar incomes in Bulgaria, Hungary and Poland, in the period 2014-2018, the average population density in the North-East Region follows the same slight declining trend.

C. Labour force: Population employed, level of training

The employment rate of labour resources is the ratio, expressed as a percentage, of the civilian population and the employment resources, and it is also a relevant indicator.



Employment rate of labor resources in the North-East Region, compared to Romania and the South-East, South-Muntenia and South-West Oltenia Regions, 2013-2018, percentage

Source: NIS, Tempo Online, 2020, "Employment rate of work resources by sex, macro-regions, development regions and counties" indicator

From the above graph, it can be noticed that the period 2015-2016 the employment rate of labour resources followed a downward trend compared to 2014 in all the regions analysed, but from 2017 onwards, there has been a slight increase in all the regions. *The employment rate level in the North-East Region in 2018 is the last in the national ranking.*

The employment rate of the working-age population is also a key social indicator for the study of the labour market evolution.

In 2018, in the North-East Region, the youth employment rate (15-24 years old) was at the top of the list (35.4%), also above the national average. Moreover, in 2018, the employment rate of the working-age population (15-64 years old) and of the elderly (55-64 years old) in the region reached the highest levels – 71,8% and 60.5% respectively.

Regardless of the region, the employment rate of the working-age population was higher for men than for women, with a gender gap of 14.2% in the North-East Region.

The employment rate of the working-age population in rural areas exceeded the one in urban areas in two out of the country's eight regions, with differences of 7.4% in the North-East Region and 4.2% in the South-West Region. In the other regions, the urban employment rate was higher than that in rural areas⁴.

In Romania, the highest employment rate for the working-age people was recorded among higher education graduates (88.4%). As the level of education decreases, employment also decreases. Thus, in 2018, 68.6% of medium-educated people were employed and only 42.6% of those with low educational level⁵.

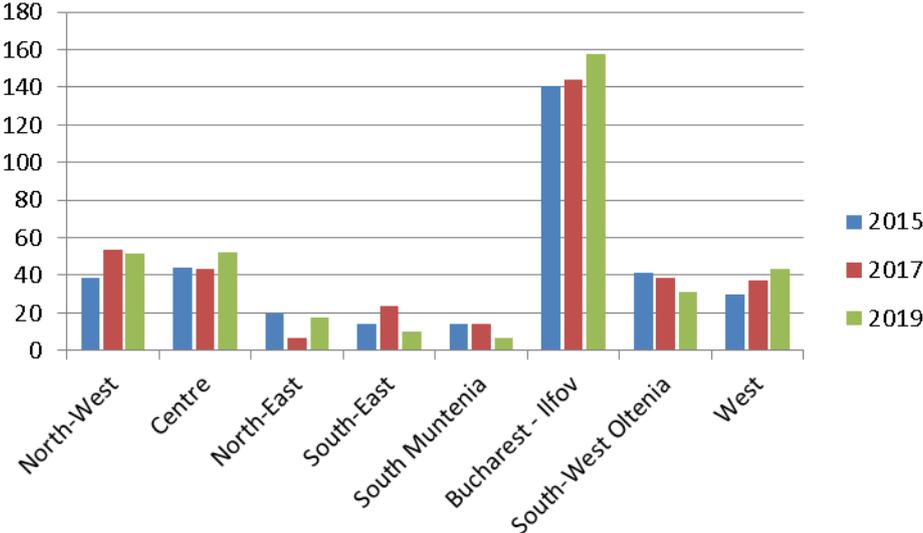
Looking at *the percentage of the population with tertiary education in the 30-34 age group* we get an overview of the advanced skills. The indicator is not limited to the scientific and technical area,

⁴ Labour force in Romania. Employment and unemployment. Year 2018, INS 2019

⁵ Labour force in Romania. Employment and unemployment. Year 2018, INS 2019

because the uptake of innovations in many areas, including in the services sector, depends on a wide range of skills. The indicator focuses on a small proportion of the population - the population aged 30 to 34 - to highlight relatively quickly the changes in the educational policies leading to an increased number of tertiary education graduates through which the business environment can innovate. They indirectly shape the dynamics of the entrepreneurial environment in the region.

Compared to the EU-28 average, in the 8 regions of Romania, the North-East Region was ranked sixth in 2019, accounting for only 10.96% of the Bucharest-Ilfov Region value (1st place – 157.81%). In the North-East Region, in the period 2015-2017, this indicator’s value fell considerably from 19.83% to 6.33%, but recovered in 2019 to 17.3%.

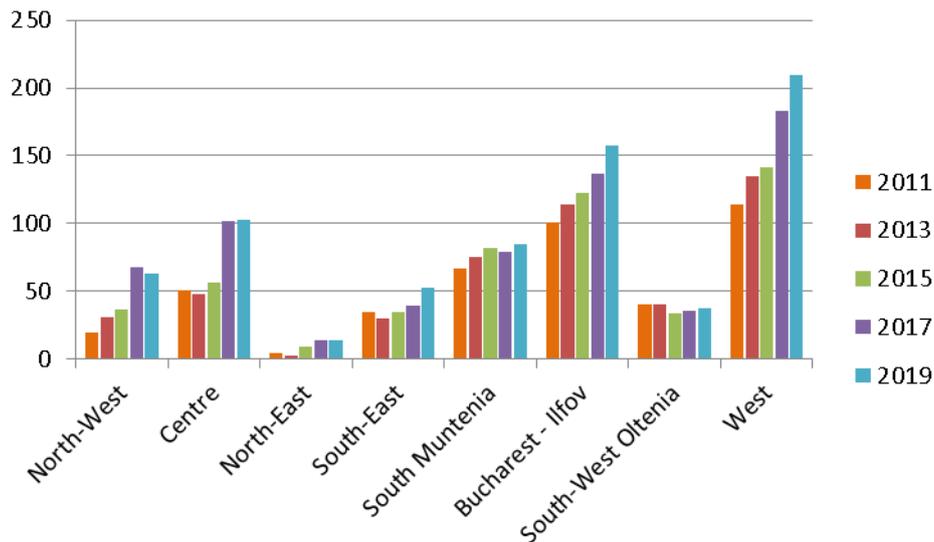


Percentage of population with tertiary education in the 30-34 age group, at regional level, 2015-2019 (measured in terms of performance against the EU-28 average, with reference value of 100%
 Source: Regional Innovation Scoreboard Edition 2019, <https://interactivetool.eu/RIS/index.html>

Although the employment rate of the working-age population in the North-East Region is high, the Gross Value Added is low due to low productivity.

To highlight the continuous innovation through creative and inventive activity, we look at *the share of employment in high-tech sectors*. The reference to total employment in all industrial and services sectors provides better indications than the reference to industrial production sectors only, as the latter may be affected by the relative decline in production in the industry. Knowledge-intensive services can be provided directly to consumers, such as telecommunications, and can contribute to the innovative activities of other firms in all sectors of the economy. These services can increase productivity across the economy and support the diffusion of innovations, especially those based on ICT.

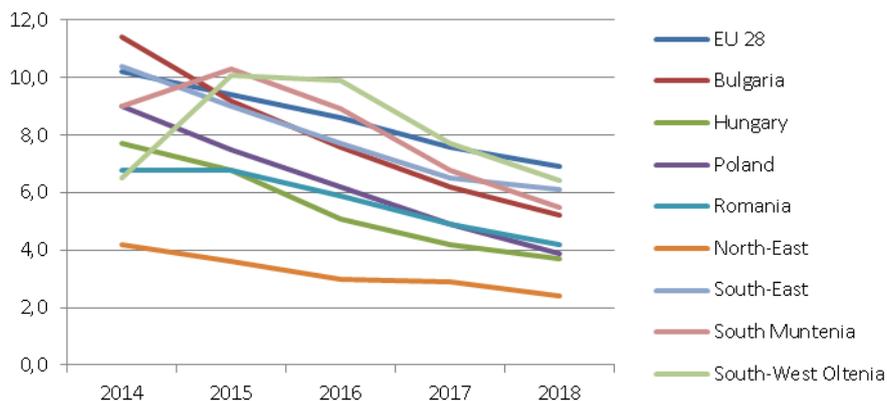
Compared to the EU-28 average, in the eight regions, the North-East Region was last in 2019, with a value representing only 6.08% of the Western Region’s value (first place). However, the North-East Region is on an upward trend between 2011 and 2017, and in 2019 it is on the same level as in 2017 (14.25%).



Employment in medium-high-technology/high-technology industries and knowledge-intensive services as a share of the total regional labour force over the period 2011-2019 (measured as performance against the EU-28 average, with a reference value of 100%)

Source: Regional Innovation Scoreboard Edition 2019, <https://interactivetool.eu/RIS/index.html>

The unemployment rate among the population over the age of 15 in the North-East Region (2.4%) is lower than the national average (4.2%) and the European average (6.9%), as seen in the chart above. The unemployment rate in the North-East Region is low compared to the southern regions: South-West Oltenia (6.4%), South East (6.1%) and South Muntenia (5.5%)⁶. At national level, in 2018, Vaslui County recorded the highest unemployment rate.

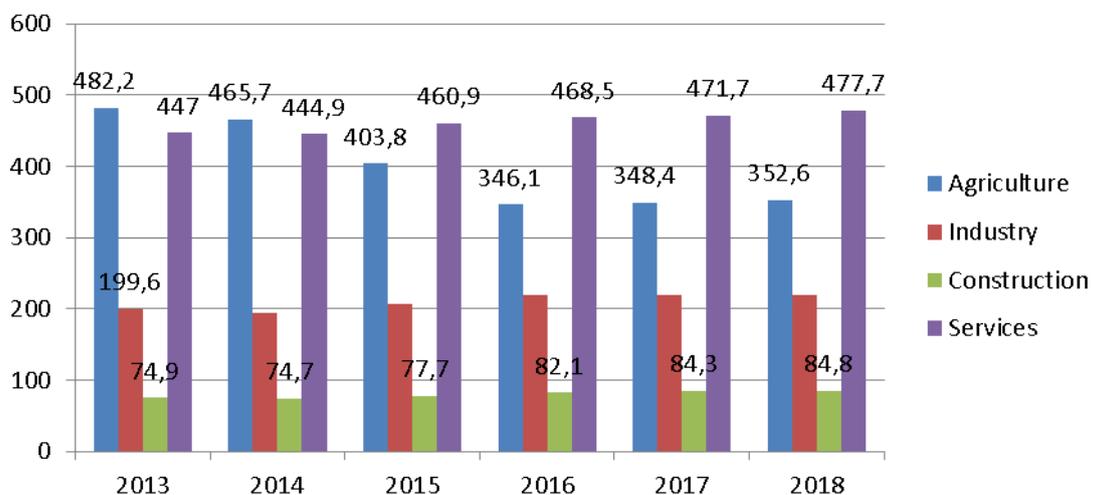


Regional, national and European unemployment rate for population over 15 year, 2014-2018,%

Source: Eurostat, 2020, "Unemployment rates by sex, age and NUTS 2 regions" indicator

⁶ Labour force in Romania. Employment and unemployment. Year 2018, INS 2019

In 2018, at regional level, the potential labour supply expressed by the employed civilian population represented 1,134,800 people. *Most of the population is employed in services (42.10%), agriculture (31.07%), while in industry the share is only 19.36% and in construction 7.47%.*



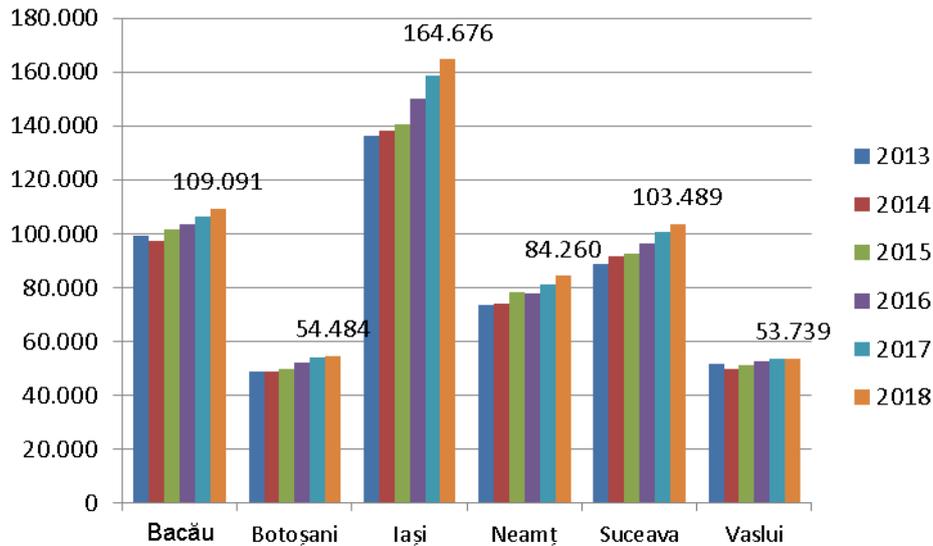
Civilian employed population by national economy sectors, North-East region, 2013-2018, thousand of persons

Source: NIS, Tempo Online, 2020, " Civilian employed population by national economy sectors at NACE Rev.2. section level: gender, development regions and counties" indicator

Looking at the civilian employed population per national economy sectors, it is noted that *education and health (including social services) are sectors where some counties in the North-East Region are in the first half of the national ranking, as follows:*

- In terms of education, Iasi is in the second place, and Suceava and Bacau are in the fourth and seventh, respectively;
- As for health and social care, Iasi is in the 1st place, and Bacau and Suceava are in the 9th and 12th, respectively.

In the region, in 2018, the average number of employees was 569,739, that is 50.21% of the total civilian employed population, up by 7.86% as compared to 2014. As presented in the chart, this slight growth characterises all the counties of the region.



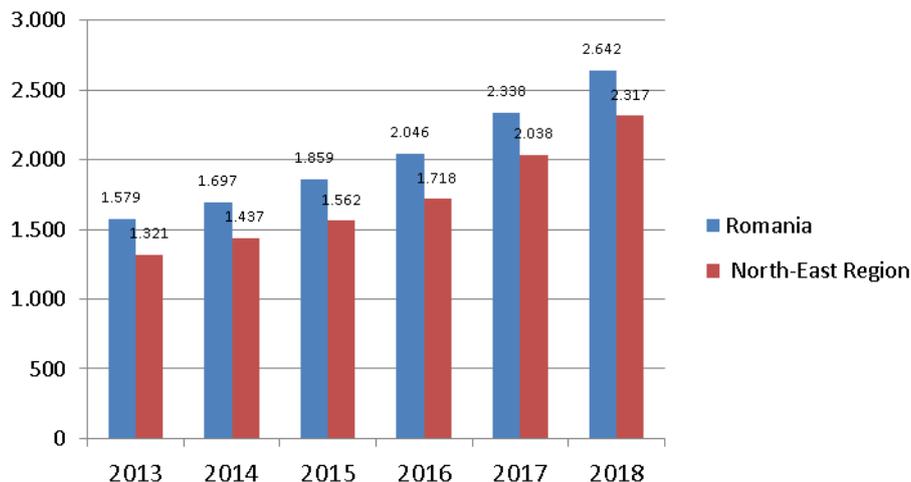
Average number of employees in the North-East Region counties, 2013-2018

Source: NIS, Tempo Online, 2020, "The average number of employees by category of employees, forms of ownership, macro-regions, development regions and counties" indicator

The increase in the number of employees over the 2013-2018 period is closely linked to the demand and supply of the labour market candidates. Thus, the very large demand for labour market candidates and the very low supply over the recent years have made employers more permissive in recruiting and selecting staff and, at the same time, increase the wages.

Most of the employees are in Iasi County (164,676), followed by Bacau with 109,091, versus the counties of Vaslui with 53,739 employees and Botosani with 54,484 employees in an opposed position.

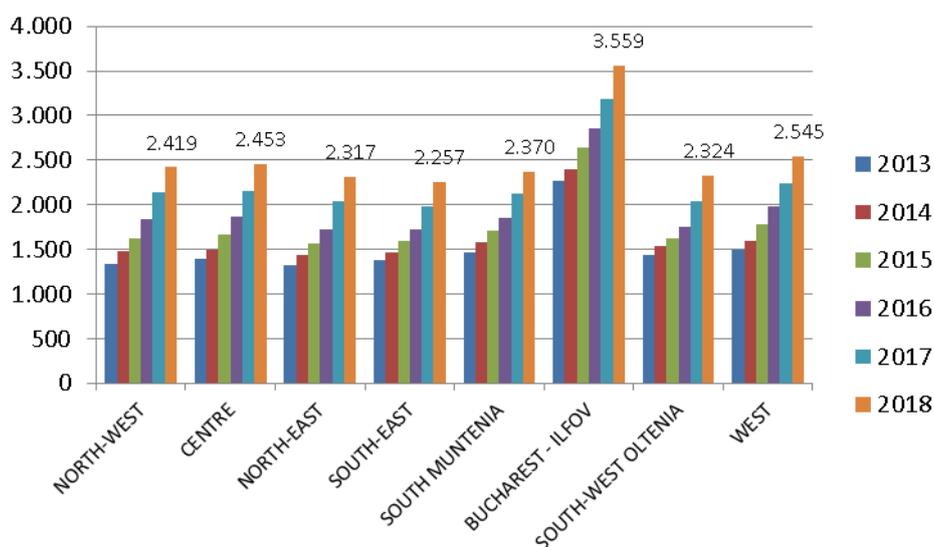
In line with the economic developments, the value of the average net nominal monthly salary in the North-East Region increased by 57.01% in the 2013-2018 period. In 2018, the average monthly net nominal wage in the region was 87.70% of the national average.



Average net nominal wage per month, lei, 2014-2018

Source: NIS, Tempo Online, 2020, "Average monthly net nominal earnings per national economic sector (sections and subsections) NACE Rev.2, gender, macro-regions, development regions and counties" indicator

As can be seen from the graph below, at 2018 level, the lowest monthly average nominal wages are recorded in the South-East Region, followed by the North-East Region. The Bucharest-Ilfov Region and the West Region are on the opposite position, with the highest wage levels in the reference period analysed.



The evolution of the average monthly net nominal wage between 2013-2018, by development regions, lei

Source: NIS, Tempo Online, 2020, "Average monthly net nominal earnings per national economic sector (sections and subsections) NACE Rev.2, gender, macro-regions, development regions and counties" indicator

Chapter 1.1 Analysis of the research, innovation, and technology transfer potential

1.1.1 The situation of R&D units

In 2018, at the level of the North-East Region, 68 local units carried out R&D and innovation activities, representing 7.33% of the total number recorded at the national level. Compared to the rest of the regions, the North-East Region ranks 5th and registers a decrease in the number of CDI units compared to the previous year. The counties of Iași and Bacău occupy the first places in the North-East Region, with a share of 54.41% and 17.65% of the region's total.

The evolution in the number of these units in recent years is shown in the table below:

Country/Region/County	Year						Share 2018 (%)
	2013	2014	2015	2016	2017	2018	
România	754	795	820	859	907	928	100.00%
NORTH-WEST Region	68	78	85	88	99	107	1,53%

CENTRE Region	58	65	67	75	78	84	9.05%
NORTH-EAST Region	58	60	62	61	71	68	7.33%
Bacău	6	7	6	5	8	12	17.65%
Botoşani			1	1		2	2.94%
Iaşi	41	40	40	39	43	37	54.41%
Neamţ	6	7	7	8	11	7	10.29%
Suceava	3	4	6	6	7	8	11.76%
Vaslui	2	2	2	2	2	2	2.94%
SOUTH-WEST Region	26	26	34	35	39	39	4.20%
SUD-MUNTENIA Region	56	61	68	71	67	72	7.76%
BUCUREŞTI – ILFOV Region	411	423	418	438	448	452	48.71%
SOUTH-WEST OLTENIA Region	25	27	34	37	48	47	5.06%
WEST Region	52	55	52	54	57	59	6.36%

Number of RDI units by development regions and detailed by the North-East Region's counties, 2013-2018
Source: NIS, Tempo Online, 2020, "Active local units, by national economy activities at the NACE Rev.2 division level, size classes by the number of employees, macro-regions, development regions and counties" Indicator

By analysing the primary performance indicators of small and medium-sized R&D companies in the region, it is noted that between 2015 and 2016, the number of people employed was approximately 400 and since 2017, this number has increased to 490 in 2018. Even though the number of local R&D units decreased in 2018, compared to 2017, the turnover increased by 23.25% compared to the previous year.

Indicator	2015	2016	2017	2018
Number of active local units				
România	814	853	901	921
North-East Region	62	61	71	68
Number of persons employed				
România	10,781	10,209	9,791	9,758
North-East Region	405	406	437	490
Turnover – mil. RON				
România	1,391	1,211	1,408	1,545
North-East Region	34	43	43	53

Main performance indicators of small and medium-sized R&D enterprises, 2015-2018

Source: NIS, "Small and Medium Enterprises in the Romanian Economy 2017", "Small and Medium Enterprises in the Romanian Economy 2018"

Depending on the research field and the number of employees, RDI units are distributed at the level of the North-East Region in the years 2017 and 2018, according to the table:

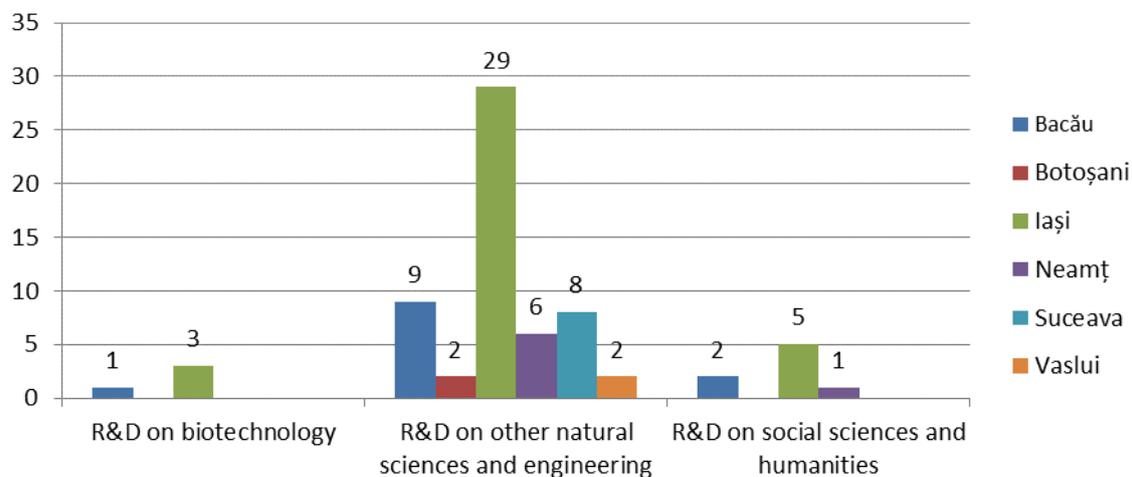
NACE Rev. 2	0-9 persons		10-49 persons		50-249 persons		Total		%	
	2017	2018	2017	2018	2017	2018	2017	2018	2017	2018
R&D on biotechnology (NACE 7211)	4	3	1	1	0	0	5	4	7.04%	5.88%

R&D on other natural sciences and engineering (NACE 7219)	54	49	2	4	3	3	59	56	83.10%	82.35%
R&D on social sciences and humanities (NACE 7220)	7	8	0	0	0	0	7	8	9.86%	11.76%
TOTAL	65	60	3	5	3	3	71	68	100.00%	100.00%

Distribution of RDI units in the North-East region by NACE codes and number of employees in 2017 and 2018

Source: NIS, Tempo Online, 2020, "Active local units, by national economy activities at the NACE Rev.2 division level, size classes by the number of employees, macro-regions, development regions and counties" Indicator

By analysing local R&D units by the number of employees, it is noted that, in 2017 and 2018, most of the R&D active companies in the North-East Region are micro-enterprises. The majority of the active local units in the region carry out R&D activities in other natural sciences and engineering.



Distribution of RDI units in the North-East Region's counties, by object of activity, in 2018

Source: NIS, Tempo Online, 2020, "Active local units, by national economy activities at the NACE Rev.2 division level, size classes by the number of employees, macro-regions, development regions and counties" Indicator

At the level of the North-East Region, in 2018, the main economic agents carrying out R&D activities under the 72 R&D Division NACE code, according to the 2018 review, classes 7211 R&D on biotechnology, 7219 R&D on other natural sciences and engineering, 7220 R&D on social sciences and humanities are:

Crt. No.	Economic Agent	County	Locality	NACE code according to the 2018 review	Turnover (RON)	Average no. of employees	Net profit (RON)	Net loss (RON)
1	ASSIST SOFTWARE SRL	SV	Suceava	7219	18,334,839	152	3,002,916	0
2	MECHATRONICS INNOVATION CENTER SRL	IS	Iași	7220	5,399,465	5	168,872	0
3	ICIT FIBRESIN SA	IS	Iași	7219	1,485,976	9	86,708	0
4	M.I.B. T.H. S.R.L.	IS	Iași	7211	1,155,597	8	0	60,845
5	1 DUZOC 8 SRL	BC	Comănești	7219	785,541	4	162,814	0
6	SINERGIS	IS	Iași	7219	776,399	3	505,395	0

	MANAGEMENT SRL							
7	CEPROPLAST IMPEX SRL	IS	Iași	7219	687,301	1	295,050	0
8	BRADO AGRI S.R.L.	SV	Vășcăuți	7219	669,303	1	489,646	0
9	ETCH-TECH SOLUTIONS SRL	IS	Iași	7219	634,370	2	460,629	0
10	SD SEEDS SRL	IS	Iași	7219	584,809	1	357,558	0
11	FRUCTEX BACĂU SRL	BC	Bacău	7219	532,815	0	1,740	0
12	BIODIVERSITY RESEARCH AND CONSULTING SRL	IS	Iași	7219	441,705	2	65,590	0
13	ALL GREEN SRL	IS	Iași	7219	418,561	9	78,492	0
14	CENTRE FOR ECONOMICS AND AGRICULTURAL DEVELOPMENT SRL	IS	Iași	7219	381,888	1	253,955	0
15	EMP AEROSPACE SOLUTIONS SRL	NT	Tîrgu Neamț	7219	314.271	0	159,007	0
16	INTELECTRO IAȘI SRL	IS	Iași	7219	303,000	12	1,172	0
17	EXPERT PROJECTS SRL	IS	Iași	7220	296,118	0	198,684	0
18	TEHNO-CRIS INDUSTRIAL SERVICE SRL	IS	Iași	7219	290.963	3	805	0
19	GL PROJECT SRL	IS	Iași	7219	289,114	4	0	67,131
20	ANLET MED SRL	IS	Iași	7219	278,196	1	212,078	0

Top 20 economic agents from the North-East Region by turnover, at the level of the 72 R&D NACE division, 2018

Source: National Trade Register Office

Most of the economic agents are from Iași County, but, by analysing the table, one can notice that the highest turnover is owned by an economic agent from Suceava County that performs R&D activities in other natural sciences and engineering.

The national R&D system consists of all public and private law units and institutions that have R&D as part of their activity.

The national R&D system includes the following categories of public law units and institutions⁷:

- a) national R&D institutes;
- b) accredited state higher education institutions or their R&D structures, without legal personality, established under the University Charter;

⁷ According to Ordinance No. 57 of 16 August 2002 on scientific research and technological development (updated August 2017)

- c) institutes, centres or R&D stations subordinated to the Romanian Academy or branch academies;
- d) other institutes, centres or R&D stations organised as public or public law-governed institutions;
- e) international R&D centres established based on international agreements;
- f) institutes or R&D centres organised within national enterprises, national companies and autonomous directorates;
- g) other public or public law-governed institutions having R&D as their object of activity or their legally established structures.

At the level of the North-East Region, we list the following main public law-governed units and institutions that are part of the national R&D system:

Crt. No.	Authority	Entity name	Location
NATIONAL R&D INSTITUTES			
1.	Ministry of Education and Research	National R&D Institute for Technical Physics – IPT	Iași
2.	Ministry of Education and Research	National Institute R&D in Construction, Urban Planning and Sustainable Territorial Development Urban-INCERC – Iași Branch	Iași
3.	Ministry of Education and Research	"Marin Dracea" National Institute for R&D in Forestry – Câmpulung Moldovenesc branch	Suceava
4.	Ministry of Education and Research	Institute of Biological Research – Iași branch of the National R&D Institute for Biological Sciences, Bucharest	Iași
5.	Ministry of Education and Research	"Stejarul" Biological, Geographical and Geological Research Centre – branch of the National R&D Institute for Biological Sciences, Bucharest	Neamț
ACCREDITED STATE HIGHER EDUCATION INSTITUTIONS			
1.	"Al.I.Cuza" University		Iași
2.	"Gh. Asachi" Technical University		Iași
3.	"Gr.T Popa" University of Medicine and Pharmacy		Iași
4.	"Vasile Alecsandri" University		Bacău
5.	"Ștefan cel Mare" Universit		Suceava
6.	"Ion Ionescu de la Brad" University of Agricultural Sciences and Veterinary Medicine		Iași
7.	"George Enescu" National University of Arts		Iași
R&D STRUCTURES OF ACCREDITED STATE HIGHER EDUCATION INSTITUTIONS, WITHOUT LEGAL PERSONALITY			
1.	"Al.I.Cuza" University	"Petre Jitariu" Biological Station	Neamț
2.	"Al.I.Cuza" University	"Ion Gugiuaman" Student Research and Practice Station, Rarău	Suceava
3.	"Al.I.Cuza" University	Physical-Geographical Research and Environmental Quality Monitoring Station, Mădârjac	Iași
4.	"Al.I.Cuza" University	R&D Station for Aquaculture and Aquatic Ecology, Iași	Iași
R&D INSTITUTES, CENTERS OR STATIONS SUBORDINATED TO THE ROMANIAN ACADEMY OR BRANCH ACADEMIES			
1.	Romanian Academy	"Petru Poni" Institute of Macromolecular Chemistry – Iași	Iași
2.	Romanian Academy	"Bucovina" National Institute	Rădăuți
3.	Romanian Academy	"CE-Mont" Mountain Economics Centre of the „Costin Kirițescu" National Institute for Economic	Vatra Dornei

		Research	
4.	Romanian Academy, Iași Branch	Institute of Archaeology, Iași	Iași
5.	Romanian Academy, Iași Branch	"Gh. Zane" Institute of Economic and Social Research	Iași
6.	Romanian Academy, Iași Branch	"A. Philippide" Institute of Romanian Philology	Iași
7.	Romanian Academy, Iași Branch	Institute of Theoretical Informatics	Iași
8.	Romanian Academy, Iași Branch	"A.D. Xenopol" Institute of History	Iași
9.	Romanian Academy, Iași Branch	"O. Mayer" Institute of Mathematics	Iași
10.	Romanian Academy, Iași Branch	"Olga Necrasov" Anthropological Research Centre	Iași
11.	Romanian Academy, Iași Branch	Research Centre for Oenology	Iași
12.	Romanian Academy, Iași Branch	Centre of European History and Civilisation	Iași
13.	Romanian Academy, Iași Branch	The Geography Collective	Iași
14.	Romanian Academy, Iași Branch	Biomedical Research Centre	Iași
15.	"Gheorghe Ionescu-Sișești" Academy of Agricultural and Forestry Sciences	"Mihai Cristea" Vegetal Genetic Resources Bank	Suceava
16.	"Gheorghe Ionescu-Sișești" Academy of Agricultural and Forestry Sciences	Podu Iloaiei Agricultural R&D Station	Iași
17.	"Gheorghe Ionescu-Sișești" Academy of Agricultural and Forestry Sciences	Secuieni Agricultural R&D Station	Neamț
18.	"Gheorghe Ionescu-Sișești" Academy of Agricultural and Forestry Sciences	R&D Station for Pomiculture, Iași (RDRP Iași)	Iași
19.	"Gheorghe Ionescu-Sișești" Academy of Agricultural and Forestry Sciences	R&D Station for Vegetables Farming, Bacău	Bacău
20.	"Gheorghe Ionescu-Sișești" Academy of Agricultural and Forestry Sciences	Dancu R&D Station for Cattle Farming	Iași
21.	"Gheorghe Ionescu-Sișești" Academy of Agricultural and Forestry Sciences	Popăuți R&D Station for Sheep and Goat Farming	Botoșani
22.	"Gheorghe Ionescu-Sișești" Academy of Agricultural and Forestry Sciences	Secuieni R&D Station for Sheep and Goat Farming	Bacău
23.	"Gheorghe Ionescu-Sișești" Academy of Agricultural and Forestry Sciences	Pajiști R&D Station	Vaslui
24.	"Gheorghe Ionescu-Sișești" Academy of Agricultural and Forestry Sciences	"Mircea Motoc" R&D Station for Combating Soil Erosion	Vaslui
25.	"Gheorghe Ionescu-Sișești" Academy of Agricultural and Forestry Sciences	Iași R&D Station for Viticulture and Wine Production	Iași

	Forestry Sciences		
26.	“Gheorghe Ionescu-Sișești” Academy of Agricultural and Forestry Sciences	„Gheorghe Lazăr” R&D Centre or Pomiculture of the RDPR Iași	Suceava
OTHER R&D INSTITUTES, CENTRES OR STATIONS ORGANISED AS PUBLIC OR PUBLIC LAW-GOVERNED INSTITUTIONS			
1.	Regional Institute of Oncology “TRANSCEND” Centre for fundamental research and experimental development in translational medicine (interdisciplinary centre of the Regional Oncology Institute, Iasi)		Iași

Main public R&D entities of national interest in the North-East Region

Source: www.research.gov.ro, www.edu.ro, www.acad.ro, www.acadIasi.org, www.asas.ro

According to the National Register of Research Infrastructures ([ERRIS – Engage in the Romanian Research Infrastructures System](#)), which was created to support the coordinators of public/private research infrastructures in Romania and those who wish to benefit from the services provided by these infrastructures, stimulating collaboration and participation of the Romanian scientific community in national and international networks, there are 212 research infrastructures in the North-East Region, distributed according to the table below:

County	Research infrastructure (number)
Bacău	18
Botoșani	0
Iași	169
Neamț	8
Suceava	15
Vaslui	2
NE Region	212

Research infrastructure in the North-East Region, 2020

Source: www.erris.gov.ro

Private law units and institutions include accredited private universities and R&D units operating as trading companies.

The following private universities operate at the regional level:

- “George Bacovia” University, Bacău
- “Apollonia” University, Iași
- “Petre Andrei” University, Iași

1.1.2 R&D staff

Low wages, totally inadequate material resources for performance achievement, as well as opportunities offered by research programmes in other countries, have gradually led to a decrease in the number of R&D employees. Regarding the average age of highly qualified R&D staff in the government and higher education performance sectors, in 2018, 52.42% of all researchers were not older than 44 years old and 47.58% were 45 years old and above.

Regarding the number of employees involved in the R&D activity, the North-East Region was one of the few regions that was characterised by an upward trend between 2003 and 2008. Since 2009, as a result of the economic and financial crisis, the activity of research units has been reduced, with the

number of employees falling to 3,376 in 2010. In the period 2011-2013, their number continued to increase to a maximum of 4,328 employees. Between 2014 and 2018, the number of employees involved in the R&D activity followed a downward trend; thus, in 2018, the region registered a number of 3,821 employees and was third in place after Bucharest-Ilfov Region and Centre Region (from the perspective of this indicator). Practically, at the end of 2018, the total number of employees involved in the R&D activity in the North-East Region accounted for 8.54% of the total existing employees in the R&D field at the national level. *Regarding the number of researchers, the region ranks second after the Bucharest-Ilfov Region (2,874 researchers). Analysing the share of employees in R&D activities (33.7 persons) out of 10,000 civilian employed persons, the region occupies the fourth place at the national context.*

Year	Region								TOTAL
	NW	CENTRE	NE	SE	SOUTH-MUNTENIA	BUCHAREST-ILFOV	SV OLTENIA	W	
No. of employees in R&D activity by development regions									
2013	3,137	2,683	4,328	1,583	4,595	21,128	2,058	3,863	43,375
2014	3,485	3,885	4,319	1,656	3,826	20,212	1,960	3,620	42,963
2015	3,277	3,728	4,298	2,023	2,902	21,088	2,101	4,031	43,448
2016	3,175	4,072	4,129	2,150	2,836	21,968	2,025	4,031	44,386
2017	3,280	4,000	3,947	2,290	2,344	22,709	2,132	4,099	44,801
2018	3,484	4,140	3,821	2,479	2,631	23,095	1,464	3,619	44,733
Out of which researchers									
2013	1,962	1,606	3,373	1,088	2,384	12,652	1,612	2,923	27,600
2014	2,280	1,831	3,332	1,212	2,160	12,469	1,625	2,626	27,535
2015	2,284	1,672	3,470	1,364	1,556	12,655	1,703	2,549	27,253
2016	2,223	1,783	3,223	1,426	1,642	13,384	1,622	2,498	27,801
2017	2,210	1,565	3,056	1,566	1,415	13,411	1,651	2,493	27,367
2018	2,334	1,545	2,874	1,723	1,408	13,856	1,033	2,698	27,471
No. of employees in R&D work per 10,000 civilian employed persons									
2013	26.4	25.8	36	15.8	39.3	168.1	24.7	46.2	
2014	29.4	37.9	36.6	16.8	33.4	161.1	24.1	43.2	
2015	27.9	36.3	37.4	20.9	26	165.4	26.7	48	
2016	27.2	39.3	37	22.7	25.9	161.5	26.6	48.3	
2017	27.8	38.3	35.1	24.1	21.3	165.9	27.8	49.4	
2018	29.5	39.4	33.7	26.1	23.8	168.2	18.8	43.6	

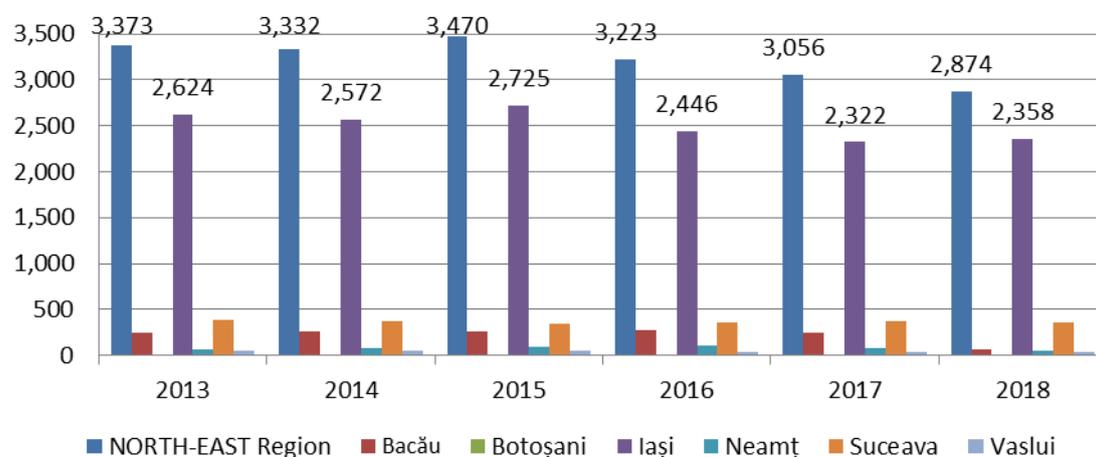
The evolution of the number of employees in R&D in the North-East Region, compared to other regions of the country, 2013-2018

Source: NIS, Tempo Online, 2020, "R&D employees by macro-regions, development regions and counties, at the end of the year" Indicator

At the county level, in 2018, most of the employees involved in R&D activities are registered in Iași County (75.24 %), followed by Suceava County (15.07%). This situation can be explained, first of all, by the fact that in both counties there are renowned university centres. From the point of view of the number of employees per 10,000 civilian employed persons, Iași County occupies the third place at the national level (100.1 researchers/10,000 civilian employed persons), after Ilfov and Bucharest. The counties of Sibiu and Cluj occupy the fourth and fifth places.

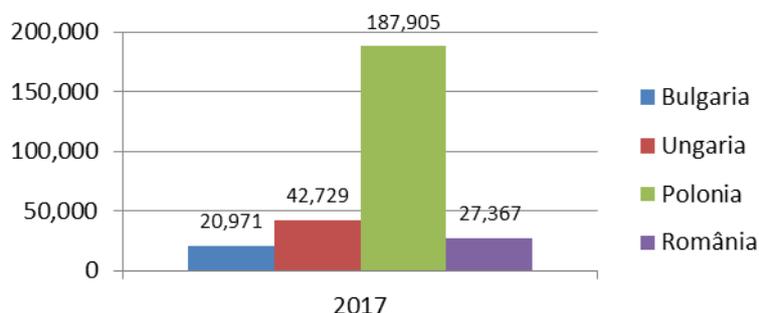
Regarding the number of researchers in the North-East Region, from a time perspective, the indicator decreased in most of the region's counties, except in Iași, where it increased by 36 researchers in

2018, compared to 2017. Bacău County registered the highest drop in 2018, of 179 researchers compared to 2017.



Evolution in the number of researchers in the counties of the NE Region, compared to the region, 2013-2018
 Source: NIS, Tempo Online, 2020, "R&D employees by macro-regions, development regions and counties, at the end of the year" Indicator

At European Union level, the latest statistical data available in the Eurostat database is from 2017. The EU-28 registered a total of 3,103.137 researchers. Compared to other European countries, with a total number of 27,367 researchers, Romania has advanced Bulgaria.



Total number of researchers in all sectors of activity, comparison to EU countries, 2017
 Source: Eurostat, 2020, „Total researchers by sectors of performance - head count" Indicator

Another indicator to be taken into account when analysing the R&D activity, and particularly in the framework of a smart specialisation strategy involving skilled and innovative staff, is represented by PhD students, who are also included in the technicians' category. Thus, at the level of the North-East Region, the situation of doctoral schools is as follows:

UNIVERSITY	LOCATION	NUMBER OF DOCTORAL SCHOOLS
"Alexandru Ioan Cuza" University	Iași	14
"Gr. T. Popa" University of Medicine and Pharmacy	Iași	1
"Gheorghe Asachi" Technical University	Iași	10*
"Ion Ionescu de la Brad" University of Agricultural Sciences and Veterinary Medicine	Iași	2
"George Enescu" University of Arts	Iași	3

"Ștefan cel Mare" University	Suceava	2
"Vasile Alecsandri" University	Bacău	1
TOTAL	North-East Region	33

*IOSUD Doctoral School – *Gheorghe Asachi* Iași coordinates the activity of the 10 council boards that coordinate the doctoral programmes operating within the faculties

The situation of doctoral schools in the universities of the North-East Region

Source: www.uaic.ro, www.umfiasi.ro, www.tuiasi.ro, www.uaiasi.ro, www.arteiasi.ro, www.usv.ro, www.ub.ro

The North-East Region totals 33 doctoral schools out of 214 registered in the country in 2020.

Analysing the preliminary distribution of the 2018-2019 schooling figure for full-time and part-time doctoral studies, financed by the state in the 2018-2019 academic year, 400 places are statistically distributed across the North-East Region, which represents 15.30% of the national total⁸.

The doctoral fields existing at universities in the North-East Region are as follows:

Doctoral Programmes		
University	Doctoral School	Field
"Ștefan cel Mare" University, Suceava	Applied and engineering sciences	Computers and Information Technology
		Geography
		Electrical Engineering
		Electronic Engineering, Telecommunications and Information Technologies
		Mechanical Engineering
		Industrial Engineering
		Food Engineering
		Materials Engineering
		Forestry
	Social Sciences and Humanities	History
		Philosophy
		Philology
		Accountancy
		Business Administration
		Economics
"Vasile Alecsandri" University, Bacău	Engineering Sciences	Environmental Engineering
		Industrial Engineering
"Alexandru Ioan Cuza" University, Iași	Biology	Biology
	Chemistry	Chemistry
	Law	Law
	Economics and Business Administration	Economics
		Finance
		Accountancy
		Cybernetics and Statistics
	Philosophy and Political Social Sciences	Philosophy
		Sociology
		Political Sciences

⁸ <https://www.edu.ro/cifra-de-%C8%99colarizare-2018-2019>

		Communication Sciences
	Physics	Physics
	Geosciences	Geography
		Geology
		Environmental Science
	Computer Science	Computer Science
	History	History
	Philological Studies	Philology
	Mathematics	Mathematics
	Psychology and Education Sciences	Psychology
		Education Sciences
	Orthodox Theology	Theology
	Sports and Physical Education Science	Sports and Physical Education Science
"Gheorghe Asachi" Technical University, Iași	IOSUD Doctoral School – <i>Gheorghe Asachi</i> Iași	Computers and Information Technology
		Systems Engineering
		Civil Engineering and Installations
		Industrial Engineering
		Mechanical Engineering
		Electrical Engineering
		Chemical Engineering
		Energy Engineering
		Electronic Engineering, Telecommunications and Information Technologies
		Environmental Engineering
		Engineering and Management
		Chemistry
		Materials Engineering
"George Enescu" University of Arts, Iași	IOSUD <i>George Enescu</i> Iași	Music
		Theatre
		Visual Arts
"Gr. T. Popa" University of Medicine and Pharmacy, Iași	IOSUD UMF Iași	Medicine
		Dental Medicine
		Pharmacy
"Ion Ionescu de la Brad" University of Agricultural Sciences and Veterinary Medicine, Iași	Engineering Sciences	Agronomy
		Zootechnics
		Horticulture
		Agriculture and Rural Development Engineering and Management
	Veterinary Medicine	Veterinary Medicine

Doctoral study fields at universities in the North-East Region

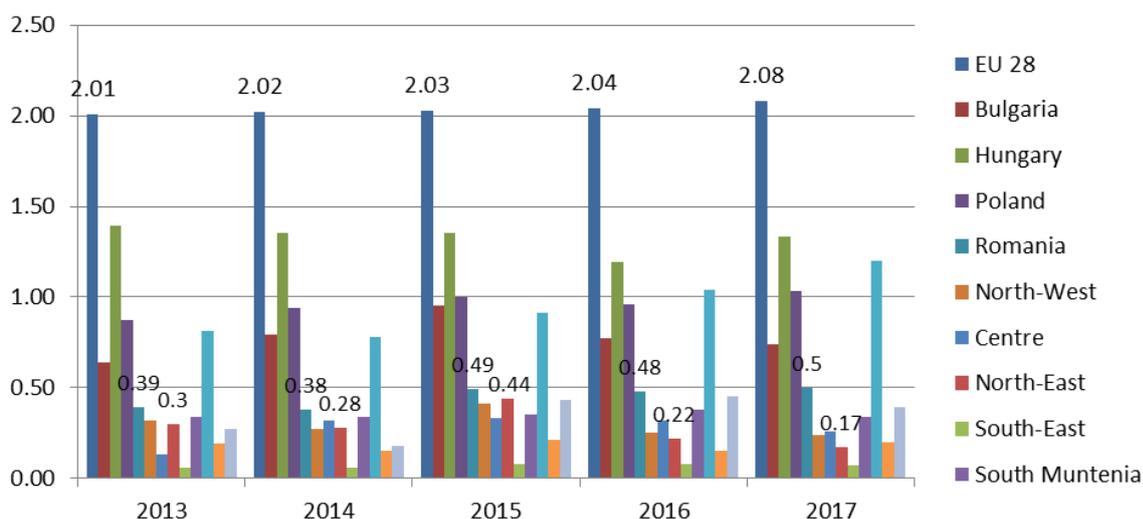
Source: www.uaic.ro, www.umfiiasi.ro, www.tuiasi.ro, www.uaiasi.ro, www.arteiasi.ro, www.usv.ro, www.ub.ro

By looking at the study fields of doctoral schools in the North-East Region, one can easily observe that most of them are part of the fundamental field of Engineering Sciences (25), followed by Social Sciences (13), Mathematics and Natural Sciences (10), Humanities and Arts (10), Biological and Biomedical Sciences (5), Sports Science and Physical Education (1).

1.1.3 R&D Expenditure

R&D expenditure is one of the main drivers of economic growth in a knowledge-based economy. R&D spending is essential to making the transition to a knowledge-based economy, as well as for improving production technologies and stimulating growth.

According to Eurostat, in 2017, Romania spent 0.5% of the National Gross Domestic Product on R&D activities, registering an increase of 0.11 percentage points compared to 2013. The achievement of the 3% target set by the Lisbon Strategy and the Europe 2020 Strategy is now extremely distant, and the private sector's contribution to R&D expenditure needs to be considerably increased.

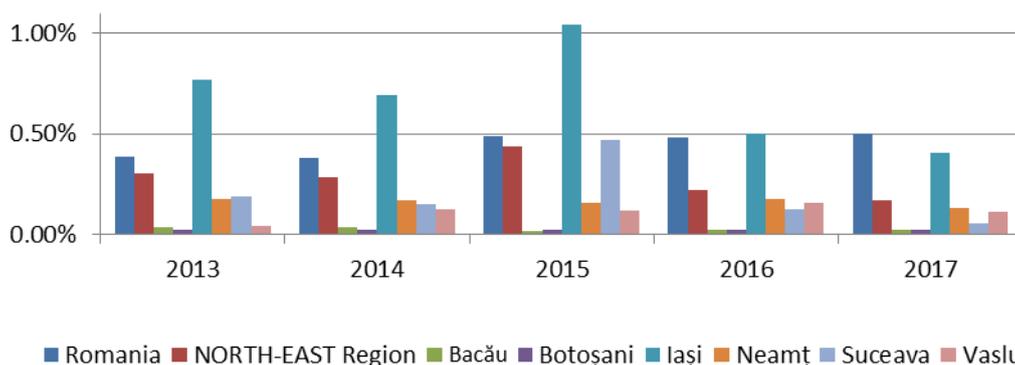


R&D expenditure as a share of GDP, 2013-2017, in percentages

Source: Eurostat, 2020, „Intramural R&D expenditure (GERD) by NUTS 2 regions”, „Gross domestic expenditure on R&D (GERD)” Indicators

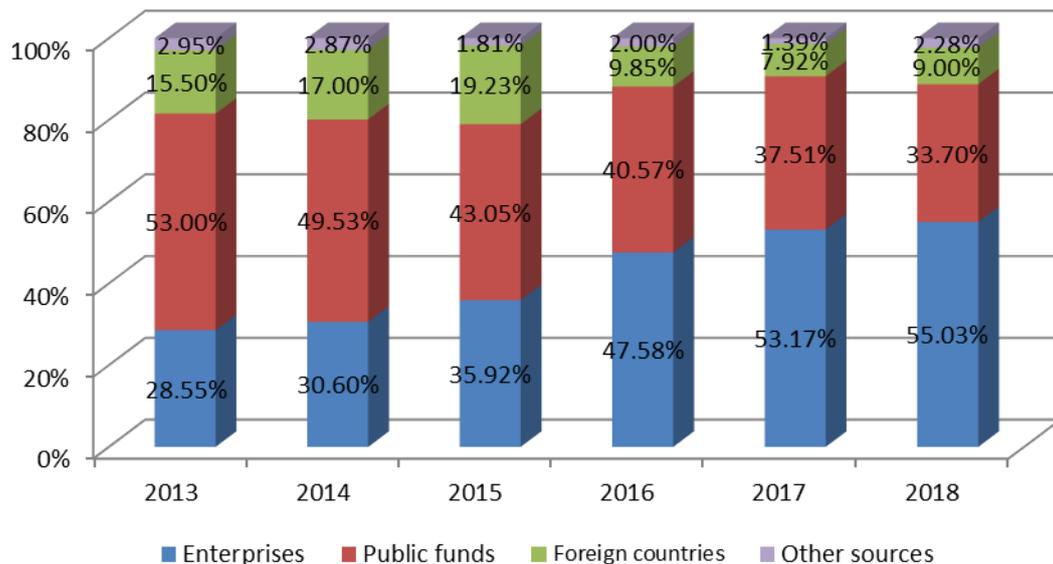
At the regional level, the share of expenditure in the period 2013-2017 peaked in 2015 (0.44%), and 2017 registered the biggest fall in the analysed range, the percentage dropping to 0.17%.

Basically, most of these expenditures are carried out by Iași County with 0.40% of R&D spending as a share of the GDP.



R&D expenditure as a share of GDP, 2013-2017

Source: NIS, Tempo Online, 2020, Calculations based on the "Total R&D expenditure by macro-regions, development regions and counties - current prices" and "GDP by macro-regions, development regions and counties - calculated according to NACE Rev.2 - ESA 2010" Indicators



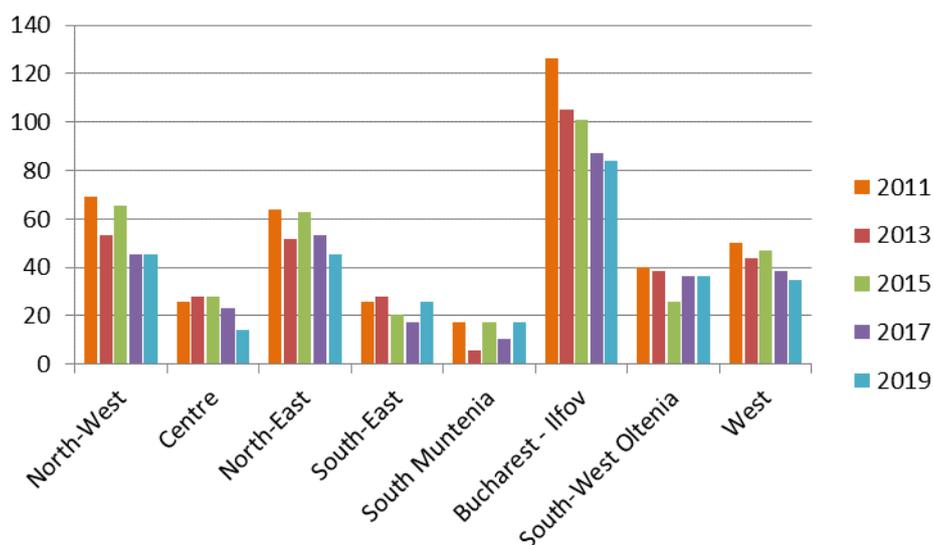
R&D expenditure at the national level, by funding source, 2013-2018, in percentages

Source: NIS, Tempo Online, 2020, "Total R&D expenditure by performance sectors and funding sources – current prices" Indicator

At the national level, R&D activities are largely funded from public and business funds. Since 2014, there has been an increase in the share of corporate funding to the detriment of public funding.

Public expenditure on R&D as a percentage of regional GDP represents all R&D expenditure from the government sector and higher education relative to the regional GDP and measured in terms of performance compared to the EU-28 average. The indicator's trends provide key information for the future competitiveness and prosperity of a region.

Compared to the other development regions in Romania, in 2019, the North-East Region comes second, on a par with the North-West Region. From a time perspective, there is a decrease in the percentage of public expenditures on R&D activities from 64.12% in 2011 to 45.52% in 2019.



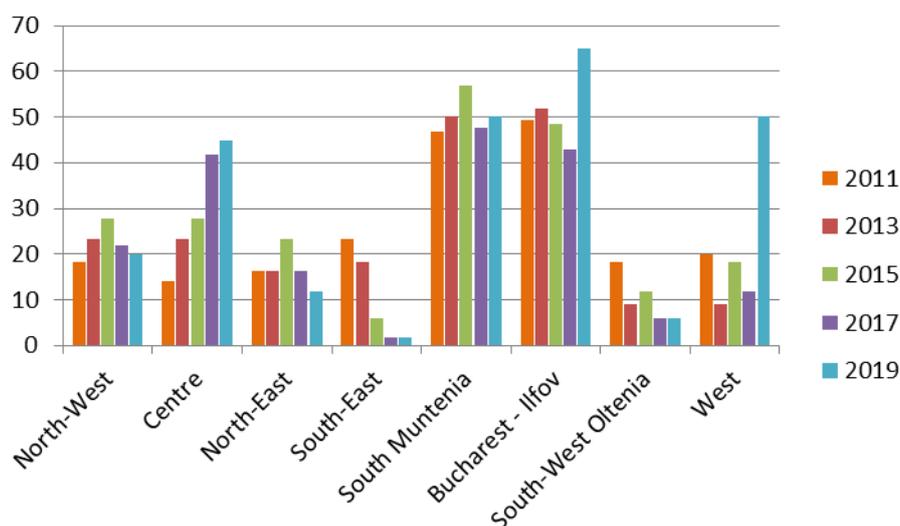
**Public expenditure on R&D as % of regional GDP at regional level between 2011-2019, in percentages
(measured as performance compared to the EU-28 average, with a 100% reference value)**

Source: Regional Innovation Scoreboard Edition 2019, <https://interactivetool.eu/RIS/index.html>

Expenditures on private-sector R&D activity, in relation to the regional GDP, capture the creation of new knowledge within companies. It is particularly important in science-based fields (pharmaceuticals, chemicals, electronics), where most innovations or discoveries are created within or in the proximity of R&D laboratories. The value of this indicator is measured as performance in relation to the EU-28 average.

Compared to the other development regions in Romania, in 2019, the North-East Region ranked sixth, followed by the South-West Oltenia and South-East Regions. Time-wise, there is a decrease in the percentage of private expenditures on R&D activity from 16.22% in 2011 to 11.69% in 2019. The highest value of this indicator was recorded in 2015 (23.39%).

At the same time, comparing the two R&D spending categories at the level of 2019, it is noted that, in the North-East Region, public sector expenditure for R&D activity as % of the regional GDP is higher. This statement is not verified in the Centre, South-Muntenia and West Regions, where the R&D spending as % of the regional GDP is higher in the private sector.



Private

**expenditure on R&D as % of the regional GDP at regional level between 2011-2019, in percentages
(measured as performance compared to the EU-28 average, with a 100% reference value)**

Source: Regional Innovation Scoreboard Edition 2019, <https://interactivetool.eu/RIS/index.html>

Between 2014-2020 (February), under the Framework Programme for Research and Innovation of the European Union, Horizon 2020, the net contribution of the European Union at the national level was EUR 212,564,723. Regarding this indicator, the North-East Region ranks fourth, after the Bucharest-Ilfov, North-West and Centre Regions. The North-East Region has signed 51 grant agreements.

Region	EU's net contribution (EUR)	Signed grant agreements	Project participations (no.)
North-East	11,001,085	51	68
North-West	19,715,252	106	127
Centre	12,761,370	76	90
South-East	7,193,398	38	53
South-Muntenia	3,773,292	32	42
Bucharest-Ilfov	150,356,531	532	724
South-West Oltenia	2,264,254	23	32
West	5,499,541	42	55

Indicators regarding funding under Horizon 2020, at the regional level, 2014-2020

Source: <https://webgate.ec.europa.eu/dashboard/sense/app/93297a69-09fd-4ef5-889f-b83c4e21d33e/sheet/a879124b-bfc3-493f-93a9-34f0e7fba124/state/analysis>

At the regional level, the top 4 organisations that are among the beneficiaries that received funding under Horizon 2020, *after the net contribution of the EU*, are the “Petru Poni” Institute of Macromolecular Chemistry Iași, ROMSOFT SRL from Iași, “Alexandru Ioan Cuza” University from Iași, ASSIST SOFTWARE SRL from Suceava.

Crt. No.	Organisation	County	EU's net contribution (EUR)	Project participations (no.)
1	“PETRU PONI” INSTITUTE OF MACROMOLECULAR CHEMISTRY	Iași	3,191,820	7
2	ROMSOFT SRL	Iași	2,137,388	5
3	“ALEXANDRU IOAN CUZA” UNIVERSITY	Iași	823,371	7
4	ASSIST SOFTWARE SRL	Suceava	770,736	3
5	“ȘTEFAN CEL MARE” UNIVERSITY	Suceava	660,091	4
6	NORTH-EAST REGIONAL DEVELOPMENT AGENCY	Neamț	629,776	8
7	“GHEORGHE ASACHI” TECHNICAL UNIVERSITY	Iași	472,835	2
8	“MAI BINE” ASSOCIATION	Iași	280,625	1
9	REGIONAL INSTITUTE OF ONCOLOGY IAȘI	Iași	237,188	1
10	“ION IONESCU DE LA BRAD” UNIVERSITY OF AGRICULTURAL SCIENCES AND VETERINARY MEDICINE	Iași	220,625	1
11	ARCADIS PROJECT ENGINEERING SA	Iași	197,775	1
12	R&D STATION FOR VEGETABLE FARMING BACĂU	Bacău	195,750	1
13	TEHNOLOPIS SRL	Iași	138,771	4
14	BIT SENTINEL SECURITY SRL	Botoșani	119,389	1
15	XWIKI SOFTWARE SRL	Iași	118,375	1
16	NE REGINOVA ASSOCIATION	Iași	100,000	1

17	ONCOLOGY CENTRE-EUROCLINIC SRL	Iași	86,125	1
18	PSYCHIATRIC HOSPITAL FOR CHRONICS, SIRET	Suceava	79,812	1
19	RITMIC COM SRL	Suceava	77,700	1
20	IAȘI AIRPORT RA	Iași	76,875	1
21	IMAGO-MOL - THE NORTH-EAST INNOVATIVE REGIONAL CLUSTER FOR MOLECULAR AND STRUCTURAL IMAGING	Iași	75,625	1
22	KATTY FASHION SRL	Iași	65,547	2
23	FUTURE IN TEXTILES ASSOCIATION	Iași	62,321	1
24	SUCEAVA MUNICIPALITY	Suceava	54,065	1
25	“SF. SPIRIDON” EMERGENCY COUNTY CLINICAL HOSPITAL, IAȘI	Iași	44,375	1
26	THE OPEN NETWORK FOR COMMUNITY DEVELOPMENT FOUNDATION	Iași	44,125	1
27	CENTRAL DOBROGEA LOCAL ACTION GROUP ASSOCIATION	Bacău	19,313	1
28	COMFIL RO SRL	Neamț	12,814	1
29	“GR. T. POPA” UNIVERSITY OF MEDICINE AND PHARMACY	Iași	7,875	1

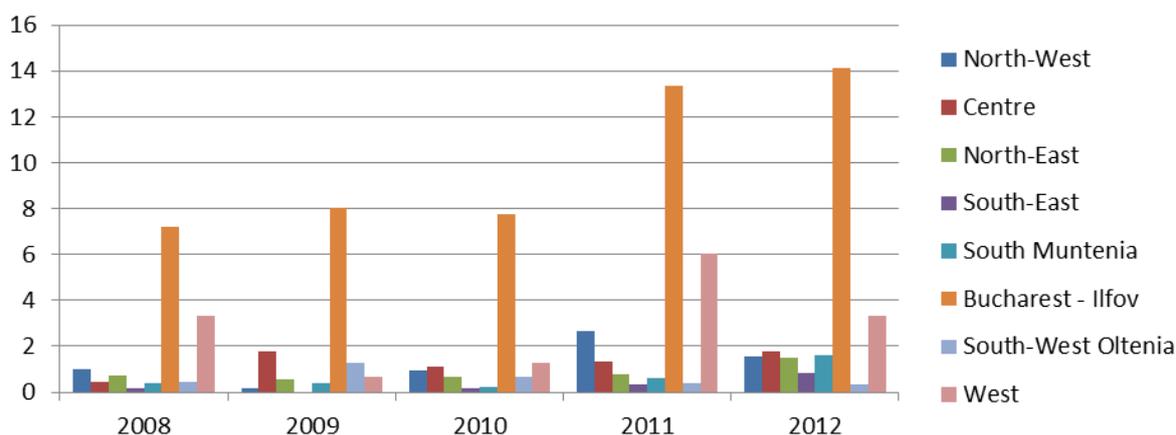
List of beneficiaries that received funding from Horizon 2020, North-East region, 2014-2020

Source: <https://webgate.ec.europa.eu/dashboard/sense/app/93297a69-09fd-4ef5-889f-b83c4e21d33e/sheet/a879124b-bfc3-493f-93a9-34f0e7fba124/state/analysis>

1.1.4 Patents and Scientific Publications

The number of patent applications submitted to the National Office in 2018 is 172 for the North-East Region, which represents 14.55% of the national total of 1,182 applications. According to the information available from the European Patent Office (EPO), in 2018, Romania registered 50 applications (1.95% of the EU-28 average), compared to 71,942 applications at EU-28 level.

According to the latest Eurostat data available at regional and county level, in 2012, the North-East Region ranks sixth in the national hierarchy regarding the number of patent applications per 1 million inhabitants registered with the European Patent Office (EPO), given that 56.4% of patent applications in Romania come from the Bucharest-Ilfov Region.



Comparative situation - number of patents/1 million inhabitants registered at the European Patent Office (EPO) – regional level compared to other regions in Romania, 2008-2012

Source: Eurostat, 2020, „Patent applications to the European patent office (EPO) by priority year by NUTS 2 regions” Indicator

In terms of the number of patents registered at the county level, Iași County ranks first, followed by Suceava County.

Country/Region/County	2009	2010	2011	2012	Period total
România	31.13	34.63	60.42	71.61	197.8
North-East	2	2.4	2.98	4.93	12.3
Bacău	0.5	0.5			1.0
Botoșani		0.2		0.25	0.5
Iași	1	1.2	2.58	3.43	8.2
Neamț			0,4		0.4
Suceava	0.5	0.5		1	2.0
Vaslui				0.25	0.3
Sud-Est South-East		0.5	1	2.17	3.7
Sud – Muntenia South - Muntenia	1.28	0.82	2	5.09	9.2
South-West Oltenia	2.83	1.5	0.87	0.67	5.9

Number of patents at the county and regional level, compared to other regions in Romania, 2009-2012

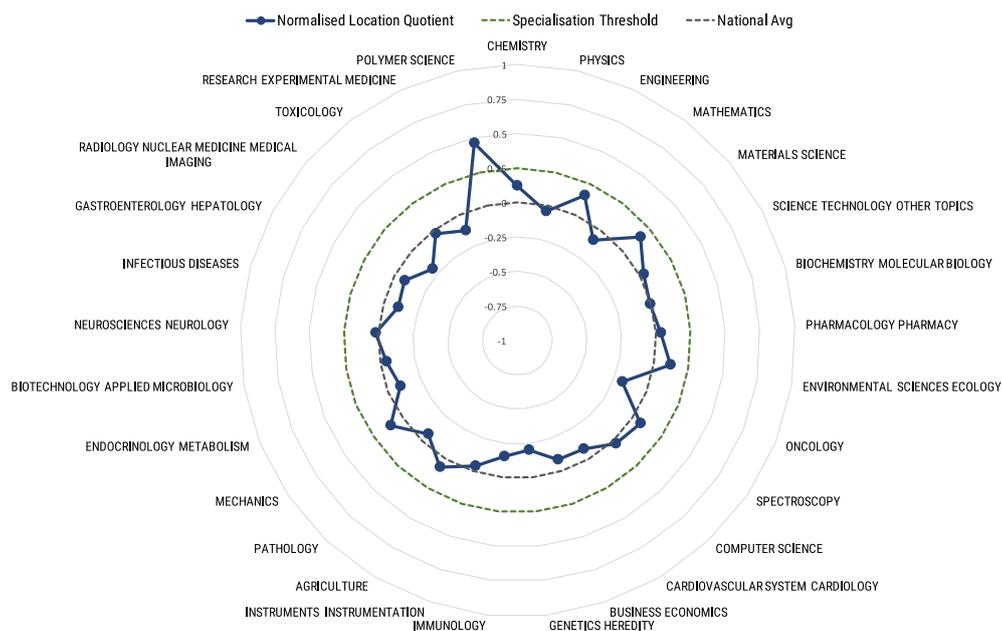
Source: Eurostat, 2020, „Patent applications to the European patent office (EPO) by priority year by NUTS 2 regions, Patent applications to the EPO by priority year by NUTS 3 regions, Patent applications to the EPO by priority year” Indicators

In 2012, the North-East Region registered an increase in the number of patents by 146.5% compared to 2009, explained by the fact that the number of patents is an indicator of the annual evaluation of the performance of the academic activity.

From the perspective of the number of publications ISI-rated (Information Sciences Institute), there are 50 ISI-rated journals at the national level, out of 57 ISI-indexed journals (21.06.2019). In the North-East Region, there are 4 ISI-rated journals and an ISI-indexed magazine belonging to the universities of Iași and Suceava.

At the national level, according to the European Innovation Scoreboard 2019 data, the percentage of scientific publications in the top 10% of the world’s most cited publications as a percentage of all scientific publications in the country has slightly increased to an average of 4.43. This is less than half the EU-28 average (11.46). *Figures suggest that the level of competitiveness of the national key actors’ research is rather modest compared to the European performance level.*

Data in the graphic below, except for polymer science, indicates that, overall, the structure of the publications of the regional research system (according to [Web of Science](#)) corresponds to the national structure, with slight variations.



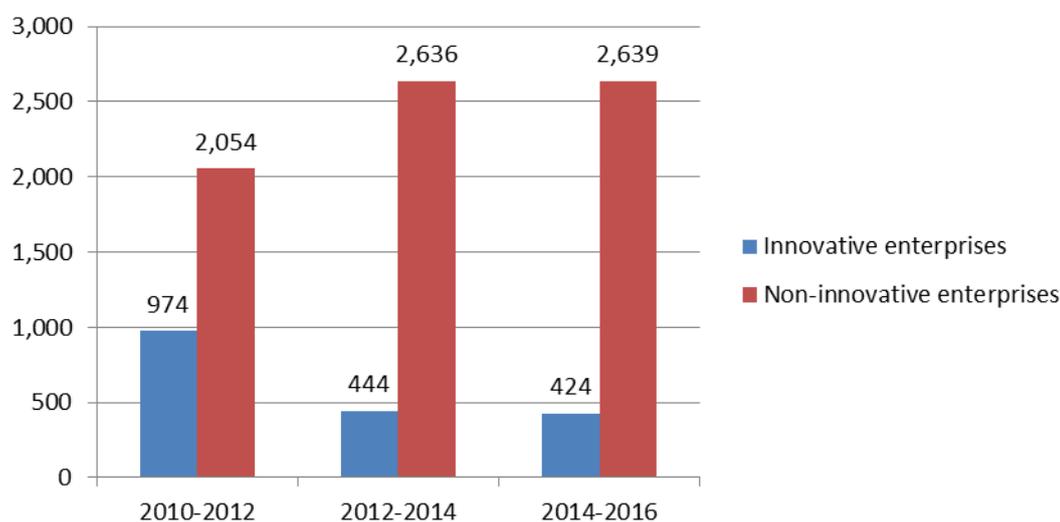
Research specialisation by number of publications, comparison between the North-East Region and Romania, according to Web of Science

Source: www.adrnordest.ro, Report on Potential Supply of Technology Transfer Services in North East Romania 2017

1.1.5 Innovative Enterprises

One category of entities carrying out innovation activities is innovative enterprises, i.e. those that launched new or significantly improved products (goods or services) on the market, or introduced new or significantly improved processes, or developed new organizational or marketing methods. The statistical work of the NSI on innovation is an exhaustive statistical research, a statistical research carried out by means of surveys.

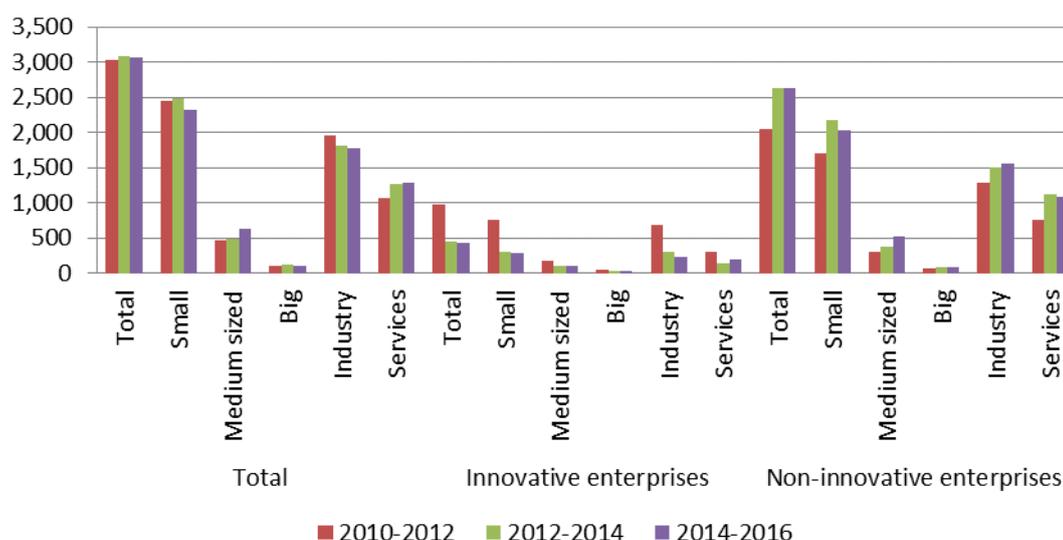
In the sample analysed it is found that the number of innovative enterprises decreased by 56.46% in the period 2014-2016 compared to the period from 2010 to 2012. At the national level, from the perspective of this indicator, the North-East Region ranks fourth in the national hierarchy, after Bucharest-Ilfov Region, North-West Region and South-East Region. We emphasize that the 424 innovative companies also include those with unfinished and/or abandoned innovations.



Number of innovative and non-innovative⁹ enterprises in the North-East Region, 2010-2016

Source: NIS, Tempo Online, 2020, "Innovative and non-innovative enterprises, by activities, size classes, by macro-regions and development regions" Indicator

Regarding innovative companies, the number of innovative service companies increased by 53 units from 2012 to 2014, compared to the 2014-2016 period. At the same time, there is a slight increase in the number of medium-sized enterprises (8) for the above-mentioned time frame. However, there are more innovative small enterprises (69.34% between 2014-2016) compared to medium-sized enterprises (25%) and large enterprises (5.66%).



Innovative enterprises by activity, size classes in the North-East Region, 2010-2016

Source: NIS, Tempo Online, 2020, "Innovative and non-innovative enterprises, by activities, size classes, by macro-regions and development regions" Indicator

There are several types of innovation, depending on different criteria. One of the common classifications defines four main types: Product innovation, process innovation, organisational innovation and marketing innovation. It is companies with **technological innovation** that have launched new (or significantly improved) goods and services or new processes.

Technological innovation measured by the introduction of new products (goods or services) and processes is essential for innovation in manufacturing activities. A higher share of technical innovators should reflect a higher level of innovative activities.

Size class and economic activities	Total		Product-only innovators		Process-only innovators		Product and/or process innovation		Innovation not completed and/or abandoned	
	2012-2014	2014-2016	2012-2014	2014-2016	2012-2014	2014-2016	2012-2014	2014-2016	2012-2014	2014-2016

⁹ According to the NSI, non-innovative enterprises are companies that did not perform innovative activities in the period under review. These companies answered a limited set of questions in the statistical research questionnaire on the absence of innovative activity.

National Total	1,840	1,556	313	430	511	478	705	518	311	130
Regional Total	99	186	23	40	23	36	32	47	21	63
Small	49	114	17	30	9	7	6	16	17	61
Medium	28	55	3	4	8	25	14	26	3	-
Large	22	17	3	6	6	4	12	5	1	2
Industry	71	102	19	9	15	20	28	23	9	50
Services	28	84	4	31	8	16	4	24	12	13

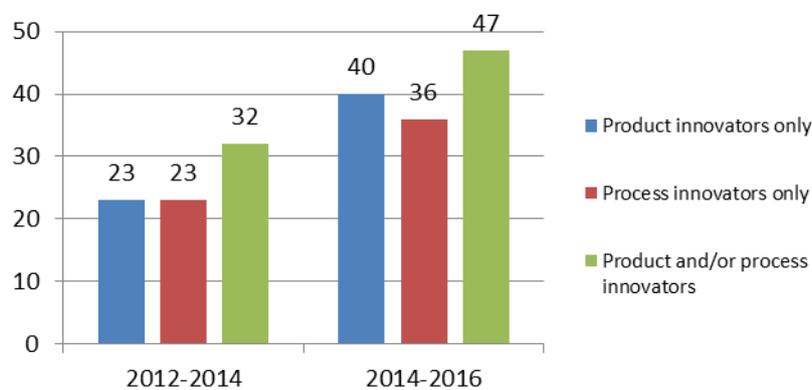
Enterprises with product and/or process innovation by activity, size classes – North-East Region

Source: NIS, Tempo Online, 2020, "Enterprises with product and/or process innovation by activity, size classes, by macro-regions and development regions" Indicator

At the regional level, between 2012 and 2014, the total number of technological innovation enterprises (99 companies) represented 5.38% of the national total, and between 2014-2016 accounted for 11.95% of the national total (194 companies). Of these, between 2014-2016, 54.84% are active in the industry field and 45.16% in services. At the same time, 61.29% of these are small enterprises with up to 50 employees, while the rest are medium-sized and large.

At the same time, it is noted that in the period 2014-2016 there was a decrease in the number of companies with technological innovation at the national level (15.43%), as well as a significant increase at regional level (87.88%). The growth was recorded both among companies active in the industry field (54.83%) and those active in services (45.16%).

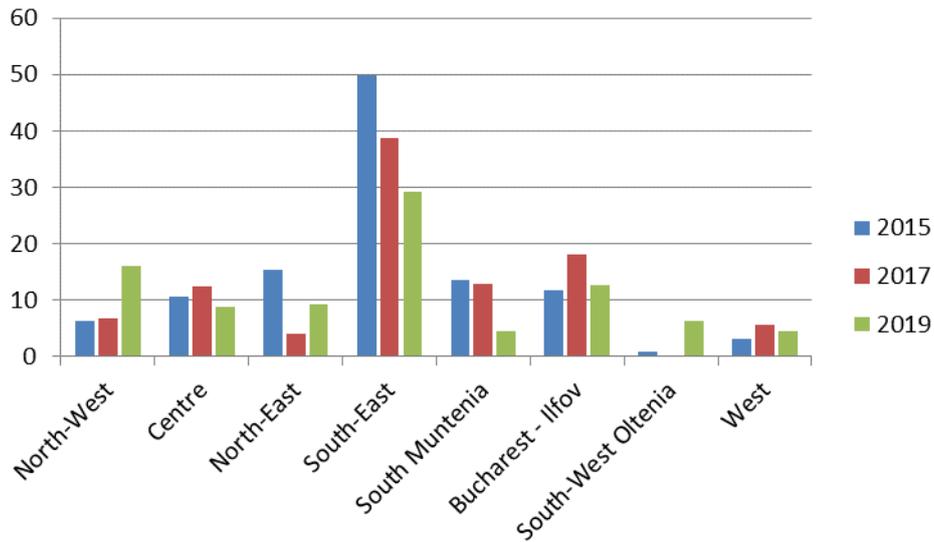
The graph below only shows the situation of product and process innovation companies so that, between 2014-2016, out of 123 companies that participated in the survey, 32.52% only perform product innovation, 29.27% only perform process innovation, 38.21% perform both product and process innovation.



Innovative enterprises by type of innovation – North-East Region

Source: NIS, Tempo Online, 2020, "Enterprises with product and/or process innovation by activity, size classes, by macro-regions and development regions" Indicator

By analysing the number of small and medium-sized enterprises that have introduced new products or processes on the market compared to the total number of SMEs, it is noted that, compared to the EU-28 average, at the level of the 8 regions, the North-East Region ranks fourth in 2019 with a value representing 31.17% of the value of the South-East Region (first place – 29.29%). In the North-East Region, between 2015-2017, the trend of this indicator was decreasing, starting from 15.46% in 2015 and reaching 3.96% in 2017. After 2017, this indicator records a positive evolution, reaching 9.13% in 2019.

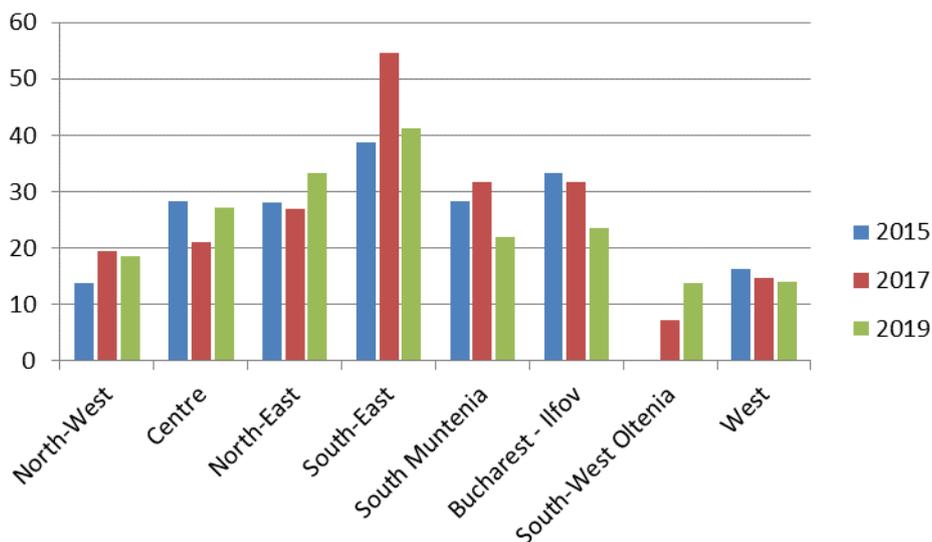


SMEs that introduced innovative processes or products % of total SMEs, at regional level, between 2011-2019 (measured as performance against the EU-28 average, with a 100% benchmark)

Source: Regional Innovation Scoreboard Edition 2019, <https://interactivetool.eu/RIS/index.html>

The marketing of innovations is an indicator that measures the turnover of new or significantly improved products and includes both new products for the company and products that are also new to the market. The indicator thus captures both the creation of state-of-the-art technologies (new products on the market), as well as the dissemination of these technologies (new products for companies).

Looking at this indicator in the Romanian regions, in 2019, the North-East Region was second, after the South-East Region. From a time perspective, the trend of this indicator in the North-East Region between 2015-2019 is rising from 27.96% in 2015 to 33.21% in 2019.

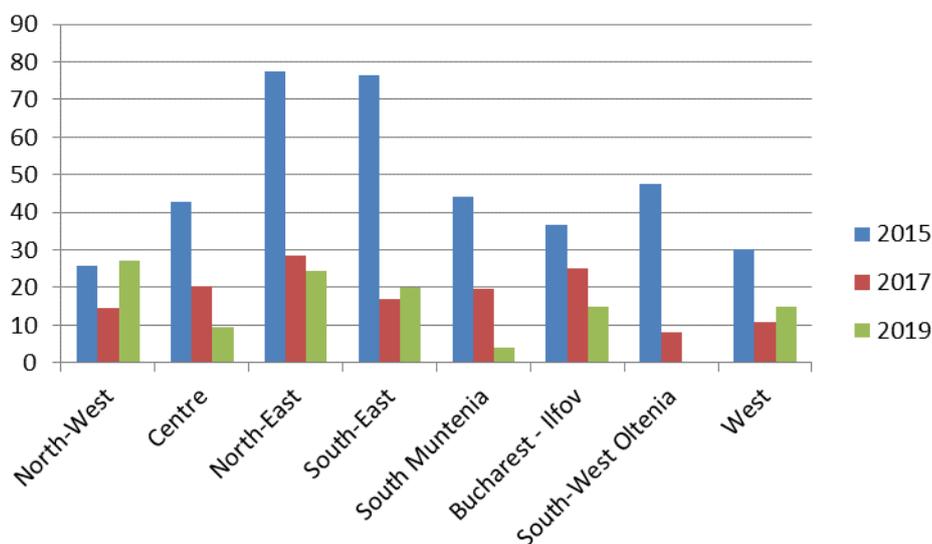


Marketing of innovations (new to the market and new to the company) as a percentage of the turnover at regional level between 2011-2019 (measured as performance against the EU-28 average, with a 100% benchmark)

Source: Regional Innovation Scoreboard Edition 2019, <https://interactivetool.eu/RIS/index.html>

Many companies, especially in the services sector, innovate through forms of non-technological innovation. Such examples are **organisational and/or marketing innovations**. To capture the extent to which SMEs innovate through non-technological innovation, we have analysed the number of small and medium-sized enterprises that have introduced marketing and/or organisational innovations on the market, compared to the total number of SMEs.

Compared to the EU-28 average, at the level of the 8 regions, the North-East Region ranks second in 2019 after the North-West Region. In the North-East Region, between 2015-2019, the trend of this indicator is downward, starting from 77.52% in 2015 and reaching 24.46% in 2019.



SMEs that introduced marketing or organisational innovation % of total SMEs, at regional level, between 2011-2019 (measured as performance against the EU-28 average, with a 100% benchmark)

Source: Regional Innovation Scoreboard Edition 2019, <https://interactivetool.eu/RIS/index.html>

Between 2014-2016, the North-East Region registered the largest number of companies with innovations in the form of organisational and/or marketing innovation, specifically 238 enterprises, i.e. 7.8% of all enterprises¹⁰.

At the same time, by comparing SMEs' indicators that introduced innovative processes or products as % of the total SMEs and SMEs that have introduced marketing or organisational innovation as % of the total SMEs, one can notice that at the level of the North-East Region in 2019, the proportion of SMEs that introduced marketing or organisational innovation (24.46%) is higher than that of SMEs that introduced innovative processes or products (9.13%).

¹⁰ NIS, Innovation in Business Enterprises 2016, 2018

1.1.6 Innovation Expenditures

Innovation expenses can be divided into the following categories: internal R&D activity, external R&D activity, acquisition of machinery, equipment and software, and acquisition of other external knowledge¹¹.

The North-East Region ranks sixth in the national hierarchy in terms of innovation expenditure in 2016.

Expenditure category	Year		
	2012	2014	2016
Total innovation expenditure, of which:	188,403	287,744	66,920
Internal R&D activity	34,402	33,412	25,868
External R&D activity	35,201	697	252
Machinery, equipment, software and buildings acquisitions	104,307	247,426	37,770
Purchases of other existing knowledge from other companies or organisations	754	1033	651
Other innovative activities ¹²	13,739	5,176	2,379

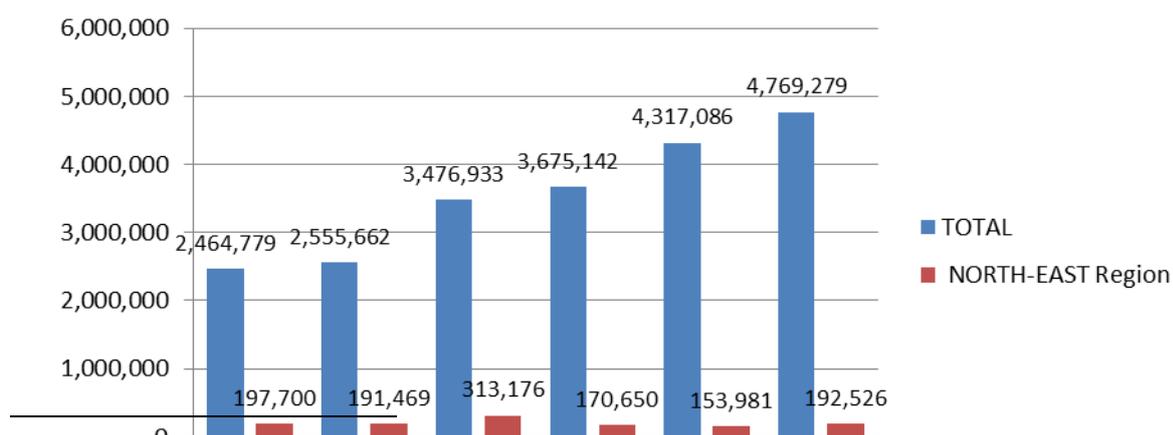
Expenditures on innovation, by component elements, thousands of lei, North-East

Source: NIS, *Regional Economic and Social References: Territorial statistics, 2019*

At the level of the last year's analysis, 2016, the innovation expenses decreased significantly, down to RON 66,920 in the North-East Region. The highest innovation expenditure is related to machinery, equipment, software and buildings acquisitions (56.44%), a large proportion of it being in the industry (71.84%).

Expenditure incurred in R&D units relates to current and capital expenditure within the scope of the respective units.

At the level of the North-East Region, R&D expenditures registered an increase in 2015, followed by a significant decrease between 2016-2018.



¹¹ According to the NIS, expenditure on internal R&D activities includes expenditure on activities that contribute to increasing the volume of knowledge and their use to produce new and improved products and processes. Expenditure on outsourced R&D activities includes those expenditures for R&D activities that the company incurs by contracting other public or private research organisations or enterprises. Expenditures for the acquisition of other existing knowledge from other undertakings or organisations include the acquisition of existing know-how, copyright, patented and unpatented inventions, etc. from other companies or organisations for the development of new or significantly improved products and processes.

¹² According to the NIS, expenditure on other innovative activities includes professional development (training), own or outsourced for personnel, development and/or introduction of new or significantly improved products, innovation marketing activities, projection activities (design).

Comparative situation, total expenditures from R&D activity, the North-East Region compared to the national level (thousands of RON), 2013-2018

Source: NIS, Tempo Online, 2020, "Total expenditure from R&D activity, by macro-regions, development regions and counties – current prices" Indicator

1.1.7 Innovation and Technological Transfer Infrastructure

In Romania, there is an infrastructure comprising of **41 accredited entities and 13 entities provisionally authorised** for innovation and technology transfer activities. Accreditation is carried out periodically, on the basis of GD 406/2003 regarding the approval of the *Specific Methodological Norms regarding the establishment, operation, assessment and accreditation of entities in the innovation and technology transfer infrastructure, as well as the method for supporting them*, and the MO no. 5039/29.03.2003 of the Ministry of Education and Research on the approval of procedures for accreditation of entities in the innovation and technology transfer infrastructure.

According to the Registry of Accredited and Authorised Provisional Entities from the Innovation and Technological Transfer Infrastructure established by the Ministry of Education and Research, in the North-East Region there were, in 2018, four technology transfer centres and one technological information centre:

- **GEA CTT@IAȘI Technological Transfer Centre**

Supports the use of new technologies and scientific results in the field of advanced materials, biotechnologies, information and communication technology and facilitates the transfer of technology between research and industry. This centre, authorised in 2018 by the Order of the Ministry of Education and Research, develops collaborative relations between actors in the R&D sector and business people from the priority industries for the North-East Region and Romania.

- **CTT POLYTECH Technological Transfer Centre (Gh. Asachi TECHNICAL UNIVERSITY, Iași)**

The Centre conducts management and monitoring activities of projects that carry out R&D, innovation, technological transfer, design, consultancy, and expertise activities, and performs services within the "Gh. Asachi" Technical University Iași, in the field of information technology and telecommunications (ITC), energy, environment and climate change, eco-nanotechnologies and advanced materials. The Centre was authorised by the Ministry of Education and Research in 2018¹³.

- **Gemini CAD Systems (CTTGCS) Technological Transfer Centre, Iași**

It is a technology supplier for industries that work with textiles, composites or leather, the centre's activity being based on researching, developing and implementing software, hardware and workflow solutions for clothing, furniture and automobiles, with a focus on computer-assisted design and production¹⁴. This entity is provisionally authorised under the order of the Ministry of Education and Research issued in 2017.

- **PETAL – CTT PETAL Technology Transfer Centre, Huși, Vaslui**

Petal S.A. started its RDI activity in 2016 in the fields of eco-technologies, energy, environment and climate change, bioeconomy. Within this entity, a Technology Transfer Centre was set up, provisionally authorised by the Ministry of Education and Research in 2018. The Centre carries out various technology transfer projects to enhance competitiveness with the development and possession of patents and technologies in the field of waste treatment, selection, and recovery, as well as its use for heat, electricity, synthesis gas and diesel production¹⁵.

¹³ Source: <http://polytech.tuiasi.ro/>

¹⁴ Source: <https://www.geminiCAD.com/>

¹⁵ Source: <http://www.cermand.eu/user/petal/>

- **INDTECH NORD EST Technological Information Centre, Bacău**

It is an agency of the Chamber of Commerce and Industry Bacău, accredited by the Ministry of National Education in 2014, in order to support economic and social development by stimulating innovation and technological transfer to the business environment, in the mechanical processing industry, wood industry and environmental protection¹⁶.

Also, on the basis of the order of the Ministry of Education and Research issued in August 2020, iTransfer Centre for Technology Transfer (CTT-iT) created by the Faculty of Informatics of the “Alexandru Ioan Cuza” University in Iași was provisionally authorised to stimulate innovation and technological transfer in order to capitalise on the research results by introducing them into the economic circuit in the form of innovative products and services. The aim of the CTT-iT is to directly address the needs of the academia for promotion services, to market research results and intermediate technology transfers, as well as to address companies' needs for consultancy services on the implementation of innovative solutions.

The **Enterprise Europe Network** is active in the region – an initiative of the European Commission launched in 2008, the largest network of business and professional organisations, development agencies, research institutes, technology parks, clusters and universities, which supports businesses so that these can benefit from the advantages of the European single market in order to develop their own business by providing specialised services in the field of innovation and internationalisation (<https://www.een-romania.ro/>). This network includes **INDTECH Nord-Est, TEHNOPOLIS Iași and North-East RDA**.

1.1.8 Analysis of the regional offer for research and technology transfer services

The research and technology transfer activities carried out by public bodies in Romania are regulated by Art. 13 of Ordinance no. 57 (16.08.2002) and Art. 117 of the Law on National Education no. 1/2011. The latter includes knowledge transfer within the mission of higher education institutions (HEI).

Public universities are leading in terms of both the number of student registrations and research “production” and are the only ones benefitting from institutional public funds. However, universities are relatively new players in the RDI and have worked hard to adapt to this new section of their post-1990 mission.

Universities' connections with the industry are weak. R&D activities in academia are rather irregular and depend only on project funding and faculties' publication efforts. In almost all the Romanian academic environment, only the “teaching responsibilities” are clearly defined for faculties, whereas “research responsibilities” amount to only 25% of the former. For this reason, in official statistics, the number of researchers in universities is simply estimated to be the equivalent of 25% of all the academic staff.

Regarding student educational profiles, there has been a trend over the last decade for obtaining Bachelor's degrees in the field of social sciences and humanities, which have been completed through private higher education programmes. Data from 2017 regarding graduates of higher education institutions from the North-East Region, that is a total of 17,605, reflects the fact that 57.88% of the graduates with a bachelor's degree,¹⁷ 62.47% of graduates with master's degree¹⁸ and

¹⁶ Source: <http://ccibc.ro/agentii-speciale/indtech-nord-est/>

¹⁷ Graduates with a Bachelor's degree have been calculated as the sum of graduates with Bachelor's degree and graduates with diploma – and Bachelor's degree in another country

51.22% of the graduates with a doctoral degree and postdoctoral programmes¹⁹ studied ICT, health and social care; engineering, processing and construction; natural, mathematical and statistical sciences; agriculture, forestry, fisheries and veterinary sciences. In stricter terms, in 2017, the percentage of graduates from the North-East Region with a STEM degree²⁰ (sciences, technology, engineering and mathematics) of the total graduates at the regional level was 30.65% at bachelor and master levels and 31.92% at the doctoral and postdoctoral programmes' levels.

TT performance analysis in higher education institutes and public research organisations

The analysis used a combined qualitative-quantitative research tool, developed with the support of the Joint Research Center DG Regio, which addressed all Higher Education Institutions (HEI)/regional Public Research Organisations (PRO) and was applied, through the North-East RDA, between January and March 2017²¹.

According to the findings of this study, the overall annual performance regarding the total number of new research agreements per year is approximately 65, most of them (96%) being agreements concluded with regional firms. Three of the seven institutions analysed contribute 94% to the value of this indicator, all of them being higher education institutions.

Overall, there seems to be a slight preference to contract research agreements (52%) over collaborative research agreements (48%). As far as consultancy agreements are concerned, they appear to have had a growing trend over the past three years, having been concluded with regional companies. *These results provide evidence of the involvement of local industry but are also indicative of the regional sphere of influence of local universities and public research organisations (HEI/PRO) in terms of technology transfer.*

The financial value of all agreements during the reference period (three years) was 14.56 million LEI, of which 97% of agreements were concluded with regional firms. A single higher education institution contributed 52% to the value of this indicator and the top 3 institutions 97% of this financial value. *The average value of a contract was calculated to 43,990 LEI (approx. 9,885 EUR).*

¹⁸ Graduates with master's degree have been calculated as the sum of graduates with diploma – master and postgraduate education and graduates with diploma – master and postgraduate education and baccalaureate degree in another country

¹⁹ Graduates with a doctoral degree and of postdoctoral programmes were calculated as the sum of graduates with a diploma – doctoral degree and postdoctoral programmes and graduates with a diploma - doctoral degree and postdoctoral programmes and a baccalaureate diploma in another country

²⁰ STEM includes the following ISCED-F 2013 classified domains: Natural sciences, mathematics, and statistics; Information and Communication Technologies (ICT); Engineering, processing and construction

²¹ Report on the potential of technology transfer services in North-East Romania, Yannis Toliás, March 2017, Technical Assistance Project "Regions Lagging behind", Stage 1, 2016-2018, financed by the European Commission, DG Regio, implemented through the Joint Research Centre (JRC)

https://adnrdest.ro/user/file/news/17/Tolias%20Y.%202017_raport%20asupra%20ofertei%20de%20TT%20din%20Regiu%20Nord-Est.pdf

<i>Performance Indicators</i>	<i>2014</i>	<i>2015</i>	<i>2016</i>
1.1 Number of research agreements with companies from NE Romania	<u>62</u> 59	<u>57</u> 55	<u>76</u> 74
1.2 Number of collaborative research agreements with companies from NE Romania	<u>37</u> 35	<u>20</u> 18	<u>36</u> 34
1.3 Number of research contracts with companies from NE Romania	<u>24</u> 24	<u>37</u> 37	<u>40</u> 40
1.4 Number of consultancy agreements with companies from NE Romania	<u>34</u> 34	<u>49</u> 49	<u>53</u> 53
1.5 The average percentage of the total private sector-funded research expenditure (%) minimum/maximum	5.05 1.6 11.86	16.35 / 0.056 / 46.9	3.18 0 / 6.9
1.6 The financial value of all research agreements (in LEI) with companies from NE Romania	<u>4,859,699</u> 4,738,210	<u>3,690,758</u> 3,506,658	<u>6,010,680</u> 5,894,530
2. Number of inventions received during the year	79	39	37
3. Total number of patent applications submitted during the year	<u>42</u>	<u>49</u>	<u>56</u>
To the National Office	41	49	56
To the European Patent Office (EPO)	1	0	0
To the UPSTO (United States Patent and Trademark Office)	0	0	0
4. Total number of new patents awarded during the year	<u>33</u>	<u>23</u>	<u>54</u>
To the National Office	33	23	54
To the European Patent Office (EPO)	0	0	0
To the UPSTO (United States Patent and Trademark Office)	0	0	0
5. Total number of licenses implemented/applied	0	0	0
6. Total amount of income obtained from licenses (in LEI)	0	0	0
7.1 Number of spin-offs set up during the year	0	0	0
7.2 Number of spin-offs active at the year	1	1	1
7.3 Revenues generated from spin-offs' royalties/profit/capital sales	0	0	0
Technology Transfer Organisations (TTOs) existing in HEIs/PROs			
Number of active TTOs		3	
Average year of establishment (min/max)		2003 (1992/2012)	
Total/average number of personnel in TTOs, in FTE		5.50 / 1.83	
Activities of TTOs			
Search and/or manage government research contracts		2 (67%)	
Search and/or manage research contracts with industry		3 (100%)	
Sale of expertise/consultancy, services to industry		3 (100%)	
Patent portfolio management		3 (100%)	
Search for new technologies/intellectual properties		1 (33%)	
Obtaining licences		3 (100%)	
Creation of spin-off companies		2 (67%)	
Continuous professional development		2 (67%)	
Management of technological and/or scientific parks		1 (33%)	
Agreements with capital funds or "business angels" networks		0 (0%)	

Technology transfer – performance indicators

Source: <https://adrnordest.ro>, Report on Potential Supply of Technology Transfer Services in North East Romania, 2017

Invention disclosures are a key indicator of knowledge transfer activities and their reporting suggests that some of the HEIs/PROs have encoded their IPR processes and have a specific practice of presenting them.

Beyond the number of presentations of inventions and/or awarded patents, what really matters in terms of HEIs/PROs' technology transfer activities is their ability to transfer their own inventions into the real economy and be able to take advantage of their share of the economic value created. From this perspective, the number of licences applied in a given year is a useful indicator of this capacity. Additionally, the value of licensing revenues is also a relevant indicator to be taken into account when assessing the impact of HEIs/PROs on the smart economy. *In these circumstances, the performance reported on the total number of licences applied and the total income obtained by the licence is rather disappointing. From the data collected, it cannot be stated whether the failure to obtain a licence has to do with institutional technology transfer strategies or the ability of the TTOs to promote their IPR portfolio or the quality of the portfolio itself, but apparently, all stakeholders are quite satisfied with the collective spending of approximately 300,000 EUR on patent fees over the last decade with no direct and obvious economic impact on the regional economy.*

Beyond the commitment alongside the industry regarding research, consultancy and patenting, another TT-related activity traditionally carried out by HEIs/PROs refers to the support (and motivation) for the creation of spin-off companies. *In the region, there are only two known spin-off companies founded by members of the entrepreneurial faculties of the Technical University of Iași and the University of Suceava.* According to the definition, the first company is mistakenly considered to be a spin-off, as there is no license agreement or a capital relationship between the company and TUI. The second company was founded in 2016 and therefore no income can be declared under indicator 7.3. *The legal framework governing spin-offs is quite vague in Romania, and HEIs/PROs do not seem to have institutional norms established regarding this topic, nor have they tried to promote the concept.*

The Ministry of Regional Development and Public Administration analysed in 2016 the situation of the Technological Transfer entities accredited in Romania according to GD no. 406/2003, noting that, for many objective and structural reasons, *already accredited entities do not satisfactorily deliver the expected results from this type of entities/networks of entities*²². The document shows that entities already accredited at the national level have not been able to generate sufficient revenues from the support activities they offered. The specialisation range is very large, approximately 26 different typologies, but many of them focus on a few areas of specialisation (e.g. ICT, machine tools or environment). Other critical issues highlighted by this analysis show limited legitimacy for host organisations (e.g. chambers of commerce) and poor collaboration (affiliation to international networks or participation in international marketing platforms), which provides limited exposure to new technology trends.

The outcome of a programme to develop the institutional capacity of technology transfer centres in the region, carried out together with the World Bank in 2019-2020, under the "RIS3 in catching-up regions" Technical Assistance Programme²³ funded by DG Regio, shows the major challenges faced by such entities, from lack of recognition and support from top management, lack of resources (material and human), lack of a policy to protect IPR, lack of standard forms for cooperation agreements with industry, lack of experts in technology evaluation and brokering.

²² Smart Specialisation în Romania and Technology Transfer Organisations (TTOs), Cristians Saublens, Director Eurada

²³ Details about this project are available here: <https://www.adrnordest.ro/index.php?page=Asistenta-Tehnica-Banca-Mondiala>

1.1.9 Analysis of the needs for the development of technology transfer structures and services

A. Analysis of companies' needs for technology transfer services

Between May-November 2017, the North-East RDA carried out a quantitative regional analysis of the need and supply of technology transfer services, identifying also the gaps between current supply and demand.

A sample of 1,250 companies was used to analyse the regional need for technology transfer services, out of which 1,100 companies were selected from the 6 areas of regional smart specialisation and 150 companies from other domains. The number of responses recorded is 814 questionnaires. Of these, 39 questionnaires were applied to companies from other fields, but that, at the time of the inquiry, had no more than 50 employees. The 775 questionnaires included in the analysis are distributed as follows:

Companies from the 6 areas of smart regional specialisation							Companies from other domains, with more than 50 employees	TOTAL
	Agri-food	Biotechnologies	ICT	Environment	Textiles	Tourism		
Number of companies	191	40	51	90	43	270	90	775

The study identified that the companies' objectives can be grouped into two main categories: supporting internal development (regarding production, quality and costs) and the second category, related to external development (business development), which concerns gaining new customers and markets. The main reasons for using new technologies and knowledge from research and innovation for new products and services are:

- increasing the performance of current products/services (67%);
- increasing productivity and competitiveness (67%);
- reducing manufacturing costs (63%).

Reducing manufacturing costs is very important for companies in the biotechnology and environment sectors. In the textile sector, the major objective is to increase the performance of current products. The main barriers to achieving these goals are:

- cost of equipment (63%);
- lack of qualified personnel (45%);
- costul materiilor prime (35%).

This indicates the need for having testing facilities and FabLabs with shared infrastructures and qualified personnel, as well as service platforms that can be contracted by companies. A company alone cannot afford the necessary investment, the financial risk being too high. The barrier imposed by the cost of the equipment is significant in the agri-food, environment, textiles and ICT sectors.

Internal development objectives can be addressed through process innovation. The following ITT services from the knowledge and equipment category may support them:

- *consultancy in research-innovation, simulation of quality improvement and smart production, e.g. by reducing manufacturing time and energy consumption;*
- *process development and testing;*
- Living labs, Fablabs for quality and new manufacturing steps testing.

B. Analysis of the needs of technology transfer entities for the development of services provision

The results of the study showed that:

- *Research and innovation consulting services are provided by all technology transfer organizations in the region;*
- *Services for process development and testing are provided by more than 50% of the technology transfer organisations from the region;*
- Living lab and FabLab services are offered by only 1 out of 9 organisations from the surveyed organisations.

Therefore, the last two categories of services must be developed at the regional level, with a focus on agri-food, biotechnologies, environment and ICT.

The study also emphasized that less than 30% of technology transfer organisations in the region provide services at TRL6 and TRL7 levels, and **NONE** at TRL 8 and TRL9 levels, corresponding to demonstration services, industrial testing and market entry qualifications.

Objectives regarding external development (*business development*) can be addressed in particular by ITT services from the “Contact” category, such as:

- *awareness events;*
- *matchmaking and brokerage events;*
- *network support;*
- *innovation Partnership agreements.*

1.1.10 Digitalisation

In the first quarter of 2016, the European Commission launched a package of 4 Communications for digital single market technologies:

- Communication regarding the Digitising of the European Industry: Achieving maximum benefits in the digital single market.
- Communication regarding the Action Plan regarding e-Governance 2016-2020: Accelerating the digital transformation of governments.
- Communication on priorities for ICT standardisation in the context of the digital single market.
- Communication regarding the European Cloud Initiative: Creating a competitive economy based on knowledge and data in Europe.

The purpose of the communications package is to present an ambitious set of objectives set by the European Commission in partnership with the Member States, as well as to draw the strategic direction for the latter in each of the areas.

At present, we are witnessing the increasingly accelerated erasing of borders between the real economy and the digital economy and their merging, resulting in increased benefits for customers,

but also for the business environment, public administration and civil society. The introduction of digitalisation in all economic and social processes is being achieved gradually, at the global level, and has started just a few decades ago, representing the fastest technological revolution in human history. Being at the origin of the first industrial revolution, Europe needs substantial investments and a common vision shared by all Member States to capitalise on the full potential of new technologies in the interest of European citizens and companies. This is why the European Union has taken a series of measures to maintain the performance of European businesses and European values in an increasingly competitive and continuously changing world, of which the establishment of the single market that facilitates the access of European businesses to the entire European market of EU Member States and associated States is of utmost importance.

Given this entire context, we note that digitalisation is one of the most important growth factors for Romanian companies, too, as well as an important catalyst for positioning itself at the level of the common market. Companies pursuing the digital transformation of technological processes, similar to companies in the other Member States, have benefited from a substantial increase in productivity and performance at the organisational and employee level. The working environment in digitised companies or experiencing the digitalisation of work processes has also improved, risks to the workforce are continuously reduced and the environmental impact is substantially diminishing. The reorganisation of production processes to take advantage of the benefits of digitalisation has, as expected, led to their simplification and an increase in the overall productivity of the company. At the level of the Romanian society, the transformation has a significant impact on the labour force, forcing its evolution to keep pace with the rest of the community economies. In this respect, new professional qualifications and specialisations are set up on the labour market, and knowledge of digital technologies becomes a basic requirement for Romanian employees in most economic sectors.

At the level of the public administration, digitalisation brings consistent improvements in workflows, reduced time for processing inquiries and an increase in taxpayers' satisfaction with institutions and public authorities. Reducing paper consumption, reducing the energy footprint of the public administration, improving professional performance, remote interaction with taxpayers and reducing waiting times at the counter are unquestionable advantages that digitalisation brings to institutions and public authorities. The digitalisation of information and documents, complemented by increased interoperability of data and information systems, will also significantly optimise documents' flows and increase the satisfaction of citizens and the business environment with the State.

However, digitalisation also brings with it a new category of digital risks, and particular attention must be paid to cybersecurity means to protect data, information systems and networks. The protection of data, networks and information systems must be ensured at the level of all actors in the society, e.g. citizens, businesses, institutions and public authorities.

As the national and Community statistics show, *Romania is still in the 2nd part of the Member States' digitalisation ranking*. According to the 2020 country report on the digital economy and society index (DESI), Romania ranks 26th in the EU on digital performance. Through sustained and better-selected investments from the 2014-2020 programming period, Romania has registered a sustained growth rate of digitalisation, above the European average, in most economic and social sectors. In order to maintain growth and possibly accelerate this growth, it is necessary to maintain the investment pace in digitalising the real economy, in the field of education, in digitalising the public administration. It should be noted that, without maintaining the pace of investment, especially in the current global context, Romania may face serious risks in the upcoming period and the loss of some of the progress made in the current programming period.

The number of broadband connections²⁴ places the North-East Region on one of the first positions compared to other development regions. Compared to fixed Internet broadband connections, their number represents 13.3% of the total connections in Romania, only 2% less than in the Bucharest-Ilfov region; for mobile Internet broadband connections, the share is 15.4% of the national total, with 2% more than in the Bucharest-Ilfov Region.

The percentage of those with broadband internet access (77%) also increased as a result of investments made in expanding and modernising fibre-optic networks through COP 2014-2020 and the RO-Net project. At the same time, through the WiFi4EU initiative, 164 localities in the region obtained funding for the acquisition and installation of hotspot equipment, the total number of potential users being 1,828 thousand, of which 624 thousand from rural areas. From the data analysed²⁵, the share of households in the region that are connected to internet networks has continuously increased between 2014 and 2017 by 19%, so that in 2018, three-quarters of the total have internet access. Two-thirds of the households connected to the Internet are in urban areas. Moreover, the percentage of those with broadband internet access²⁶ is in close proximity, 69% in 2018, which shows that network expansion is done through fibre-optic works. At the same time, the differences between the regional and national levels are in favour of the latter by 6-7%. It should be noted that the gap with the Community average has narrowed over time, but remains quite consistent; in 2017, the EU-28 average was 87%.

The territorial analysis of households' endowment with computers indicates that, within the region, only slightly more than half of them have a personal computer (57.8%), a level that places the region on the last place, with 10% lower than the national average, respectively by 25% compared to the Bucharest-Ilfov Region. At the same time, two-thirds of the total number of computers are found in urban households.

In the region, two-thirds of the people aged 16-74 (ever) used the computer, the registered value being lower than both the national level (72.7%) and the Bucharest-Ilfov region (89.7%).

Concerning those who access the Internet²⁷, it is noted that a quarter of the total population of the region has never accessed the Internet (2018), the percentage slightly decreasing from one year to the next, 9% lower than in 2014. Possible explanations include: the lack of Internet connection and/or a computer/smartphone/other appliances, the reluctance of some older people to use new, modern technologies, lack of necessary income, etc. In contrast, *45% of the region's population uses the Internet on a daily, this percentage growing rapidly every year.* In this case, too, regional values are lower than national ones.

Users use the Internet for communication (electronic messaging services, internet telephony, social platforms), downloading audio-video files, streaming video/audio, file transfer, shopping/sales on the internet (e-commerce), civic or political participation, access to information, banking transactions (internet banking) and interacting with public services (payment of taxes). A suggestive comparison is between those who use the Internet for access to social networks versus banking: 57% vs. 7% – regional level.

The analysed period indicates still the very small share of those using the Internet for online purchases of goods and/or services for personal purposes. Although the percentage is increasing

²⁴ Household connections

²⁵ Analysis of the figures published by Eurostat, Survey on households' access to information and communication technologies 2014-2018

²⁶ Download speed > 20 Mbps

²⁷ [Internet users](#) are defined as all persons in the 16-74 age group who have used the Internet

annually, the level recorded in 2018 is only 17%, a value slightly lower than the national one (20%) and far from the Community average of 57%. In this case, too, there are also many factors influencing the decision to shop using a computer and an Internet connection: Internet access, the existence of electronic means of payment, the existence of income, reluctance to online orders, etc. For example: of those who have access to the Internet, only one-third orders online; three-quarters of those ordering online live in urban areas.

Another indicator expressing the level of those using ICT applications is the share of people accessing the Internet at school or work – we detect an accelerated dynamic, practically the 46% level of 2018 is twice the 2014 level and below the national one (58%).

The number of businesses owning a website is very small – less than half of the total – but on a growing trend. Only a quarter of the personnel in active businesses use computers connected to the Internet. In the ICT sub-sector, there are 91 units, representing only 10% of the national total, most of which are in Iași County. The main challenges companies face in digitalisation are poor practices in online acquisitions, low use of e-commerce (8%) and under-utilisation of online advertising potential (44%). The 2014-2019 trend is positive and there are prospects for improvement as new tools targeting the digitalisation of companies will be adopted.

The Digital Agenda for Romania 2014-2020 and the strategic objectives up until 2025

In the recent economic recovery plan²⁸, the European Commission supports a recovery process based on a double transition: climate neutrality and digital transformation. The lessons learned from the COVID-19 pandemic highlighted the importance of digital infrastructure and services in education, health, employment, economy, etc. The objectives of the Europe 2020 Digital Agenda have been taken over and adapted to the current context in Romania.

In the previous programming period, the National Strategy on the Digital Agenda for Romania 2014-2020 was developed and implemented at the national level. The document directly targeted the ICT sector, aiming to contribute to Romania's economic development and competitiveness, both through direct actions such as supporting the e-Commerce sector and the effective development of the Romanian ICT sector, as well as through indirect actions, such as increasing the efficiency and reducing the costs of the public sector in Romania, improving the productivity of the private sector by reducing administrative barriers in relation to the state, improving the competitiveness of the Romanian workforce and beyond.

In order to structure Romania's approach to the objectives of the digital agenda, the national strategy proposed 4 areas of action:

1. e-Governance, interoperability, network and information systems security, cloud computing and social media;
2. ICT in Education, Health and Culture;
3. e-Commerce, ICT and research-development-Innovation;
4. Broadband and digital services infrastructure.

The European Commission has proposed three main strategic objectives serving digital connectivity by 2025:

²⁸ European Commission – Europe's moment: Repair and Prepare for the Next Generation

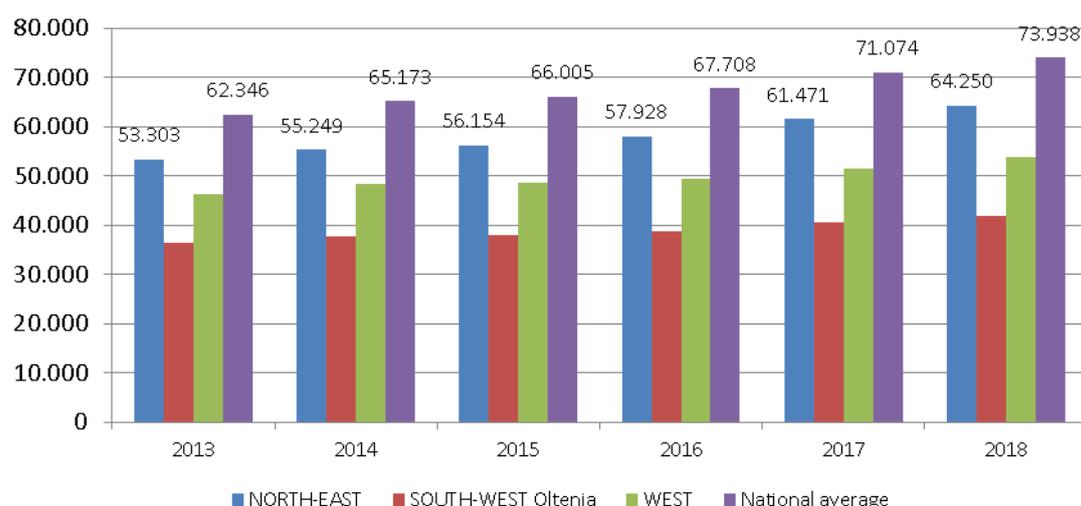
- A. Economic-social actors – schools, universities, research institutes, hospitals, local public administration, companies using digital technologies in their activity should have access to very high-speed Internet connections – 1 Gbps;
- B. Rural and urban households should have access to Internet connections that ensure speeds of at least 100 Mbps and ensure the transition to Gbps;
- C. All urban areas and the main road and rail routes should have uninterrupted 5G coverage.

Chapter 1.2 Dynamics of the entrepreneurial environment

1.2.1 Entrepreneurship in the North-East Region

The number of enterprises is an indicator that signals the intensity of entrepreneurship in a given territory.

In the North-East Region, in 2018, there were 64,250 **active local units**²⁹, with 10,947 more than in 2013. As a percentage, they represent 10.86% of the total registered at the national level, a level approximately constant in the analysed period. The North-East Region occupies the 6th place on national level from the perspective of this indicator, being followed by the West and South-West Oltenia Regions, with values below the national average (of 73,938 active local units).



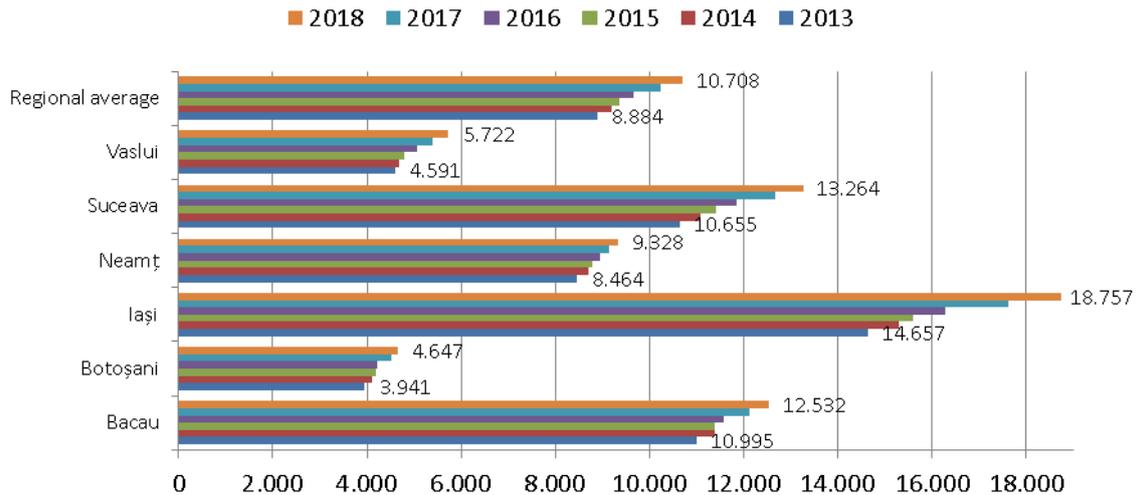
Evolution of the number of active local units in the North-East Region, 2013-2018

Source: NIS, Tempo Online, 2020, "Active local units, by activities of the national economy at NACE Rev.2 division level, size classes by the number of employees, macro-regions, development regions and counties" indicator

Also, from the chart above it can be seen that in the period 2013-2018, the number of active local units increased in all regions.

²⁹ According to the NIS, a **local unit** is an enterprise or part of it (workshop, factory, warehouse, office, mine or station, etc.) located at an identifiable address.

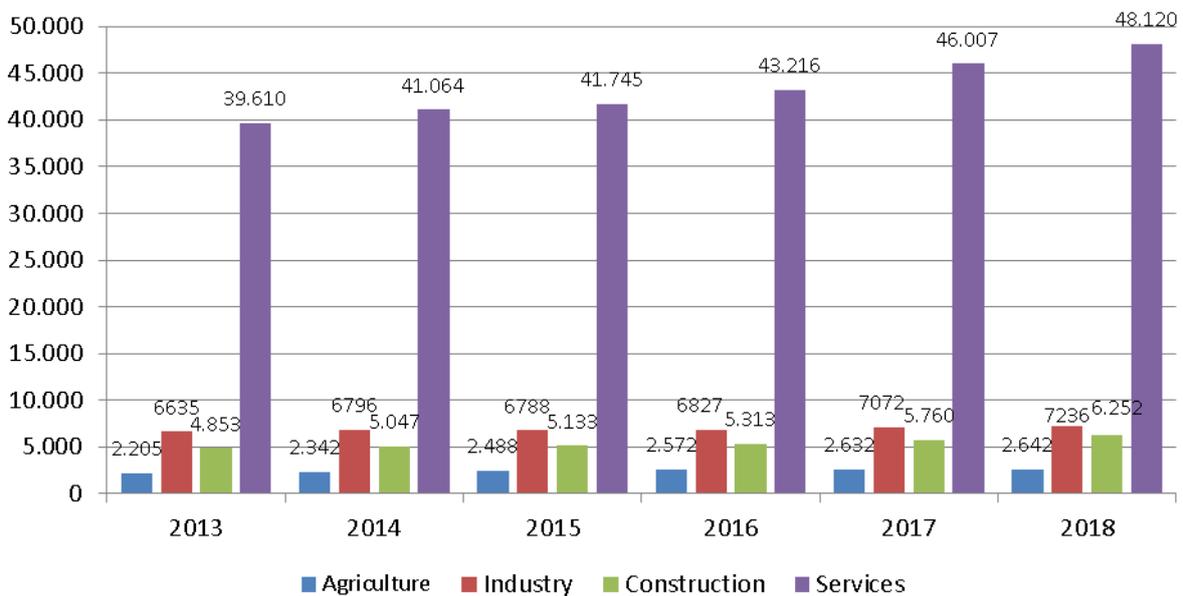
The **active enterprise** is the entity that is economically active (during the observation period), i.e. generating goods or services, recording expenses and drawing up the balance sheet.



Number of local units active in the counties of the North-East Region, compared to the regional average, 2013-2018

Source: National Institute of Statistics, Tempo Online, 2020, "Active local units, by activities of the national economy at NACE Rev.2 division level, size classes, by number of employees, macro-regions, development regions and counties" indicator

Although the number of active local units has steadily increased in all counties of the region, following the national trend, their distribution in the counties of the region is uneven, with significant discrepancies between Botoșani and Vaslui counties, on the one hand, and Iasi county, on the other. The regional average is exceeded only by the counties of Iasi, Bacau and Suceava, and the county of Botoșani is on the last place at the national level in terms of this indicator.



Number of local units active on the main economic activities, in the North-East Region, 2013-2018³⁰

³⁰ Agriculture includes the section NACE REV. 2: A; industry includes NACE Rev. 2 sections. 2: B - E; constructions include section NACE Rev. 2: F; services include the NACE Rev. 2 sections. 2: G – S. Classification of activities in the national economy - NACE Rev.2 can be found at: <https://www.onrc.ro/index.php/ro/caen>

Source: National Institute of Statistics, Tempo Online, 2020, "Active local units, by activities of the national economy at the section level CLASSIFICATION OF ACTIVITIES IN THE NATIONAL ECONOMY Rev.2, size classes by the number of employees, macro-regions, development regions and counties" indicator

Analysing the graph above, it can be seen that in all 4 main activities the number of active local units increased during the analysed period.

From the point of view of the number of local units active in the main economic sector in the North-East Region, it can be seen that most of them operate in the **service** sector, mainly in trade (44.88% in 2018), *professional, scientific and technical activities* (12.16% in 2018), *transport and storage* (11.64% in 2018). In the *hotels and restaurants sector*, the first 3 places are occupied by the counties of Suceava (846), Iași (733) and Bacău (576) with a total of 2,155 active local units out of the 3,241 existing at regional level (6.74% of services).

The active local units in *information and communications* (2,297) represent 4.77% of the services sector. The division of service activities in *information technology* represents 48% of the active local units in the information and communications section, Iași county occupying the first place (631), followed by Bacău (148) and Suceava (117).

The number of local units active in **construction** in the North-East Region increased by 8.54% in 2018, compared to the previous year. The first 3 places are occupied by the counties of Iași (1,868), Suceava (1,326) and Bacău (1,290), with a total of 4,484 active local units out of the 6,252 existing at the regional level. Most local units are active in *building construction* (3,547) and *special construction works* (2,360).

In the region, **agriculture** is the only branch with the smallest increases in the number of active local units in 2018, compared to the previous year (0.38%). In the county profile, the number of local units active in agriculture is as follows (2018):

- in *agriculture, hunting and ancillary services* - out of a regional total of 1,820 active local units, the counties of Iași (414), Vaslui (326) and Botoșani (305) stand out;
- in *forestry and timber operation* - out of a regional total of 728 active local units, the counties of Suceava (362), Neamț (145), Bacău (131) stand out;
- in *fishing and aquaculture* - out of a regional total of 94 active local units, the counties of Iași (23), Vaslui (17), Bacău (14) and Botoșani (14) stand out.

In 2018, most active local units in the **manufacturing industry** in the North-East Region were active in the *food industry* (17.41%), *wood processing* (16.61%), the *textile and clothing industry* (15.23%), i. e. in low value-added sectors. At the county level, the *wood processing* sector, the *manufacture of wood and cork products, except for furniture; the manufacture of articles of straw and other woven vegetable materials* occupies the first place in the counties of Suceava (493), Neamț (284) and the *food industry* occupies the first place in the counties of Iași (251), Bacău (222), Botoșani (128) and Vaslui (122).

Among the activities with a significant number of local units active in the *manufacturing industry* are:

- *Manufacture of clothing* - out of a regional total of 789 active local units, the counties of Iași (208), Neamț (190), Bacău (133), Vaslui (106) stand out;
- *The industry of metal constructions and metal products, excluding machines, equipment and installations* - out of a regional total of 637 active local units, the counties of Iași (154), Neamț (149), Bacău (135), Suceava (116) stand out;
- *Furniture manufacturing* - out of a regional total of 522 active local units, the counties of Iași (134), Suceava (117), Bacău (101), Neamț (86) stand out;

- *Manufacture of rubber and plastic products* - out of a regional total of 342 active local units, the counties of Neamț (102), Bacău (64), Suceava (52) and Iași (52) stand out;
- *Manufacture of other non-metallic mineral products* - out of a regional total of 286 active local units, the counties of Suceava (87), Bacău (59), Iași (58) stand out;
- *Repair, maintenance and installation of machines and equipment* - out of a regional total of 241 active local units, the counties of Iași (85), Bacău (55), Neamț (39) stand out;
- *Manufacture of textile products* - out of a regional total of 234 active local units, the counties of Iași (69), Bacău (49), Suceava (43) stand out;
- *Printing and reproduction of recordings on media* - out of a regional total of 229 active local units, the counties of Iași (81), Bacău (46), Neamț (42) stand out;
- *Tanning and dressing of leather; manufacture of travel and leather goods, harness and footwear; fur preparation and dyeing* - out of a regional total of 205 active local units, the counties of Vaslui (65) and Suceava (65) stand out;
- *Other industrial activities n.c.a.* - out of a regional total of 320 active local units, the counties of Iași (127), Bacău (63), Suceava (55) stand out;

The statistics of active local units by size classes in the North-East Region show a positive evolution for micro-enterprises and slightly fluctuating for the rest of the enterprises, as can be seen in the graph below:

Size classes of active local units	Year					
	2013	2014	2015	2016	2017	2018
0-9 persons	46,226	48,248	49,041	50,857	54,190	56,854
10-49 persons	5,965	5,885	6,005	5,882	6,123	6,234
50-249 persons	958	957	951	1.025	990	1.003
251 persons	154	159	157	164	168	159
Total	53,303	55,249	56,154	57,928	61,471	64,250

Number of active local units by size classes, 2013-2018

Source: NIS, Tempo Online, 2020, "Active local units, by activities of the national economy at NACE Rev.2 division level, size classes by the number of employees, macro-regions, development regions and counties" indicator

SMEs represent 99.75% of the total number of enterprises, a percentage similar to that recorded at the national level (99.68%) and European level (approximately 99.8% - Eurostat estimates).

At the level of 2018, out of the total number of SMEs, the share of micro-enterprises was 87.7%, of small enterprises - 9.73%, and of medium-sized enterprises, it is 1.56%. At the level of the North-East Region, in the analysis interval 2013-2018, the number of SMEs registered an increase of 20.59%, and the number of large companies increased only by 3.25%.

Comparing the level of 2013 with that of 2018, it is noticed that the county with the highest increase in the number of SMEs is Iasi (28.02%, 18,702 SMEs in 2018). The counties with the fewest SMEs are Botosani (4,631 SMEs in 2018) and Vaslui (5,706 SMEs in 2018). Regarding the situation of large companies, most of them are found in Iasi County (55 companies out of the regional total of 159), their number increasing by 7 companies in the period 2013-2018.

Another indicator that measures entrepreneurship is the number of active enterprises per thousand inhabitants (residents). It offers the possibility to appreciate the attractiveness of the region for

investors and the spirit of initiative of the population. *Thus, in 2018, the density of enterprises in the North-East Region was 19.4 enterprises/ 1000 place- below the national average (34.5% lower) and the lowest level between regions.* Moreover, no county of the region records a higher value than the national average. The highest value in the region is in Iași county (23 enterprises/ 1000 inhabitants), and the lowest in Botoșani (11.6 enterprises/ 1000 inhabitants) and Vaslui (14.8 enterprises/ 1000 inhabitants).

Indicator / Year	2013	2014	2015	2016	2017
No. new businesses	16,589	6,946	12,401	13,675	14,961
Creation rate	4.3	1.8	3.2	3.5	3.6

The evolution of the number of new enterprises and the creation rate in the North-East Region, 2013-2017 (expressed concerning the total number of enterprises in that year).

Source: National Institute of Statistics, Tempo Online, 2020, "Newly created active enterprises, their creation rate, by development regions and the record of GDP per capita" indicator.

The table shows that, in 2014, the value of the indicator had a sharp decrease (by 58%), followed by a resumption of the growth process without reaching the level recorded in 2013. Thus, the number of new enterprises created in 2017 it was 14,961 units.

At the same time, the annual rate of creation of new enterprises decreased to a minimum of 1.8% in 2014. Starting in 2015, there is a new increase, reaching 3.6% in 2017.

In 2017, 20.5% of the newly created companies had no employees, 63.3% had between one and 49 employees, and 16.2% had more than 49 employees. Also, 66.1% of these enterprises are founded/run by men and only 33.9% by women. The high (but declining) percentage of start-ups without any employees suggests that many of them have not actually started and/or may be in the "grey" area of the economy.

Regarding the level of training of the founder/manager, it is found that the percentage of companies founded/run by high school/university graduates is 54.7% in 2017, the rest being founded/run by people with primary, secondary education or vocational.

In terms of the level of the annual rate of creation of new enterprises, in 2017, the North-East Region ranked fourth, after the regions of Bucharest - Ilfov (7.7%), North-West (5.5%) and Centre (3.9 %).

In 2017, entrepreneurs in the North-East Region set up 48.3% of companies but chose to become individual entrepreneurs in a proportion of 51.7%. The research-development and innovation activity is much more intense and is generally suitable for commercial companies, with qualified personnel and a more rigorous structure of the economic activity.

Following the distribution of newly created enterprises in the North-East Region by fields of activity, it shows that, in 2017, most new enterprises were created in the field of trade (33.4% of the total number, higher than the national level 28,5%). *The industry owns only 21.8% of the newly created enterprises, even though this sector, through its sub-branches, can provide added value in the medium and long term.* The next preferences of entrepreneurs were oriented towards construction (17.2%, higher than the national average of 13.1%), transport (10.4%) and hotels and restaurants (5.9%).

In terms of the manager's age, the newly created enterprises in 2017 in the North-East Region were founded by people up to 30 years old (32.8% of the total) and between 30-39 years old (31.1% of the total). Compared to 2013, the percentage of founders/managers up to 30 years of age increased by 12.1%.

Analysing the distribution of active local units according to the Eurostat classification of technology-intensive industries, we notice that, in the North-East Region, 5.30% of active local units are part of the **“high technology”** category (according to NACE divisions 21 and 26), 16.29% fall into the **“medium-high technology”** category (according to NACE divisions 20,27,28,29,30), and 78.41% fall into the **“medium-low technology”** category (according to NACE divisions 19,22, 23,24,25,33). Approximately the same proportion is found at the national level.

Classification	NACE Division Rev.2	NE Region	Romania
High-technology	21 Manufacture of basic pharmaceutical products and pharmaceutical preparations	13	136
	26 Manufacture of computers and electronic and optical products	91	845
Total High-technology		104	981
Medium-high-technology	20 Manufacture of substances and chemicals	89	920
	27 Manufacture of electrical equipment	59	656
	28 Manufacture of machinery, equipment and machinery NOC	130	1231
	29 Manufacture of road transport vehicles, trailers and semi-trailers	30	535
	30 Manufacture of other means of transport	12	365
Total Medium-high-technology		320	3707
Medium-low-technology	9 Manufacture of coke oven products and petroleum products	8	70
	22 Manufacture of rubber and plastic products	342	2870
	23 Manufacture of other non-metallic mineral products	286	2620
	24 Metallurgical industry	26	366
	25 Industry of metal construction and metal products, excluding machinery, machinery and installations	637	6313
	33 Repair, maintenance and installation of machinery and equipment	241	2697
Total Medium-low-technology		1540	14936

Distribution of active local units in the North-East Region and Romania, according to the classification of technology-intensive industries according to NACE codes, in the year and 2018
Source: NIS, Tempo Online, 2020, "Active local units, by activities of the national economy at NACE Rev.2 division level, size classes by the number of employees, macro-regions, development regions and counties" Indicator

In 2018, the economic agents from the **“high technology”** category with the highest turnover are from Iași County and carry out manufacturing activities of pharmaceutical products.

Economic operator	County	City	Code for classifying activities in the national economy according to the 2018 Balance Sheet	Turnover (million lei)	No. average employees	Net profit (million lei)	Net loss (million lei)
ANTIBIOTICE SA	IS	Iași	2110 Manufacture of basic pharmaceutical products	365.30	1,415	34.30	0.00
FITERMAN PHARMA SRL	IS	Iași	2120 Manufacture of pharmaceutical preparations	131.85	187	6.12	0.00
ELSACO ELECTRONIC SRL	BT	Botoșani	2651 Manufacture of instruments and appliances for measuring, checking, checking, navigating	108.06	227	0.00	3.77
A-E ELECTRONICS SA	BC	Bacău	2611 Manufacture of electronic components (modules)	46.78	203	2.16	0.00
TOTALGAZ INDUSTRIE SRL	IS	Iași	2651 Manufacture of instruments and appliances for measuring, checking, checking, navigating	45.94	255	0.87	0.00
TELCAVI SPECIAL CONNECTORS SRL	BC	Mărgineni	2611 Manufacture of electronic components (modules)	28.39	29	3.19	0.00
SOLERS SRL	BC	Bacău	2611 Manufacture of electronic components (modules)	18.79	153	0.26	0.00
BADOTHERM-AMC SA	VS	Vaslui	2651 Manufacture of instruments and appliances for measuring, checking, checking, navigating	15.75	124	0.06	0.00
EMS-ELECTRA SRL	IS	Iași	2611 Manufacture of electronic components (modules)	15.53	46	2.33	0.00
ELECTRA SRL	IS	Iași	2640 Manufacture of consumer electronics	14.38	86	0.80	0.00
CYBERNET SRL	BC	Bacău	2620 Manufacture of computers and peripheral equipment	10.74	22	0.53	0.00
IRCON SRL	IS	Iași	2120 Manufacture of pharmaceutical	10.43	43	1.44	0.00

			preparations				
VANELLI SRL	IS	Lețcani	2120 Manufacture of pharmaceutical preparations	9.40	58	0.05	0.00

Top economic agents with activities in the “high technology” category, by turnover, NE Region, 2018

Source: National Office of the Trade Register

Analysing the economic agents from the “medium-high technology” category with the highest turnover in 2018, it is noticed that the first three places are occupied by economic agents from Iași and Bacău and carry out activities for the manufacture of other parts and accessories for vehicles and motor vehicles (Classification of activities in the national economy 2932) and the manufacture of aircraft and spacecraft (Classification of activities in the national economy 3030).

Economic operator	County	City	Code for classifying activities in the national economy according to the 2018 Balance Sheet	Turnover (million lei)	No. average employees	Net profit (million lei)	Net loss (million lei)
DELPHI DIESEL SYSTEMS ROMANIA SRL	IS	Brătuleni	2932 Manufacture of other parts and accessories for motor vehicles and their engines	2,208.40	2,662	58.32	0.00
VIMERCATI EAST EUROPE SRL	BC	Hemeiuș	2932 Manufacture of other parts and accessories for motor vehicles and their engines	367.67	772	52.80	0.00
AEROSTAR SA	BC	Bacău	3030 Manufacture of aircraft and spacecraft	353.41	1,804	79.92	0.00
EGGER TECHNOLOGIA SRL	SV	Rădăuți	2014 Manufacture of other basic organic chemicals	348.22	49	16.21	0.00
TRW AIRBAG SYSTEMS SRL	NT	Roman	2932 Manufacture of other parts and accessories for motor vehicles and their engines	338.12	1,330	13.78	0.00
KOBER SRL	NT	Dumbrava Roșie	2030 Manufacture of paints, varnishes, printing inks and putties	330.17	834	19.22	0.00
CHIMCOMPLEX SA BORZESTI	BC	Onești	2013 Manufacture of other inorganic basic chemicals	294.30	875	32.69	0.00
RULMENTI SA	VS	Bârlad	2815 Manufacture of bearings, gears, gearboxes and mechanical	214.95	1,383	0.00	7,45

			transmission elements				
ELECTRO-ALFA INTERNATIONAL SRL	BT	Botoșani	2712 Manufacture of electricity distribution and control apparatus	141.90	272	1.99	0.00
IG WATTEEUW ROMANIA SRL	IS	Iași	2815 Manufacture of bearings, gears, gearboxes and mechanical transmission elements	139.90	445	0.00	2,64
IMA COMPONENTES IAȘI SRL	IS	Iași	2932 Manufacture of other parts and accessories for motor vehicles and their engines	118.14	130	1.09	0.00
OMCO ROMANIA SRL	IS	Iași	2829 Manufacture of other general-purpose machinery NEC	98.59	443	0.00	5,15
ELECTROPUTERE VFU PAȘCANI S.A.	IS	Pașcani	3020 Manufacture of rolling stock	88.27	501	2.88	0.00
SIDEM SRL	SV	Șcheia	2932 Manufacture of other parts and accessories for motor vehicles and their engines	74.17	244	18.96	0.00
MISAVAN TRADING SRL	IS	Voinești	2041 Manufacture of soap and detergents and maintenance products	65.56	258	1.35	0.00
BMT AEROSPACE ROMÂNIA SRL	IS	Iași	2815 Manufacture of bearings, gears, gearboxes and mechanical transmission elements	59.32	304	0.00	4,86
CHIMIEI PROPERTIES S.R.L.	IS	Iași	2821 Manufacture of ovens, furnaces and burners	51.58	188	1.90	0.00
ASAM SA	IS	Iași	2932 Manufacture of other parts and accessories for motor vehicles and their engines	50.41	223	1.20	0.00
COMES SA	NT	Săvinești	2899 Manufacture of other specific machinery and equipment NEC	45.93	183	2.17	0.00

Top economic agents with activities from the category “medium-high technology”, by turnover, North-East Region, 2018

Source: National Office of the Trade Register

Analysing the economic agents from the “medium-low technology” category with the highest turnover at the level of 2018, it shows that the first three places are occupied by economic agents from Neamț and Iași and carry out activities according to NACE codes 2420 *Production of tubes, pipes, tubular profiles and fittings therefor, of steel* and 2342 *Manufacture of ceramic sanitary ware*.

Economic operator	County	City	Code for classifying activities in the national economy according to the 2018 Balance Sheet	Turnover (million lei)	No. average employees	Net profit (million lei)	Net loss (million lei)
ARCELORMITTAL TUBULAR PRODUCTS ROMAN SA	NT	Roman	2420 Manufacture of tubes, pipes, tubular profiles and fittings thereof, of steel	417.92	718	0.00	28.30
ARCELORMITTAL TUBULAR PRODUCTS IAȘI SA	IS	Iași	2420 Manufacture of tubes, pipes, tubular profiles and fittings thereof, of steel	394.61	253	5.04	0.00
CERSANIT ROMANIA SA	NT	Roman	2342 Manufacture of ceramic sanitary ware	148.49	642	0.00	5.65
PROINVEST GROUP SRL	IS	Pașcani	2433 Production of cold-formed profiles	138.41	467	5.37	0.00
GREIF FLEXIBLES ROMANIA SRL	BT	Botoșani	2222 Manufacture of plastic packing goods	138.15	714	3.96	0.00
TEHNO WORLD SRL	SV	Baia	2221 Manufacture of plastic plates, sheets, tubes and profiles	126.92	130	2.16	0.00
ELECTRIC PLUS SRL	BC	Bacău	2223 Manufacture of builders' ware of plastic	126.25	535	5.90	0.00
SYMMETRICA SRL	SV	Verești	2361 Manufacture of concrete products for construction	98.00	422	5.68	0.00
BRIKSTON CONSTRUCTION SOLUTIONS SA	IS	Iași	2332 Manufacture of bricks, tiles and other construction products, of burnt clay	95.83	200	15.36	0.00
TECNOSTAMP TRIULZI EAST EUROPE SRL	BC	Hemeiuș	2229 Manufacture of other plastic products	90.26	246	6.17	0.00
ELMET INTERNATIONAL SRL	BC	Bacău	2562 General mechanical operations	85.90	220	4.52	0.00
JIFFY PACKAGING SA	NT	Piatra Neamț	2221 Manufacture of plastic plates, sheets, tubes and profiles	68.66	177	0.48	0.00
GML STEEL GRUP SRL	NT	Săbăoani	2431 Cold drawing of bars	66.46	16	1.04	0.00

FONDAL INTERNATIONAL SRL	IS	Lețcani	2453 Casting of light non-ferrous metals	63.28	170	0.83	0.00
ADF PROD SRL	NT	Piatra Neamț	2223 Manufacture of builders' ware of plastic	61.85	157	8.45	0.00
BICO INDUSTRIES SRL	NT	Piatra Neamț	2223 Manufacture of builders' ware of plastic	52.20	189	0.42	0.00
BUILD CORP PREFABRICATE SRL	IS	Iași	2361 Manufacture of concrete products for construction	40.37	150	3.04	0.00
CARETTA SRL	IS	Iași	2550 Manufacture of fabricated metal products; powder metallurgy	39.96	86	1.71	0.00
MINDO SA	BT	Dorohoi	2364 Manufacture of mortar	32.67	58	0.00	0.87

Top economic agents with activities in the category "medium-low technology" by turnover, North-East Region, 2018

Source: National Office of the Trade Register

Regarding the number of deregistered companies in the North-East Region, after decreases in 2017, in 2018 and 2019 the number of deregistered companies increased, reaching a total of 14,907.

Territorial level	2013	2014	2015	2016	2017	2018	2019
Bacău County	2,196	1,971	2,437	2,516	2,057	2,193	3,409
Botosani County	1,035	1,080	1,110	1,340	947	1,101	1,213
Iasi district	4,103	3,230	4,110	4,693	3,720	3,137	4,994
Neamt County	1,255	1,152	1,782	2,451	1,489	1,401	2,208
Suceava county	1,891	1,681	1,796	2,116	1,546	1,542	1,576
Vaslui County	820	628	743	985	762	799	1,507
Northeast region	11,300	9,742	11,978	14,101	10,521	10,173	14,907
Romania	80,786	76,483	94,374	109,113	82,295	80,181	101,601

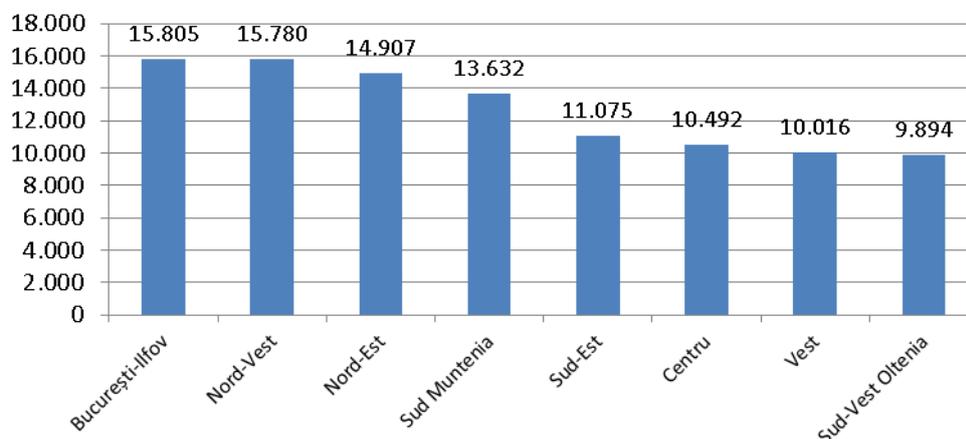
Statistical situation of deregistered companies in the period 2013-2019, at county, regional and national level

Source: National Office of the Trade Register (ONRC) <https://www.onrc.ro/>

The analysis of deregistered companies at the national level in 2019, shows that out of a total of 42 counties, Iași County is on the 2nd place in terms of a large number of deregistered companies, followed by Bacău County (6th place), Neamț County (18th place), Suceava county (28th place), Vaslui county (32nd place), Botoșani county (36th place). On the 1st place in the ranking, is

Bucharest, which stands out clearly with a big number of deregistered companies, namely 12,554 in 2019.

As can be seen from the graph below, the comparative analysis of the number of deregistered companies by development regions shows that the North-East Region is among the top 3 development regions with the highest number of deregistered companies.



Number of companies deregistered by development regions, comparison in 2019

Source: National Office of the Trade Register (ONRC) <https://www.onrc.ro/>

1.2.2 Sector analysis

In the following, all economic sectors will be analysed, so that later industrial agglomerations and sectors with clustering potential can be identified.

a. Agriculture, forestry and fishing

In 2018, in the agriculture, forestry and fishing sector, 2,642 active local units were operating in the North-East region, achieving a turnover of 5,431 million lei, training an average number of employees of 19,581 and net investments of 997 million lei.

Indicator	2013	2014	2015	2016	2017	2018
Number of active local units	2,205	2,342	2,488	2,572	2,632	2,642
Turnover (million lei)	4,384	4,001	4,186	4,544	5,251	5,431
The average number of employees	19,034	15,663	19,682	19,326	19,803	19,581
Weight from no. average employees at the regional level	4.61%	3.89%	4.77%	4.59%	4.55%	4.46%
Net investments (million lei)	373	776	759	631	1,045	997

The main indicators of the Agriculture, Forestry and Fisheries Units in the NE Region, 2013-2018

Source: Neamț Regional Directorate of Statistics and INS, Tempo Online, 2020, "Active local units, by activities of the national economy at NACE Rev.2 division level, size classes by the number of employees, macro-regions, development regions and counties" indicator

At the county level, most active local units were based in Suceava (612), and the fewest in Botosani (337). In terms of time, between 2013-2018, their number in the region increased by 19.82%. In 2018

there is an agglomeration of local units active in non-permanent plant cultivation activities (37.85% - 1,000 local active units), forestry (19.19% - 507 active local units) and animal husbandry (11.43% - 302 active local units). This trend is common in most counties, but the emphasis is also on agricultural ancillary and post-harvest activities (Iași, and Vaslui), on mixed farm activities (vegetable cultivation combined with animal husbandry) (Iași and Botoșani) and on forestry and other forestry activities (Neamț and Suceava).

b. Industry

In 2018, in the North-East Region, 6,843 local units active in industry (extractive industry and manufacturing industry) were operating. In 2018, these units achieved a turnover of 28,437 million lei, registered an average number of 120,129 employees and net investments of 1,597 million lei.

Indicator	2013	2014	2015	2016	2017	2018
Number of active local units	6,237	6,380	6,377	6,427	6,668	6,843
Turnover (million lei)	22,695	23,038	24,433	24,400	26,912	28,437
The average number of employees	122,056	121,153	120,415	122,386	122,680	120,129
Weight from no. average employees at the regional level	29.55%	30.09%	29.20%	29.09%	27.39%	27.39%
Net investments (million lei)	1,428	1,580	1,312	1,122	1,556	1,597

The main indicators of the industrial units in the North-East Region, 2013-2018

Source: Neamț Regional Directorate of Statistics and INS, Tempo Online, 2020, "Turnover of active local units, by activities of the national economy at the level of NACE Rev.2 section, size class by the number of employed persons, macro-regions, development regions and counties, current prices", "Net investments of active local units, by activities of the national economy at NACE Rev.2 section level, size class by the number of employed persons, macro-regions, development regions and counties" indicators

At the level of the North-East Region, the *extractive industry* totalled in 2018 some 124 active local units, most of which operate in the counties of Suceava (40) and Neamț (30). However, this sector is not representative of the region, the number of active local units representing in 2018 only 0.19% of the total number of units in the region. The turnover represents 1.13% of the regional turnover for industry, and the number of employees only 2.61% of the average number of employees in the industry.

c. Manufacturing industry

The manufacturing industry contributes significantly to the development of the industrial sector of the North-East Region. In 2018, at the level of the region, there were 6,719 local units active in this industry, approximately 10.46% of the total number of units in the region that achieved a turnover of 28,119 million lei. Most units operate in the counties of Iași (23.08%), Suceava (22.64%), Neamț (19.05%) and Bacău (18.87%). The main indicators at the level of this industry that characterize the North-East Region are presented in the table below:

Indicator	2013	2014	2015	2016	2017	2018
The number of active local units	6,119	6,257	6,261	6,314	6,546	6,719
Share of the total number of local units active at regional level	11.48%	11.33%	11.15%	10.90%	10.65%	10.46%
Turnover (mil. lei)	22,431	22,760	24,180	24,111	26,660	28,119
Share of regional turnover	28.17%	27.79%	27.26%	25.65%	25.73%	24.09%
The average number of employees	118,190	117,377	118,048	118,786	119,594	117,075

Weight from no. average employees at the regional level	28.62%	29.15%	28.62%	28,23%	27.51%	26.69%
Net investments (million lei)	1,056	1,201	1,248	1,068	1,331	1,355

The main indicators of the units in the manufacturing industry, North-East Region, 2013-2018

Source: Neamț Regional Directorate of Statistics and NSI, Tempo Online, 2020, "Turnover from active local units, by activities of the national economy at NACE Rev.2 section level, size classes by the number of employed persons, macro-regions, development regions and counties, current prices", "Net investments from active local units, by activities of the national economy at NACE Rev.2 section level, size classes by the number of employed persons, macro-regions, development regions and counties" indicators

d. Constructions Sector

At the level of the North-East Region, there were, in 2018, 6,252 local units active in the construction sector, most of which had as the object of activity construction works of residential and non-residential buildings (54.38%), followed by works of electrical and technical installations - plumbing and other construction installation works (21.45%).

At the county level, in 2018, there is a concentration of these units in Iasi (29.88%), Suceava (21.21%) and Bacau (20.63%). The turnover achieved by the active local units in the construction sector was 7,975 million lei, and the average number of employees in the active local units was 42,233 persons.

e. The service sector in the North-East Region

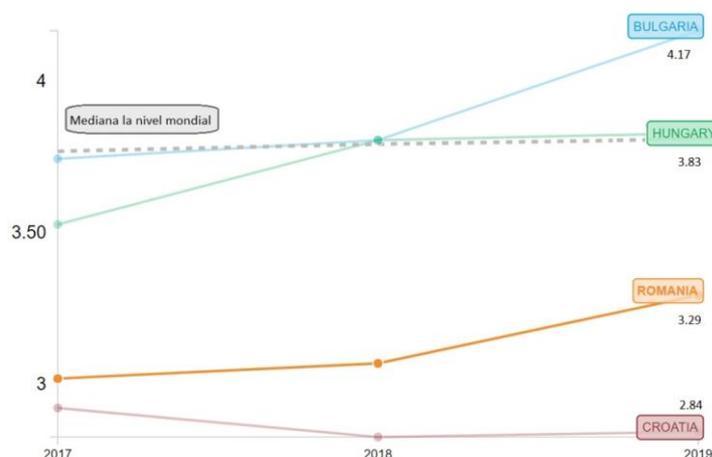
In 2018, 48,120 active local units were operating in the North-East Region, most of which operated in Wholesale and retail trade; repair of motor vehicles and motorcycles (44.88%). These units had a turnover of 72,483 million lei and the average number of employees in the active local units was 224,640.

1.2.3 Clusters and clustering potential

According to the Romanian Cluster Association (CLUSTERO), there are currently 76 clusters operating in Romania, of which 47 are members of CLUSTERO.

Analysing the Report prepared by the World Economic Forum for 2019 - "Report on Global Competitiveness", Romania is ranked 109th out of 141 countries analysed, in terms of the development stage of clusters. Based on the data provided by this report, the World Bank determines the spread of clusters developed in the analysed countries.

For Romania, compared to other EU member states, the evolution of clusters according to the value in the classifications of this kind made in the period 2017-2019 is presented in the following graph:



Evolution of cluster development by value, 2017-2019 (1 = non-existent; 7 = widespread in many areas)

Source: *The World Bank*,

https://tcddata360.worldbank.org/indicators/h1292504c?country=ROU&indicator=42722&countries=BGR,HUN,HRV&viz=line_chart&years=2017,2019

So far, at the level of the North-East Region, there are 10 regional clusters and a national cluster with representatives from the NE Region, namely:

1. Ind-Agro-Pol agri-food technology cluster (national cluster with representatives from the NE Region);
2. The Innovative Regional Cluster of Molecular and Structural Imaging North-East (IMAGO-MOL) (Iași);
3. ASTRICO North-East Textile Cluster (Săvinești, Neamț);
4. Regional Tourism Cluster - Bucovina Tourism Association (Suceava);
5. ICONIC Cluster - Interactive Cluster of New Media Industry (Iași);
6. EURONEST IT&C Hub Regional Innovative Cluster (Iași);
7. BioROne biotechnology cluster (Iași);
8. "Ieșeni Builders Guild" cluster (Iași);
9. "Neamț Land" cluster (Piatra Neamț);
10. BioNEst Regional Organic Agriculture Cluster (Iași);
11. Carpathian Furniture Cluster (Iasi)³¹.

Among the clusters present in the North-East Region, four are members of the National Association of Clusters in Romania: ASTRICO North-East (Neamț), IMAGO-MOL (Iași), EURONEST IT&C Hub (Iași), Ind-Agro-Pol agri-food technology cluster (national cluster with representatives from the NE Region). These amounted to the end of 2019: 130 enterprises, over 12,000 employees and accumulated 2.85 billion lei turnover, 288 million Euro exports, reporting research and development expenses of 43 million RON, noting increases ranging between 61% in the case of exports and 207% in the case of research and development expenditures, compared to 2013³².

According to the information presented by the European Secretariat for Cluster Analysis (ESCA), of the clusters operating in the North-East Region, only IMAGO-MOL (Iasi), ASTRICO-NORD-EST and the Ind-Agro-Pol agri-food technology cluster are under certification European "silver" award given by this body, in recognition of the efforts made to improve the management activities of the cluster.

Ind-Agro-Pol agri-food technology cluster

It is an innovation cluster with national coverage, established in 2011. In 2018, the cluster had 134 members (including SMEs, large enterprises, Professional Associations, RDI institutes, universities, Regional Authorities, catalyts) from all regions of Romania, with a number of 3,398 employees and a cumulative turnover of 1,325,909,761 lei. The mission of the IND-AGRO-POL Competitiveness Pole is to stimulate innovation and collaboration in the agro-industrial sector and related sectors (bioeconomy, renewable energy, environmental and climate change, green and advanced technologies, information and communication technology). Being a cluster with national coverage, the members (economic agents) from the North-East Region are SC SALBAC SA (NACE 1013), SC OMP SRL (NACE 4619), SC ALBRAU PROD SA (NACE 1105), SC RANCON SRL (NACE 2454), SC RANCON RECLARE SRL (NACE 3832), SC METATECH-CD SRL (NACE 7112), SC MECANICA CEHLAU SA (NACE 2830), SC MECANO FUC SA (NACE 2892).

Innovative Regional Cluster of Molecular and Structural Imaging North-East-IMAGO-MOL (Iasi)

³¹ <https://mobiera.ro/mobiera-membru-carpathian-furniture-cluster/>

³² <http://clustero.eu/wp-content/uploads/2020/04/situatia-clusterelor-din-romania-aprilie-2020.pdf>

It was founded in 2012 and is the only medical imaging cluster in Romania and the European Union. Within the cluster, research and development activities are carried out in the field of medical imaging and technology transfer, as well as fundamental and applied research and medical studies that pursue physiological and pathological medical aspects through molecular imaging methods. In 2018, the IMAGO-MOL cluster had 38 members (universities, hospitals, Iași Regional Oncology Institute, Iași County Council, TEHNOPOLIS Science and Technology Park, North-East Regional Development Agency, "Petru Poni Institute of Macromolecular Chemistry", As well as SMEs in the field of ICT, health, consulting), with some 369 employees and a cumulative turnover of 69,902,707 lei..

ASTRICO North-East Textile Cluster (Săvinești, Neamt)

It was established in 2010, by concluding a partnership between the association of the same name, the North-East Regional Development Agency, the Faculty of Textile Leather and Industrial Management of the Technical University "Gheorghe Asachi" Iasi; National Research and Development Institute for Leather Textiles - Bucharest; Inno Consult SRL - Bucharest. The cluster operates in the textile-clothing field, being oriented on activities for the development of innovative technologies and products in the textile field, as well as on research and education activities in this field.

This structure includes producers of yarns, knitwear, clothing, as well as producers from other fields of activity (furniture, packaging) in the North-East region, universities and research units, the North-East Regional Development Agency and a catalyst. The main exponent of the association is RIFIL SA Săvinești, the most important producer of acrylic yarns in the European Union. In 2011, the ASTRICO North-East cluster developed a unique sampling and sales system for all members of the cluster, which is based on a complete package of services: sampling, contracting, production tracking, commercial and logistics services. In 2018, the cluster had 33 members, with some 2,703 employees and a cumulative turnover of 871,061,454 lei.

Regional Tourism Cluster - Bucovina Tourism Association (Suceava)

It was established at the end of 2001 at the initiative of the Chamber of Commerce and Industry of Suceava County, of the IBD-GTZ office in Romania (Integrated Economic Consulting Service for Romania of the German Government), with the support of the Ministry of Tourism, public administration and tourism agencies. The association aims to promote domestic and international tourism in Bukovina. The association has as members besides travel agencies, hotels and pensions - Suceava County Council, Vatra Dornei City Hall, Gura Humorului City Hall, Suceava Chamber of Commerce and Industry, Muzeul Oului Vama (The Customs Egg Museum), Atelierul de Ceramică Neagră Marginea (Black Ceramics Studio), totalling, in 2018, 47 of members, with some 800 employees.

ICONIC Cluster - Interactive cluster of the new media industry (Iasi)

It was founded in 2012 by Arhipelago, a company operating in the field of web publishing.

The ICONIC cluster operates in the sector of informatics and communication technology activity. It aims to develop companies from Iasi that operate in the IT and new media fields and increase their visibility and international competitiveness, by attracting investors and technology transfers.

ICONIC became the first Romanian IT cluster to join the Business Roaming Agreement (BRA), an international network of clusters with members on all 5 continents. Following this agreement, the companies from Iasi that are part of the ICONIC cluster receive access to business events organised within the BRA, as well as free access to conference rooms, internet connections and other facilities

at any of the network partners. The cluster consists of 32 members (companies, universities, Iasi Science and Technology Park, associations).

Euronest IT&C Hub Regional Innovative Cluster (Iasi)

It was established in 2013, at the initiative of the Iasi County Council, by associating 21 founding members from the IT business environment, universities and local authorities from the North-East Region. In 2017, the cluster had 72 members, with several 3,000 employees and a cumulative turnover of 748.8 million lei. The activity of the cluster consists in promoting and supporting the common interests of the IT sector in the region in relation to the state and the economic environment at the national and international level, increasing the competitiveness of communications and information technology in the North-East Region (especially high value-added products), increasing the regional competitiveness of IT&C education, creating and promoting the brand of the innovative IT&C industry at the regional level, developing cluster services and products, supporting entrepreneurship and SMEs in the field; facilitating the transfer of ideas, skills and work practices, including by setting up and managing databases and know-how, online platforms with information relevant to the fields of IT&C and research-development-innovation (RDI); facilitating collaboration with relevant institutions, local authorities and research and innovation and educational institutions in the country and abroad, etc.

BioROne Biotechnology Cluster (Iasi)

It was founded in 2011 and is the first biotechnology cluster in Romania. The 20 members are national leaders in education, research, innovation and production in the medical, pharmaceutical and biotechnology fields - clinical hospitals, universities, research institutes, Public Health Directorates of Iasi and Neamț counties, Iasi Institute of Forensic Medicine, companies. The cluster has a strategic objective the increase of the competitiveness of the bio-medical sector in the North-East Region, activating in the field of biotechnology, health and medical sciences, microtechnologies, nanotechnologies and optical technologies. In 2019, the cluster totalled 5,800 employees and a cumulative turnover of 912 million lei.

"BREASLA" (Iasi)

Established in 2013, this cluster is a platform for collaboration, development, research and innovation in the civil and industrial construction industry. The cluster had, in 2018, 47 members ("Gh. Asachi" Technical University and companies operating in the field of construction), some approximately 2,000 employees and a cumulative turnover of 288 million lei.

"Tinutul Neamțului" Cluster (Neamț Land Cluster) (Piatra Neamț)

The cluster was established in 2014, by signing the association protocol by 26 founding members, representing local public administrations and public institutions (P. Neamț City Hall, Museum Complex), facilitator organisations (NE RDA, Chamber of Commerce and Industry Neamț, CVD Brașov), cultural associations (Ion Creangă Foundation, Carmen Secularae), education and research institutions (Academy of Economic Studies Bucharest, Stejarul Biological Research Center), professional associations (ANTREC, Romanian Mountain Forum, Ordinary General Assembly of the Association for the Development and Promotion of Tourism Neamț, Valea Ozanei Association, People's Craftsmen Association), SMEs (Il Liteanu, Rocom Central, Romsteam Aldo, Top Tour, Grand Hotel Ceahlău, Perla Invest, Center for Research and Processing of Medicinal Plants PLANTAVOREL, Gamma Advertising, Hanul Ancuței, Autonom Rent a Car) and consultants (Alchemy SRL). The predominant sectors of activity are activities of tourism and related, production of goods for the tourism industry, consulting services, training, marketing, business development and promotion, etc. The cluster focuses on local tourism (in all its specialised forms such as rural, urban, cultural,

historical, spiritual, adventure, business, treatment, etc.), including local or traditional products and services, natural resources, etc.; which support the local tourism industry).

BioNEst Regional Organic Agriculture Cluster (Iasi)

The cluster was established in 2018 and aims to contribute to:

- promoting a healthy lifestyle with an emphasis on nutrition by stimulating the development of agriculture, the food industry and trade in organic, organic, natural and traditional products;
- increasing the economic performance of cluster members through cooperation, development and promotion of common resources and values under a unique identity;
- supporting fundamental, applied and experimental research with an impact on the bioeconomy;
- the smart development of the North-East Development Region by stimulating research, knowledge transfer ecosystems and technology transfer chains.

In 2019, the cluster had 35 members, with some 40 permanent employees and a cumulative turnover of approximately 15 million lei.

Carpathian Furniture Cluster (Iasi)

The cluster was established in 2019 as a result of the initiative of some companies from the North-East region, the fields of activity of the founders including architecture and design, furniture production, wood processing and raw material production. Furniture, along with 13 other companies in the region (Atelier Raft, Bitecture, Contur Studio Arhitectură, Daste Mobili, Herse Deco, Karmic Wood, Mar Lico - Lemnar, Mobila Saco, Point Architects, Saral Prod, Studio Apunct, Succedo, Viitorul - Lemnartis), aims to solve problems common to the industry, such as the internationalisation of services, the quality of labor, cooperation in production activities or intensifying collaboration between academia and companies for programs dedicated to education and innovation. The cluster enjoys both the support of the academic environment - through the National University of Arts "George Enescu", the Faculty of Visual Arts and Design and the Technical University "Gheorghe Asachi", the Faculty of Architecture "GM Cantacuzino" - and the support of local or central public authorities.

1.2.4 Business support structures

Business support and development structures are the entities that provide the necessary framework for the facilitation and development of productive economic activities and the provision of services by SMEs, with the aim, on the one hand, of attracting investments in the field of production and high value-generating services, and on the other hand, capitalising on the potential of human and material resources in the area concerned.

Among the business support structures, we list industrial parks, business incubators, business centres, economic centres. The industrial park is defined by Law 186/2013, on the establishment and operation of industrial parks, as "a delimited area within which economic activities, scientific research, capitalisation of scientific research and / or technological development, agro-industrial, industrial, logistical and innovative operations are carried out, etc., in a specific facility regime. " The provisions of the same law provide developers with facilities such as exemptions from the payment of land tax, building tax or exemptions from the payment of construction permits, as well as a number of other specific facilities.

The situation of industrial parks in Romania, prepared by the Ministry of Public Works, Development and Administration on 13.04.2020, indicates the presence of a number of 92 industrial parks on the territory of the country.

There are 8 industrial parks in the North-East Region.

Name of the entity	Type of the entity	The current situation of the park	Surface (Ha)	Location		The administrator company
				Locality	County	
Industrial Park Hemeiuş (HIT Park) Bacău	Industrial Park	Operational ³³	10.85	Hemeiuş	BC	S.C. Parc Industrial HIT S.R.L.
Industrial Park Botoşani	Industrial Park	Operational	12.95	Botoşani	BT	S.C. Electromining S.A.
Industrial Park Iaşi	Industrial Park	Under construction ³⁴	18.6	Leţcani	IS	Societatea Iaşi Industrial Park S.R.L
Industrial Park Miroslava, Iaşi county	Industrial Park	Operational	46.44	Miroslava	IS	Societatea Miroslava Industrial Parc S.R.L.
Industrial Park Miroslava 2, Iaşi county	Industrial Park	Greenfield ³⁵	25.2	Miroslava	IS	Societatea Miroslava Industrial Parc S.R.L.
Industrial Park Ceahlău, Neamţ county	Industrial Park	Operational	10.43	Piatra-Neamţ	NT	S.C. Mecanica Ceahlău S.A.
Industrial Park Siret	Industrial Park	Greenfield	15.94	Siret	SV	Societatea Industrial Park East European Border
Industrial Park Bucovina	Industrial Park	Greenfield	13.74	Salcea town and Dumbrăven	SV	Societatea Parcuri Industriale

³³ The park in which at least one economic agent operates.

³⁴ The park where construction works are carried out (infrastructure, utilities)

³⁵ The site that has no infrastructure and utilities

				i village		Bucovina S.A.
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Industrial parks in the North-East Region

Source: <https://www.mlpda.ro/pages/parcuriindustriale>

Regarding the existing business incubators / business centres / economic centres in the North-East Region, we mention:

Name of the entity	Type of the entity	Business sector	Location	Belonging to
Science and Technology Park Tehnopolis	Science park/ business incubator	Business incubation for start-up companies, thus supporting entrepreneurial initiatives Research and development: environmental assessment laboratories, cryogenics, biotechnologies. Business consulting: legal, financial, accessing European funds, finding new partners	Iași	SC Tehnopolis SRL
RubikHub	Business centre	Rubik Hub has taken on the mission of developing and connecting communities, with which it inspires, educates and accelerates startups to become successful businesses globally. Rubik Hub is also a coworking space, where you can rent workspaces or meeting rooms, workshops, conferences, etc.	Piatra Neamț	North-East RDA
Business incubator for SMEs in Botosani (2 locations: Administrative Centre and Microproduction Centre)	Business Hub	It offers various incubation services to newly established or existing SMEs	Botoșani	SC LOCATIVA SA
Centrul Economic Bucovina	Economic centre	Exhibition spaces, conferences, research	Suceava	Suceava City Hall
Tutova Bârlad Business Center	Business centre	Facilities for SMEs, foreign investors, Development of machine building, textile and food industries, etc.	Vaslui	Bârlad City Hall
Business Resource Center (CRAV)	Business centre	Supports entrepreneurship and contributes to increasing the competitiveness of SMEs	Vaslui	Vaslui County Council
"Mircea Cancicov" Business and Exhibition Center	Business centre	The centre comprises a 5-level business incubator, a three-level conference room and an exhibition space.	Bacău	Bacău Business and Exhibition Center SA

In the ROP 2007-2013, the business support centres were assisted in the area of intervention 4.1 "Sustainable development of business support structures of regional and local importance". The indicative financial allocation at the level of the North-East Region for this Area of Intervention was Euro 42.56 million. The beneficiaries of funding in the region were:

Beneficiary name	County	Locality	Project title	Contracted non-reimbursable financial assistance (lei)
SC INTERNATIONAL ORIENT EXPRES SRL	SV	Rădăuți	CONSTRUCTION OF BUSINESS SUPPORT AND DEVELOPMENT CENTER THROUGH TRANSFORMATION AND EXTENSION EXISTING CONSTRUCTION	7,300,078.10
SC ENVIRO CONSTRUCT SRL	IS	Iași	CONSTRUCTION OF BUSINESS CENTER, RELATED ANNEXES, UTILITIES CONNECTIONS, SITE ORGANISATION	6,248,918.90
SC INSTCOMP CONSTRUCT SRL	SV	Suceava	ARRANGEMENT AND MODERNISATION OF INDUSTRIAL HALLS	5,478,314.10
SC LUCOSILV SRL	SV	Suceava	CONSTRUCTION OF "CLUB BUCOVINA" BUSINESS CENTER	16,129,379.00
SC INVEST PLUS SRL	NT	Piatra Neamț	BUSINESS SUPPORT STRUCTURE	3,448,749.49
SC JAD GROUP SRL	IS	Iași	ESTABLISHMENT OF BUSINESS SUPPORT STRUCTURE FOR THE VALORISATION OF THE MATERIAL AND HUMAN POTENTIAL OF IAȘI MUNICIPALITY BY MODERNISATION OF EXISTING BUILDING AND INTERIOR ARRANGEMENTS	32,450,427.97
SC TERRAMED BABY SRL	IS	Iași	CONSTRUCTION OF A BUSINESS SUPPORT CENTER FOR SME	6,609,791.30
SC PROFILE BUSINESS CONSULTING SRL	IS	Iași	INCUBATOR AND BUSINESS CENTER FOR SUPPORTING THE BUSINESS ENVIRONMENT AND CREATING AN ENVIRONMENT SUITABLE FOR SELF-SUSTAINABILITY AND ECONOMIC DEVELOPMENT OF INCUBATED COMPANIES	22,454,620.00
SC SOLO SRL	IS	Iași	LOGISTIC PARK LEȚCANI COMMUNE - IAȘI COUNTY	13,627,514.56
SC BURSA MOLDOVEI SA	IS	Iași	CONSTRUCTION OF BUSINESS CENTRE, IAȘI	10,534,856.50

SC SORANA SRL	IS	Iași	CONSTRUCTION OF BUSINESS CENTER, IAȘI LOCATION, IAȘI COUNTY	3,385,683.70
COMUNA CACICA	SV	Cacica	MULTICULTURAL BUSINESS CENTER - CACICA	816,886.50
SC AXA PLUS SRL	IS	Iași	AXA - GREEN BUSINESS CONSULTANCY CENTER	5,157,391.75
SC CARTIERUL CAROL SRL	IS	Iași	"CAROL" BUSINESS SUPPORT AND DEVELOPMENT CENTER	4,991,173.72
SC TESTER GRUP SRL	IS	Iași	BUSINESS SUPPORT AND DEVELOPMENT CENTER	19,155,219.09

Source: <http://www.regio-2007-2013.inforegionordest.ro/>

In the period 2014-2020, the creation of sectoral business incubators was supported, by building the related spaces and equipping them with tangible and intangible assets. At the level of the North-East Region, the projects contracted within the ROP 2014-2020 are the following:

Beneficiary name	County	Project title	Type	Total project value (lei)
SC TOTAL PRIM EXPERT SRL	IS	CREATIVE INDUSTRIES HUB – IAȘI	PRIVATE	3,696,565
SC HIGH FEE CONNECTED SRL	NT	CONSTRUCTION OF ENTREPRENEURSHIP PROMOTION STRUCTURE (OFFICES), FENCE, UTILITY CONNECTIONS	PRIVATE	3,679,181
SC FAST STREAM S.R.L.	SV	BUILDING BUSINESS HUB	PRIVATE	25,359,606
SC PERSPECTIVES CONSTRUCTIONS INVEST SRL	IS	CONSTRUIRE INCUBATOR AFACERI-PERSPECTIVES	PRIVATE	55,729,066
MUNICIPIUL BACĂU	BC	CREATING AN INFRASTRUCTURE BUSINESS INCUBATION SUPPORT HUB FOR YOUTH - HORIZON CINEMA	PUBLIC	21,370,617

Source: <https://myadr.ro>

Chapter 1.3 Analysis of factors preventing the dissemination of innovation

The study “Analysis of the factors that obstruct the diffusion of innovation, including digitisation”³⁶ carried out within the project “Increasing the capacity of the RDI system to respond to global challenges. Strengthening the anticipatory public policy-making capacity” has identified deficiencies that limit the capacity to innovate, both at the national and regional level.

We mention the following barriers to the dissemination of innovation:

- **The R&D system is underfunded.** In 2017, Romania ranked last in the EU in terms of spending on R&D activities as a percentage of GDP, and the North-East Region ranked next to the last place compared to Romania’s regions. The intensity of the private sector R&D expenditure is

³⁶ Analysis of the factors that obstruct the diffusion of innovation, including digitization, Mariana Chioncel, 2019

very low. Many fiscal incentives are available in Romania for RDI activities, but legislative norms and conditions of application are unclear and difficult to apply.

- **The Romanian legislative framework is characterised by unpredictability, excessive bureaucracy.** This creates pressure, particularly on small businesses, which have limited capacity to manage bureaucratic procedures and adapt to frequent legislative changes. Legislation has been constantly highlighted by the business community as an obstacle to the development of current activity or to making new investments. Also, access to and implementation of public-funded projects, in particular, the Structural Funds and those for public authorities, have the disadvantages of a slow and time-consuming procurement process.
- **The majority of companies in Romania does not have a form of intellectual property protection.**
- **Romania has a number of intellectual property (IP) regulations with several contradictions** regarding the ownership, use and transfer of invention, discouraging individual researchers/innovators, institutions and private investors. Also, high patent costs, the lengthy patent procedure discourages SMEs, while multinationals prefer to transfer intellectual property to the country where they have their headquarters.
- **The Romanian labour market is disrupted by socio-demographic problems** such as the negative natural increase of the population and the high level of emigration. Between 2015 and 2016, Romania had the highest rate of emigration among the tertiary-educated population, a rate that is increasing faster than the number of tertiary education graduates
- **There are problems within the vocational education and training systems.** Early school leaving is a big problem in Romania. Our country is also experiencing one of the lowest average increases in the rate of participation in lifelong learning. In 2016, Romania invested only 2.58% of the GDP in education (compared to 6% declared). In the top 1000 Shanghai 2019, Romania is represented by only 2 universities, none of them being from the North-East Region, which signals the low productivity of research at international level. Funding for universities is largely based on the number of students and not on performance. Additionally, the lack of collaboration between HEIs and the private sector in setting up the curriculum has also led to an inadequate alignment between skills achieved in universities and those required by private sectors, as evidenced by the acute shortage of well-trained workforce/with relevant research skills. Regarding Romania's participation in continuous vocational training as a percentage of people employed, this is below the EU-28 average. Romania has recently implemented legislative measures to support dual education and lifelong learning.
- **Low innovation culture,** generated by fear of failure, a traditional and rigid educational environment where the creative component is lacking. There is a low demand for new and innovative products and services due to a decrease in market maturity. Domestic companies consider that the purchasing power of Romanian customers is low, often preferring cheaper but lower quality imported products.
- **Financial support for business investments is limited.** In Romania, SMEs' access to finance is limited and SMEs are perceived as risky for banks due to the high share of non-performing loans. The venture capital market is at an early stage with few providers of risk capital visible on the market. Also, private investors such as Business Angels are almost non-existent, and fundraising through crowdfunding platforms amounts to less than 1 million USD in Romania in 2019.
- **Structural economic/market factors.** Romania's competitiveness is affected by a weak research and innovation capacity coupled with a reduced demand for research and innovation due to structural factors. Romania specialises in intensive labour industries. Agriculture and manufacturing play a stronger role compared to other EU-28 countries. The wood and furniture, textile and agri-food sectors play a major role in the national economy regarding their contribution to the GDP, employment and exports. However, these are "low technology"

sectors based on competitive advantages, such as massive production capacities or low wages. Investments in R&D are concentrated in "high technology" and "medium-high technology", the share of SMEs using advanced technology being low.

Additionally, the innovation potential of the private sector is also linked to the size of the business. SMEs and mainly micro and small enterprises do not have the capacity and financial strength to support and develop the RDI department/activity for product/process innovation, especially in the context of other significant pressures, such as the volatile legal framework, the struggle to find and keep employees.

In terms of the position in the value chain, Romanian companies are mainly producers, without significant roles in the other segments of the value chain.

- **Romania has a low presence in the European Research Area (ERA).** Under Horizon 2020, the grant agreements signed by Romania accounted for 2.79% of the total, with an allocation representing 0.4% of the total budget. Compared to the other development regions, the North-East Region ranks fourth.
- **R&D infrastructure records a low degree of use.** The ERRIS platform highlights a large number of research equipment in Romania. However, investment in research infrastructures has often failed to respond to national strategic priorities or have been duplicated at the territorial level or underused due to lack of adequate qualified human resources and subsequent funding for maintenance and relevant research activities. It is noted that graduates lack practical experience in using state-of-the-art technologies and their training requires significant resources.

Chapter 1.4. Conclusions of the regional socio-economic and innovation potential analysis

The real GDP growth rate in Romania between 2013-2017 recorded positive values and a steady growth, with an annual growth rate of 7.1% in 2017, with Romania ranking second after Ireland among EU's member states. From a time perspective, at the regional level, the value of this indicator increased by 36.22% in 2017 compared to 2013. However, the North-East Region remains the poorest region in Romania, with a GDP per capita that places it among the low-income regions of the European Union. In 2017, the region recorded a GDP per capita of EUR 6,000, which represents 19.93% of the EU-28 average.

The population of the North-East Region is still the largest in the country (3,198,564 inhabitants on 01.01.2019), with an average population density of 88 inhabitants per sq. km.

In the North-East Region, in 2018, the youth employment rate (15-24 years old) reaches a level that places it at the top of the ranking (35.4%), surpassing the national average as well. But the region accounts for 11.25% of the average number of employees existing at the national level and registers a monthly average net nominal salary that place it on the second-last place at the national level. It also ranked last nationally in terms of the share of the population with tertiary education in the 30-34 age group (6th place) and the employment rate in the high-tech sectors (8th place).

The offer for RDI services in the region includes 212 research infrastructures registered on the NRRI platform (National Register of Research Infrastructures). Additionally, the national R&D system is well represented in the region by institutes, accredited state higher education institutions, R&D structures of accredited state higher education institutions (without legal personality), R&D centres or stations. In addition, there are also 3 private universities and 68 active local units that operate in

the region, their main activity being R&D. There are 2,874 researchers and 33 doctoral schools in the region, and most doctoral fields are part of the fundamental Engineering Sciences field. *Regarding the number of researchers, the region ranked second after the Bucharest-Ilfov Region (2,874 researchers).*

R&D spending accounted for 0.17% of the GDP in 2017, compared to 0.5% at the national level. Public-sector spending on R&D as a percentage of the regional GDP was higher than private-sector expenditure (2nd place at the national level). R&D units in the region contribute with 3.05% to the national turnover of these units. Most of the companies that carry out R&D activities are located in Iasi county.

Universities are relatively new players in the RDI activity and have worked hard to adapt to this new section of their post-1990 mission; however, their capacity to transfer their inventions into the real economy and be able to take advantage of their share of the economic value created is reduced if analysed in the light of the total number of applied licenses and the total revenue obtained by the license.

Creating strong links between academia and the business environment is a regional concern, both through clusters, which support technology transfer and help take the research results to the industry, as well as through other existing entrepreneurial initiatives, such as spin-off and technology transfer activities, scientific and technological parks. However, universities' links with the industry remain weak. R&D activities in academia are rather irregular and depend on project funding and faculties' publication efforts only.

Between 2014 - 2020 (February), under the European Union's Horizon 2020 Framework Programme for Research and Innovation, the net contribution of the European Union at national level was EUR 212,564,723. *The North-East region ranks fourth after the Bucharest – Ilfov, North-West and Centre Regions in relation to this indicator.* The North-East region has signed 51 grant agreements.

The supply of information and technology transfer services is poorly represented, with four technology transfer centres and one technology information centre in 2018, out of a national total of 54 entities: the GEA TTC@IAȘI Technology Transfer Centre, the POLYTECH Technology Transfer Centre (Gheorghe Asachi TECHNICAL UNIVERSITY, Iasi), the Gemini CAD Systems – Technology Transfer Centre (GCSTTC) Iași, the PETAL Technology Transfer Centre – PETAL TTC Huși, Vaslui, the INDTECH North EAST Technological Information Centre Bacău. Moreover, the Enterprise Europe Network that provides support services for innovation management is also active in the region, INDTECH North-East, TECHNOPSIS Iași and North-East RDA being regional members.

The regional quantitative study carried out by the North-East RDA on the need for technology transfer services³⁷ revealed that the main objectives of the surveyed companies (selected sample of 1,250 companies) can be grouped into two main categories: support for internal development (in terms of production, quality and costs) and the second category, regarding external development (business development), which refers to attracting new customers and markets. The main reasons for using new technologies and RI knowledge for new products and services are: increasing the performance of current products/services (67%), increasing productivity and competitiveness (67%), reducing manufacturing costs (63%).

³⁷ Analysis of needs, offers and gaps for Innovation & Technology Transfer services for companies in the North-East region of Romania, 2017, Dr. Jonathan Loeffler, Steinbeis Europa Zentrum, Contract N° CCI 2016CE16BAT071

Entrepreneurship in the North-East Region is moderate to low, placing the region on the sixth place in 2018 in the national ranking regarding the total number of active local units (64,250) and last in terms of SMEs' density (19.4 SMEs/1,000 inhabitants). SMEs account for 99.75% of the total number of companies. Regarding the new enterprise creation rate, the North-East region came fourth. Most new businesses were created in the trade field, followed by industry, construction, transportation, hotels and restaurants. In the North-East region, only 5.30% of active local units are in the "*high technology*" category, 16.29% fall under the "*medium-high technology*" category, and 78.41% under the "*medium-low technology*" category.

The region benefits from the activity of 11 clusters (associative structures with legal personality activated on the quadruple helix principle – companies, education, R&D, local public administration and civil society) in areas with potential for development, and these initiatives must be further supported as they foster the creation of cross-sectoral links and knowledge outsourcing. In the North-East Region, there exist active business support structures (8 industrial parks, 1 scientific park, business centres, business incubators) aimed at attracting investments in the production industry and services that generate high added value, as well as capitalising on the potential of local human resources. Within the framework of the ROP 2014-2020, the creation of sectoral business incubators was supported by building the necessary premises and equipping these with tangible and intangible assets, 5 such projects being financed in the North-East Region.

For Romanian companies, digitalisation is one of the most important growth factors and an important catalyst for positioning themselves on the common market. As statistics show, the trend in digitalisation is positive and there are prospects for improvement as new tools that will target the digitalisation of companies are implemented.

The focus of the smart specialisation strategy is to encourage the process of entrepreneurial discovery, through which creative solutions are developed, by combining assets and through collaboration between partners. This process revolves around companies that can identify new opportunities that help discover the specifics of production and identify future R&D areas. Moving further along this line, in the North-East Region, several sectors with competitive potential have been identified, where the activity of economic agents is strong and results can be maximised by means of a smart specialisation-based type of thinking. Thus, *the agri-food & wood industry, textiles, environment, energy, IT&C, health and tourism sectors* can be considered key sectors in the context of smart specialisation in the North-East Region.

Given the industrial concentration, production structure, competencies range (education and research), correlated with current technological trends, the focus in the North-East Region needs to be on *reshaping traditional industries: agri-food and wood industries, textiles; development of new activities in sectors with high regional development potential: energy, environment, health; and diversifying activities in catalyst areas: ICT, tourism, by applying innovative and sustainable solutions, which contribute to the reduction of societal needs and generate wealth.*

At both national and regional level, the main shortcomings hampering the capacity to innovate are excessive bureaucracy and the unpredictable legislative framework, skills shortages due to demographic problems and the lack of market-relevant skills, as well as failing to meet the targets of the research-development-innovation policy.

Chapter 1.5. SWOT Analysis

STRENGTHS	WEAKNESSES
<ul style="list-style-type: none"> • Positive dynamics in the evolution of the Gross Domestic Product; positive growth rates in all counties of the region • The region with the highest number of inhabitants, compared to other development regions in Romania • The region with the highest employment rate among the working-age population (15-64 years old), compared to other developing regions in Romania • The region with the highest employment rate among young people (15-24 years old) and older people (55-64 years old), compared to other development regions in Romania • The region with the lowest unemployment rate among the population aged over 15 years old, compared to national and European averages • Health (including social welfare) and education are the economy's activities in which the Iași County ranks first and second regarding the civilian employed population • The region with the highest number of companies with organisation and/or marketing innovations out of all enterprises, compared to other development regions in Romania • Continuous growth in the number of SMEs in the region • Second place at the national level in public spending for R&D activities as a percentage of the regional GDP • Second place at the national level in terms of the number of researchers at the regional level • In the region, the largest number of RDI units operate in the R&D field in other natural sciences and engineering • Technological Innovation Enterprises have seen a significant increase at the regional level • Second place at the national level in terms of the percentage of SMEs that have introduced marketing or organisational innovation 	<ul style="list-style-type: none"> • Increased disparities in the North-East Region regarding the value of the county Gross Domestic Product • The lowest value of the GDP per inhabitant expressed in PPS compared to the other development regions in Romania • Next to last place at the national level in terms of R&D expenditure as a percentage of the GDP • 6th place at the regional level regarding the private sector expenditure on R&D activities as a percentage of the regional GDP • Next to last place at the national level in terms of the monthly nominal average net salary • 6th place at the regional level regarding the percentage of the population with tertiary education in the 30-34 age group • Last place at the national level in terms of the employment rate in high-tech sectors • There is no regional offer for technology transfer services of TRL8-TRL9 level • Universities' weak links with the industry. Rather irregular academic R&D activities that depend only on project funding and faculties' publication efforts • 6th place at the national level in terms of the number of patent applications per 1 million inhabitants registered at the European Patent Office (EPO)-2012 • Poor performance of the HEI/PRO based on the total number of applied licenses and the total revenue obtained by the license • 6th place at the national level in terms of the number of active local units • Uneven distribution of active local units in the region's counties (very dense in Iași and very dispersed in Botoșani and Vaslui) • Small number of new businesses created in the industry sector, compared to the number of new companies in the trade sector • The lowest level between regions in terms of business density per 1,000 inhabitants • A low level of initiative among the population in terms of the number of newly created

<ul style="list-style-type: none"> • Second place at the national level on the commercialisation of innovations (new for the market and new for the company) • High number of doctoral schools in the region • The existence of 11 clusters in fields such as imaging medicine, textiles, tourism, new media, IT&C, agricultural equipment, construction and biotechnologies • Top-notch research infrastructure owned by research institutes in the region (research equipment with high scientific and/or technological potential) • The existence of 212 research infrastructures registered on the NRRI platform • The presence of the 11 research institutes of the Romanian Academy, Iași Branch, which can contribute with know-how in shaping regional development strategies and policies • The presence of the national "Petru Poni" Macromolecular Chemistry Institute - leading national RDI actor, the first in the country in the polymers field • The presence of a large number of agricultural and forestry research stations, under the Academy of Agricultural and Forestry Sciences • Existence of the Area Command Centre Moldova and the Unit to Fight Hailstones Falls Moldova 1 Iasi • The existence of a significant cultural heritage • The existence of a considerable number of UNESCO monuments • Business infrastructure well represented at the regional level • Organic farming tradition • Frequent collaborations between academic and RDI entities and international research networks 	<ul style="list-style-type: none"> enterprises (4th place at the national level) • Low capacity of universities and research institutes to attract external funding • Low share of ISI-type of publications in the national total • Results obtained by R&D companies below the national average (turnover, number of employees) • Underdeveloped technology transfer infrastructure • Low level of foreign direct investment in 2018 – 8th place at the national level • Concentration of research infrastructure in few urban centres • Insufficient exploitation of existing RDI equipment for the benefit of the industry • Lack of a unique platform that would link the research potential with the industry • Lack of a brand and regional logo for products obtained in the North-East Development Region • Low visibility of local brands in the North-East Development Region • Low level of education and information regarding organic agri-food products • Absence from the market of organic agri-food products obtained in the region
OPPORTUNITIES	THREATS
<ul style="list-style-type: none"> • New funding opportunities for R&D in the fight against the Covid19 virus • The European Commission's proposal for the Multiannual Financial Framework 2021- 2027 – Policy Objective 1 – “A Smarter Europe – innovative and smart industrial transformation” will benefit from at least 25% of the Cohesion Policy funds 	<ul style="list-style-type: none"> • The entry of the world economy into a period of economic downturn caused by the emergence of the Covid19 pandemic • Legislative, political, economic, and institutional instability • The trend of decreasing the population in the region in the upcoming period • The aging of the population

<ul style="list-style-type: none"> • The European Commission’s proposal for the Multiannual Financial Framework 2021-2027 – Policy Objective 2 - "A Greener Europe" – will benefit from an allocation of at least 30% from the Cohesion Policy funds • The share of SMEs from the companies' total is high (99.75%) and similar to that at the national and European level • High research and innovation potential • Financing opportunities for R&D projects through national and structural funds • The development of the business environment as a result of setting up the business support infrastructure • The existence of ERRIS and BrainRomania platforms • Co-opting RDA within the advisory structure dedicated to the development of the National Strategy for Research, Innovation and Smart Specialisation 2021-2027 • The Romanian Government’s proposal to have the North-East ROP 2021-2027 • North-East RDA is the managing authority for North-East ROP and the coordinator of North-East RIS3 	<ul style="list-style-type: none"> • The emigration of qualified personnel, especially in intelligent-intensive areas • Companies’ reluctance to invest in R&D • The reduced capacity to co-finance research in the public environment • The lack of coordination between various sectoral policies with implications for the development of the RDI sector • the legal framework governing spin-offs is rather vague in Romania, and HEI/PRO do not seem to have established institutional rules on this issue, nor have they tried to promote the concept • lack of financial instruments to support innovation entrepreneurs (spin-off and start-up) as an alternative to grant programmes and bank loans • the lack of a regulatory framework that would provide incentives for researchers, and allow talent to be retained in research activity
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CHAPTER 2 – IDENTIFICATION OF ECONOMIC SECTORS WITH SPECIALISATION POTENTIAL IN NORTH-EAST REGION

THE AGRI-FOOD SECTOR AND THE WOOD INDUSTRY

For the analysis of the **agri-food sector**, the CLASSIFICATION OF NATIONAL ECONOMY ACTIVITIES rev.02 divisions have been taken into account: **01 – Agriculture, hunting and related services, 10 – Food industry, 11 – Manufacture of beverages** and for analysing the **wood industry** were taken into account the divisions of CLASSIFICATION OF NATIONAL ECONOMY ACTIVITIES rev.02: **02 – Forestry and logging, 16 – Wood processing, manufacture of wood and cork products, except furniture; Manufacture of articles of straw and other plaited vegetable materials, 31 – Manufacture of furniture.**

- **the existence of industrial agglomerations**

The **Agriculture, Forestry and Fisheries sector** has the highest share in employment at regional level (31.07 %) in 2018, agriculture being a traditional occupation of the region's inhabitants. At the national level, the region ranks first in terms of the civilian population in the **agriculture, forestry and fisheries** sectors. As regards the average number of employees, in this sector, the North-East Region occupies the 3rd place at the national level, with 13,16 %.

The sector's contribution to Regional Gross Value Added is 7.31 % (decreasing by 1.14 % compared to 2013), with 2.54 % higher than the national level. The contribution of agriculture to the county economy exceeds the value recorded at the regional level in Botoșani counties (12.28 %), Vaslui (10.69 %), Suceava (9.37 %) and Neamt (9.09 %).

In 2018, in the **Agriculture, Forestry and Fishing** sector, 2,642 *active local units* were operating in the North-East region (12.71% of the national total), which achieved a turnover of 5,431 million lei, increasing by 23, 9% compared to 2013), involved an average number of 19,581 employees and net investments of 997 million lei (increasing by 167.3% compared to 2013, but slightly decreasing compared to 2017). In terms of time, between 2013 and 2018, the number of active local units in the region increased by 19.82%. At the county level, most local units were active in Suceava County (612), followed by Iași County (480), Neamț (441).

In 2018, there is an agglomeration of active local units in sub-sector **01 - Agriculture, hunting and related services** in the following activities: *0111 - Growing of cereals (excluding rice), legumes and plants (881 active local units), 0150 - Mixed farm activities (vegetable growing combined with animal husbandry) (180 active local units), 0161 - Auxiliary activities for vegetable production (158 active local units), 0113 - Growing of vegetables and melons, roots and tubers (107 active local units), 0141 - Raising of dairy cattle (88 active local units), 0147 - Raising of poultry (73 active local units).*

In 2018, 12% of the total active local units in the **food and beverage industry** nationwide (10,333, of which 9,587 in the *food industry* and 746 in *beverage manufacturing*), are found in the North-East Region (1,240, of which 1,170 in the *food industry* and 70 in *beverage manufacturing*). Most of them operate in the counties of Suceava (289), Iași (267) and Bacău (238).

There is a concentration of companies especially in the fields: *1071 - Manufacture of bread; manufacture of cakes and fresh confectionery* (Iași, Suceava and Bacău counties), *1051 - Manufacture of dairy products and cheese* (Suceava and Botoșani counties), *1013 - Manufacture of meat products, including poultry meat* (Suceava county and Bacău county).

In 2018, the average number of employees in the **food industry and beverage manufacturing** (22,897) represents 13.07% of the national total in this category, recording an increasing trend in the period 2013-2018. The share of the sector in total employees at regional level is 4.02%.

In 2018, in the **Forestry and logging** sector, 738 active local units were operating in the North-East Region (17.97% of the national total in this category), placing the region on the 3rd place at national level. Compared to 2013, the number of active local units increased by 12.17%. At county level, most local units were active in Suceava County (361), Neamț County (143) and Bacău County (134). In the fields *0220 - Logging* and *0210 - Forestry and other forestry activities*, 69.6%, respectively 25.4% of the regional total of local active units in the Forestry and logging sector were active.

In the **wood industry** (division 16 CLASSIFICATION OF NATIONAL ECONOMY ACTIVITIES Rev.2), the North-East Region was represented in 2018 by 1,116 active local units, a value that placed the region on the 2nd place in the national context (21.85% of the total number on this category). Most local units in this industry were active in the counties of Suceava (44.18%) and Neamț (25.45%), and the fewest in the counties of Botoșani (3.49%) and Vaslui (3.58%). There is a concentration of this industry, especially in the counties in the western part of the Region, in the fields: *1610 - Cutting and planing of wood* (Suceava and Neamț counties), *1623 - Manufacture of other carpentry and joinery elements, for constructions* (jud. Suceava and Neamț), *1629 - Manufacture of other wood products; manufacture of articles of cork, straw and other materials* (Suceava and Bacău counties), *1621 - Manufacture of veneer and wooden panels* (Bacău county).

In 2018, the average number of employees in the wood industry (10,678), represents 19.6% of the national total in this category, registering an increasing trend in the period 2013-2018.

In 2018, in the **furniture sector**, there were 522 local units active in the North-East Region (increasing from 412 in 2014), of which most were operating in the counties of Iași (25.67%), Suceava (22.41 %), Bacău (19.35%) and Neamț (16.48%). A special emphasis is noted on the domains *3109 - Manufacture of furniture* (Suceava, Iași, Bacău, Neamț County) and *3101 - Manufacture of office and shop furniture* (Iași and Bacău County).

In 2018, the average number of employees in the furniture industry was 5,062, increasing compared to the level recorded in 2014 (3,886).

- **the existence of natural factors that favour the development of the sector**

The agricultural area of the North-East Region is 2,124.77 thousand ha, representing 14.52% of the agricultural area of Romania (3rd place at the national level). The value of the production of the agricultural branch by development regions, in 2018, ranks the North-East region on the *first place* for animal production with a value of 4,475 thousand lei, and on the

3rd place for the vegetal production and the agricultural branch, with a value of 9,092, respectively 13,652 thousand lei.

The North East region stands out in the following sub-domains of agriculture:

- **1st place** in the production of cherries and sour cherries (29.72%) with a production of 19 kg/tree, exceeding the national average of 17 kg/tree;
- **1st place** on the area under rye, beans, textile plants, fibre hemp, soybeans, sugar beet, potatoes - whole, dried onions, dried garlic, edible roots, vegetables are grown in the field, fresh vegetables from family gardens, green fodder from arable land, perennial fodder, alfalfa, annual green fodder, root fodder;
- **2nd place** on the surface cultivated with oats, vegetables - total, white cabbage, peppers, clover, green fodder maize and 3rd place on the one cultivated with corn grains; locul 2 la producția totală de struguri (18,05%) și locul 3 la suprafața viilor pe rod (17,92%);
- **1st place** for herds of cattle, cows, buffaloes and heifers; heifers cows and buffaloes, horses, work horses, rabbits, 2nd place in the flocks of adult laying birds and 3rd place in the flock of birds;
- **3rd place** at the no. self-propelled forage harvesters (14.49%);

The forest area in the North-East Region represents 18.26% of the total forest area in Romania, a figure that places the region on the **2nd place** at the national level, while the total volume of wood harvested in 2018 represents 28.25% of the total harvested at the whole country, placing the region in **first place** with a total of 5,499.2 thousand cubic meters. Also, at the level of development regions, in 2018, 26.0% of the total regenerated area was achieved in the North-East region (1st place).

- **the existence of associative structures**

he Ind-Agro-Pol Cluster, the BioNEst Regional Organic Agriculture Cluster and the Carpathian Furniture Cluster are active in the agri-food sector. Details of their work are included in section **1.2.3 Clusters and clustering potential**.

Of particular importance for the efficiency of the agricultural sector is the **Local Action Groups** (LAGs). There are 45 LAGs in the North East Region. These associative structures were created to enable local actors in rural areas to develop strategies and implement priority development projects aimed at sustainable and inclusive economic growth. In the context of smart specialisation, these associative structures are an important element for concentrating strategic development skills, for ensuring a permanent relationship with public and private representatives in their area of coverage.

- **the analysis of regional industrial and innovation value chains for the respective field**

Even if short supply chains are currently perceived as a strong innovative character, being in fact reinvented, at the level of Western European countries, the North-East Development

Region has an old tradition in this respect, short chains being the communist period, for example, even a survival solution for both peasants and urban consumers.³⁸

To be able to offer a real chance to the local regional products, small producers must associate, thus ensuring a greater diversity of the range of products offered, but also a diminished seasonality. This attribute can be a real competitive advantage for better promotion of local products in the local agri-food sector, including in the regional rural tourism sector.³⁹

The development of the food industry is closely related to the evolution of agricultural companies, which ensure the processing of agricultural products as a first phase.

At the level of the North-East Region, the value chain identified following the regional mechanism of entrepreneurial discovery achieved in 2020 in the agri-food field is:

Producers of agri-food raw materials (vegetable and animal) → conservation of agrobiodiversity and sustainable management of ecosystem services → **food processors** (development of new safe and healthy products, traceability and quality control of food, development of new by-products) → **packaging, storage** → **logistics & distribution** → **consumers** → **waste management** (recovery of agricultural waste for food).

Regarding the existing critical mass in the region, we mention the following simplified value chain, at the level of 2018:

Producers of agri-food raw materials (01 - Agriculture, hunting and related services) - 1,820 active local units → **Food & beverage processors** (10 - Food industry, 11 - Beverage manufacturing) - 1,240 active local units → **Distributors** (463 - Wholesale of food, beverages and tobacco) - 688 active local units → **Traders** (472 - Retail sale of food, beverages and tobacco in specialised stores) - 709 active local units → **Consumers**

Also the region includes companies that are operating in the field of 2830 - *Manufacture of machinery and equipment for agriculture and forestry*.

- **the innovative nature of the field**

The specific activities of the agri-food sector and the wood industry are part of the **low-technology** category, and it is necessary to reconfigure this field from the perspective of smart specialisation, to generate products with high added value. Compared to other sectors, the agricultural sector has low labour productivity.

- **the region's performance in the field**

At a national level, according to the *Top 100 Strongest Romanian Brands 2017* made by Unlock Market Research for Biz magazine, the ranking includes the following brands from the North-East Region: 6th place - **Dorna** (mineral water in the Coca-Cola HBC portfolio source springs in the Vatra Dornei area), 19th place - **LaDorna** (brand of LACTALIS GROUP, which uses as raw material products from Țara Dornelor), 29th place - **Bucovina** (mineral

³⁸ Source: Tanasă, L., "Sustainable short agri-food logistics chains for the innovative development of tourism and rural communities in emerging countries", in the volume "Crises and emerging markets", coordinator Alina-Petronela Haller, Romulus-Cătălin Dămăceanu, Pro Universitaria Publishing House, Bucharest, ISBN 978-606-26-0341-0, 2015, pages 191-218

³⁹ Source: Tanasă, L., Dinu Vasiliu, C., Brumă I.S., Doboș, S., "Short agri-food chains as a mechanism for sustainable development. Târgu-Neamț tourist area", in "Agrarian Economy and Rural Development - Realities and Perspectives for Romania", 7th Edition, ASE Publishing House, 2016

water captured from several sources in the Vatra Dornei area), 73rd place - **Cotnari** (Iași County), 76th place - **Agricola** (Bacău County), 93rd place - **Pambac** (Bacău County).

Regarding **traditional products**, according to the National Register of Traditional Products, between 2015 and June 30, 2020, 73 products from the North-East Region were certified, which represents 25.62% of the total registered at the national level. Products were certified in the following categories: bread, bakery and pastry products (examples: pickles, pies, cakes), vegetables (fruits: Romanian vegetable spread (zacusca), jam, syrup), milk and milk products (examples: cheese, salty cheese (telemea)), beverages (examples: brandy, fermented fruit drink), fish (examples: smoked trout), meat and meat products (examples: various smoked products).

A product from the North-East Region is in the process of acquiring protection at the level of the European Union as a Protected Geographical Indication, “**Cașcaval de Săveni**” (cheese), originating in Botoșani County, for which the documents were submitted in Brussels.

At the level of the North-East Region, **in the Agriculture, hunting and ancillary services sector**, the highest turnover in 2018 (450.67 million lei) is registered by the company PLANTAGRO-COM SRL from Vaslui County, which carries out the activity of *Cultivation of cereals (excluding rice), leguminous plants and oilseeds* (CLASSIFICATION OF NATIONAL ECONOMY ACTIVITIES 0111). In 2018, turnovers of over 100 million lei are also recorded by the economic agents INTERAGROALIMENT SRL (Bacău county), AGRICULTORUL SRL (Bacău county), COTNARI SA (Iași county), FERMADOR SRL (Iași county), COMCEREAL SA (Botoșani County).

In the **food industry**, the highest turnover in 2018 (Lei 464,602 million) is registered by the company AGRICOLA INTERNAȚIONAL SA from Bacău County, which carries out the activity of *Processing and preserving poultry meat* (CLASSIFICATION OF NATIONAL ECONOMY ACTIVITIES 1012). Turnover of over 100 million lei in 2018 also registers companies active in *Meat processing and preservation* (DOLY-COM DISTRIBUȚIE SRL, DADYCOM SRL from Botoșani county, KOSAROM SA and AVA STAR SRL from Iași county), *Manufacture of products dairy products and cheeses* (DORNA LACTATE SA from Suceava County), *Manufacture of milling products* (PAMBAC SA from Bacău County), *Manufacture of ice cream* (BETTY ICE SRL Suceava County), *Manufacture of biscuits and biscuits; manufacture of cakes and preserved pastry products* (CROCO SRL from Bacău County).

In the **beverage industry**, the highest turnover in 2018 is registered by CARPATHIAN SPRINGS SA from Suceava County with a value of Lei 229.11 million (*Production of non-alcoholic soft drinks; production of mineral waters and other bottled waters*). With a turnover between Lei 20 and 30 million, we mention BERMAS SA Suceava (*Brewing*), CASA DE VINURI COTNARI SA Iași (*Manufacture of grape wines*), PRODALCOM SA Botoșani (*Distillation, refining and mixing of alcoholic beverages*).

In 2018, at the level of the North-East Region, in the **Forestry and logging sector**, in the top of the companies with the highest turnover in the field were 3 economic agents with the object of activity 0220 - *Logging* (PAN & FOREST SRL - Jud Neamț, TECHNO FOREST SRL - Iași county, PRICOFORST SRL - Neamț county) with a total of Lei 57.33 million. The next ranked, Forestry Service SILVA-BUCOVINA SRL (Suceava County) and Forestry Service LIGNUM SRL (Bacău County) had as an object of activity 0210 - *Forestry and other forestry activities*.

In the **wood industry**, in the top of the companies with the highest turnover in 2018 were: EGGER ROMÂNIA SRL from Suceava County (Lei 1,587.29 million), HS BACO PANELS S.R.L. from Bacău county (Lei 290.7 million) with the object of activity 1621 - *Manufacture of veneer and wood panels* and BARLINEK ROMANIA SA from Bacau county (Lei 156.11 million) with the object of activity 1610 - *Cutting and planing wood*.

In the **furniture industry**, we mention the companies IMOB SRL (3109 - *Manufacture of furniture NEC*) and PROD ALCAR IMPEX SRL (3101 - *Manufacture of office and shop furniture*) from Neamț county, GLOBAL DESIGN SRL (3101 - *Manufacture of office and shop furniture*) from Suceava County, in the top 3 companies with the highest turnover in 2018 in this industry, with values ranging from Lei 25 to 28.5 million.

- **competitive and comparative advantages**

The North-East Region recorded an increase in the value of exports by 43.17% for agri-food products (sum of sections I, II, III and IV according to the Combined Nomenclature) in 2018, compared to 2013, reaching a value of Euro 150.179 million. At the national level, for the same period, the increase was only 23.03%.

In 2018, the share of exports of agri-food products in total regional exports was 4.94%. The highest contribution to the value of exports of agri-food products from the North-East Region has Bacău County (36.66%), followed by Suceava County (19.19%), Iași (17.07%).

At the regional level, Section IV has the largest share of exports - *Food, beverages and tobacco*, followed by section I. - *Live animals and animal products*.

At the county level, compared to the total value of agri-food exports of the region, there are high shares in the *Export of cereals based products and cereals* (Bacău County), *Meat and edible offal* (Botoșani County, Bacău, Suceava, Vaslui), *Meat and fish products* (Bacău county, Iași, Suceava), *Miscellaneous food products* (Iași county), *Milk and dairy products; eggs; natural honey* (Vaslui county, Suceava), *Vegetable products, fruits* (Vaslui county), *Live animals* (Suceava county).

The North-East Region recorded an increase in the value of exports by 13.20% for *wood products, excluding furniture* (section IX of the Combined Nomenclature) in 2018, compared to 2013, reaching a value of Euro 407.672 million. At the national level, for the same period, there was a decrease of about 13%. In 2018, the share of exports of these products in total regional exports was 13.41%. The region's exports accounted for 25.02% of the country's total exports in this category.

The highest contribution to the value of exports of *wooden products, excluding furniture* from the North-East Region comes from Suceava County (64.83%), Bacău County (24.45%) and Neamț County (8.56%).

Analysing chapter 94. *Furniture; lighting and other similar articles (including components)* The North-East Region registered in 2018 a value of Euro 88,664 million, decreasing by 3.64% compared to 2013. In 2018, the share of exports of these products in total exports regional level was 2.92%. The highest contribution to the value of exports of these products from the North-East Region was made by Iași County (37.59%), Bacău (17.94%), Neamț (17.52%).

- **the existence of a regional competence-base in the field**

In the North-East Region, there is a regional base of competences in the agri-food and wood industry.

At the level of pre-university education, there are 17 colleges and high schools specialising in agriculture and 17 specialising in the food industry in all component counties of the North-East Region. Also, 3 colleges are specialising in forestry, located in Neamț and Suceava counties.

The academic component in the agri-food field is well-represented at the regional level note:

"Ion Ionescu de la Brad" University of Agricultural Sciences and Veterinary Medicine has in its composition the Faculty of Agriculture, the Faculty of Horticulture, the Faculty of Animal Husbandry, the Faculty of Veterinary Medicine, as well as 2 doctoral schools: Doctoral School in Agronomy, Horticulture, Animal Husbandry, Engineering and Management in Agriculture and Rural Development and Doctoral School of Veterinary Medicine. The Faculty of Food Engineering within the **"Stefan cel Mare" University of Suceava** also trains specialists in the field of food engineering, bachelors, masters and doctoral level. **"Vasile Alecsandri" University of Bacau** has a Faculty of Engineering, which offers specialisations in the fields of Food Engineering and Chemical Engineering, with undergraduate and masters degree programs.

The "Cristofor Simionescu" Faculty of Chemical Engineering and Environmental Protection within the **"Gheorghe Asachi" Technical University** offers specialisations in the field of chemical engineering.

The Faculty of Forestry within the **"Ștefan cel Mare" the University of Suceava** offers specialisations in the field of Agricultural and Forestry Sciences at bachelors, masters and doctoral level. The faculty has 2 research laboratories: Forest Biometrics Laboratory, Fundamental Biological Processes Laboratory. The Faculty of Forestry of Suceava operates as a founding member of the **Regional Centre for Central and Eastern Europe of the European Forestry Institute (EFI CEEC)**, with contributions in three thematic areas of the network - *Forest Policy and Economy, Land Use Change and Forest ecosystem management.*

- **the existence of RDI and TT infrastructures**

In the region there are located 3 national research institutes (Institute of Biological Research Iași branch, National Institute for Research and Development in Forestry "Marin Dracea" - Câmpulung Moldovenesc Branch, Centre for Biological, Geographic and Geological Research "Stejarul" - branch of the National Institute of Research - Development for Biological Sciences (Bucharest), as well as numerous research stations subordinated to the Academy of Agricultural and Forestry Sciences "Gheorghe Ionescu-Șișești", covering a wide range of research fields: agriculture, meadows, fruit growing, viticulture and vinification, vegetable growing, raising cattle, sheep and goats, combating soil erosion, forestry, aquaculture and ecology.

Also, in the region operates the Bank of Plant Genetic Resources from Suceava, the only functional one in the country, its purpose being the exploration, collection, evaluation and conservation of plant genetic resources. The Bank is responsible for the conservation of plant germplasm in Romania and, through international collaboration, participation in ensuring global plant genetic resources, with particular importance for food security.

Within the Romanian Academy, Iași Branch, Institute of Economic and Social Research "Gh. Zane", operates the **Rural Economy Team** where fundamental research on rural space is carried out reflected through monographs, historical and historiographical research, comparative studies, rural surveys and forecasts, forecasts and strategies, complex interdisciplinary research.

"**Ion Ionescu de la Brad**" **University of Agricultural Sciences and Veterinary Medicine** has 4 research centres, 1 research institute and 12 analysis laboratories for research activity. The university obtained 20 patents in the period 2015-2018, of which 17 in agriculture and 3 in horticulture.

Also, within the Bacau Chamber of Commerce, Industry and Agriculture, the **INDTECH NORD EST Technological Information Centre** operates in the field of mechanical processing industry, wood industry, environmental protection.

- **correlation with major challenges (including societal)**

Agriculture, forestry, fishing and aquaculture, together with the industries that make up the concept of the bio-economy, are an area of specialisation of the North-East Region but must be managed from the perspective of the use of limited natural resources. These areas produce and process biological resources that must meet the demand of the population, as well as a wide range of other industries: food, furniture, clothing, footwear, construction materials, etc. The sector is correlated with the global challenge identified in Pillar 2 of the Framework Program for Research & Innovation (2021-2027) grouped in cluster 6 Food, bio-economy, natural resources, agriculture and environment.

Opportunities in the field, such as the growing demand for agri-food products, the under-exploited regional agricultural potential, the development of value chains and thematic platforms for product sales, the establishment of agricultural cooperatives and the need for innovation, development, performance, lead to future goals such as improved access of local producers and domestic products on the national market; investments for technological development; encouraging biodiversity and standardising product quality.

As biological resources are a key contribution to the EU economy, to improve the sustainability of agri-food products, through the Circular Economy Action Plan, the European Commission will propose the introduction of a target on reducing food waste as a key action in the future "Farm to consumer" strategy, which will comprehensively address the food value chain. Besides, to improve the sustainability of food distribution and consumption, the Commission is considering replacing disposable packaging, crockery and cutlery with reusable food products.

TEXTILE SECTOR

For the analysis of the **textile sector**, the NACE divisions rev.02 were taken into account: 13 - Manufacture of textiles, 14 - Manufacture of clothing and 15 - Tanning and dressing of leather; manufacture of travel and leather goods, harnesses and footwear.

- **the existence of industrial agglomerations**

In the **textile and clothing industry** in the North-East Region, in 2018, there were 1,023 active local units (234 active in the manufacture of textiles and 789 in the manufacture of clothing), increasing by 12.3% compared 2013. At the national level, the North-East Region ranks 2nd in terms of the number of active local units in the Manufacture of Garments (15.03%), an activity with a long tradition in this area of the country, and on the 3rd place in terms of the number of active local units in the Manufacture of textile products (15.16%).

At the regional level, most active local units are found in the counties of Iasi (27.08%), Neamț (22.09%) and Bacău (17.79%). A concentration is observed in the fields: 1413 - Manufacture of other articles of clothing (Iași, Bacău and Neamț counties), 1392 - Manufacture of articles made of textiles, except clothing and underwear (Iași and Bacău counties), 1419 - Manufacture of other wearing apparel and accessories NEC (Neamț and Iași counties), 1439 - Manufacture by knitting or crocheting of other articles of clothing (Neamț county), 1431 - Manufacture by knitting or crocheting of stockings and haberdashery (Neamț county).

At the national level, the North-East Region was in **first place in 2018**, in terms of the number of active local units specialized in 1310 - Preparation of fibres and spinning of textile fibres, 1431 - Manufacture by knitting or crocheting of socks and haberdashery, 1391 - Manufacture of footage by knitting or crocheting.

Regarding the average number of employees in sector 14 - *Manufacture of clothing*, the North-East Region ranked 1st nationally with a percentage of 18.50% (23,125), and 4th for 13 - *Manufacture of textiles* with a 16.60% (6,684).

In the activity of ***Tanning and finishing of leathers; manufacture of travel and leather goods, harnesses and footwear***, in 2018, in the North-East Region, there were a number of 205 active local units, with a percentage of 13.43% (4th place nationally). Regarding the number of active local units ***producing footwear***, in 2018, there were 172 local units active in the field of 1520 - Footwear manufacturing, and most of them were concentrated in Vaslui (61) and Suceava (60) counties.

The average number of employees in Tanning and finishing of leather; the manufacture of travel and leather goods, harnesses and footwear amounted to 6,290 in 2018.

- **the existence of associative structures**

The ASTRICO North-East Săvinești Textile Cluster operates in the textile sector. Details of its work are included in section ***1.2.3 Clusters and clustering potential***.

- **analysis of regional industrial and innovation value chains for the respective field**

At the level of the North-East Region, the value chain identified following the regional entrepreneurship discovery mechanism achieved in 2020 in this field is:

Manufacturers and suppliers of raw materials → developers of advanced technologies and processes in textiles (technological ecodesign, eco-design, zero waste technological processes) → **textile producers** (fashion/ innovative textiles, functional textiles - eg. medical textiles, smart textiles, textiles Digital Fashion (intelligent design, digital textiles printing) → **marketing and distribution** → consumers/users (individuals, companies, public entities) → **management of textile waste** from the production activity or the use by consumers (creation of new materials).

However, at the level of the North-East Region, the small number of raw materials existing in the region, increased the import dependence of the industry, resulting in an incomplete value chain.

Regarding the critical mass existing in the region, we mention the following simplified value chain, at the level of 2018, incomplete (important links are missing as weavers, supply manufacturers and manufacturers of specific technological machines and equipment):

Manufacturers (13 - *Manufacture of textiles*, 14 - *Manufacture of wearing apparel*) - 1,023 active local units → **Distributors** (4641 - *Wholesale of textiles*, 4642 - *Wholesale of clothing and footwear*) - 178 active local units → **Traders** (4751 - *Retail sale of textiles in specialized stores*, 4771 - *Retail sale of clothing in specialized stores*) - 943 active local units → **Consumers**.

- **the innovative nature of the field**

The sector considered **low technology** faces the acute need for medium and highly qualified staff (mentality and competition of sectors with better wage levels), the low appetite of economic agents for information and investment in innovative and technologically advanced solutions, very high competition for access directly to the market, the reconversion of this economic sector, the reinvention and integration in global value chains being necessary to maximize the economic performance of this sector.

- **the region's performance in the field**

The companies with a turnover of over 100 million lei at the level of 2018 that operate in 13 - *Manufacture of textile products* are RIFIL SA (Neamț county), ROLANA TEX SRL (Botoșani county) YARNEA SRL (Neamț county) with activity 1310 - *Preparation of fibres and spinning of textile fibres* and CARREMAN ROMÂNIA SRL (Botoșani county) with activity 1320 - *Fabric production*, and in 14 - *Manufacture of clothing* are FORMENS SRL (Botoșani county) and EUROTUX COMPANY SRL (Iași county) having CAEN 1413 - *Manufacture of other wearing apparel (excluding underwear)*.

In 1520 - *Manufacture of footwear*, only RHINO WORK S.R.L. (Bacău county) has a turnover of over 100 million lei, but in the top are companies like MARELBO PROD-COM SRL (Suceava county), GARTEK SRL (Vaslui county), DENIS SRL (Suceava county), HUSANA SA (Vaslui County).

- **competitive and comparative advantages**

Although they have a low added value, the exports of textiles and textile articles (section XI according to the Combined Nomenclature) of the region reached the value of 786.603 million euros in 2018 (19.38% of the national total in the same category), registering an increase by 22.8% in 2018, compared to 2013. At the national level, for the same period, the increase was only 9.15%.

In 2018, the share of exports of textiles and textile articles in total regional exports was 25.87%. The highest contribution to the value of exports of textiles and textile articles from the North-East Region has Botoșani County (35.06%), followed by Neamț County (21.57%), Bacău (18.29%). The chapters with the highest value of exports at the regional level are: 62. *Articles of apparel and clothing accessories other than knitted or crocheted* (EUR 324.925 million), 55. *Synthetic or man-made staple fibres* (EUR 122.726 million), 51. *Wool* 79.990 million euros), 61. *Articles and accessories of knitted clothing* (73.697 million euros).

Exports of footwear and parts thereof (Chapter 64 according to the Combined Nomenclature) represent 2.52% of total regional exports and 5.81% of the national total in the same category. The highest contribution to the value of exports is made by Vaslui and Bacău counties with a percentage of 53.77%, respectively 35.17%.

- **the existence of a regional competence-base.**

In the North-East Region, there is a regional base of competences in the textile field.

At the level of pre-university education, there are 12 colleges and high schools specializing in the textile and leather industry in all the component counties of the North-East Region.

From the perspective of the academic dimension, the region has the Faculty of Industrial Design and Business Management within the **Technical University "Gheorghe Asachi"**, which has 11 laboratories and a doctoral school and the Faculty of Visual Arts and Design within the **National University of Arts George Enescu in Iasi**.

"Cristofor Simionescu" Faculty of Chemical Engineering and Environmental Protection within the **"Gheorghe Asachi" Technical University** offers specializations in the field of Chemical Engineering, Engineering and Management.

The Faculty of Chemistry within the University "Al. I. Cuza" from Iași, also trains specialists in the field of chemistry, a bachelor's, master's and doctoral level. "Vasile Alecsandri" the University of Bacău has a Faculty of Engineering, which offers specializations in the fields of Chemical Engineering and Industrial Engineering, with bachelor's and master's degree programs.

- **the existence of RDI and TT infrastructures**

The **FIBRESIN Institute for Research and Technological Engineering**, the **National Research-Development Institute for Technical Physics**, the **"Petru Poni" Institute of Macromolecular Chemistry** operate in the region.

The **FIBRESIN Institute for Research and Technological Engineering** is a research institute with a tradition in the chemical and textile field with multiple award-winning innovations and inventions. The object of activity in the textile field is the production of synthetic yarns and fibres obtained from polypropylene granules, of different thicknesses and twists, in various colours.

The **National Research-Development Institute for Technical Physics Iași** carries out research-development and innovation activities in the field of magnetic materials with new structures and physical properties, devices, devices and equipment based on them, new methods of obtaining and new techniques for characterizing materials and non-destructive testing, electrical and magnetic separation methods, materials and special devices with applications in engineering, medicine and biotechnology. The applications resulting from this research are developed in partnership with research institutes and universities within projects in national, European and international research programs, but also with industrial partners. According to the activity report for 2018, the institute filed 5 patent applications, was granted 3 patents and 1 patent was capitalized.

"Petru Poni" Institute of Macromolecular Chemistry, Iași, has laboratories such as Laboratory of functional polymers, Laboratory of natural polymers, bioactive and biocompatible materials, Laboratory of inorganic polymers, hybrid and complex systems, Laboratory of electroactive polymers and plasma chemistry, **Chemistry Laboratory polymer physics, Laboratory of polymer and polymeric materials physics, Laboratory of applied research and technology transfer**. According to the activity report of the institute for 2019, the institute filed 6 patent applications; it was granted 8 patents.

Reginnova NE Association, founded in Iasi in 2018, is a non-profit association for innovation of sustainable development and community support. The main goal is to stimulate innovation and increase the competitiveness of the textile sector in the North-East Development Region of Romania and to promote its capabilities and interests for sustainable development at both national and European level.

- **correlation with major challenges (including societal)**

Textiles, a sector with a long tradition in the region, is currently characterized by the low added value of products and on a Lohn production, being threatened by the Asian competition on the textile market and the European one of the manufacturing countries, by the emigration of qualified personnel. However, given the regional expertise and experience, the large number of companies

active in the field, the textile industry can be revived to be competitive on the European market, by developing digital solutions for links in the textile value chain, by developing partnerships to achieve of innovative products with high added value.

As textiles are included in the list of product categories with the highest pressure on the use of main raw materials and water and rank fifth in terms of greenhouse gas emissions, the European Commission will adopt a Circular Economy Action Plan, a set of measures that include the application of ecodesign measures; providing incentives and support for "product as a service" business models; stimulating the sorting, reuse and recycling of textiles; guidelines for achieving high levels of separate collection of textile waste.

ICT SECTOR

According to the decision of the Member States of the Organization for Economic Co-operation and Development (OECD), the ICT sector is defined as a combination of production and service activities of industries that take over, transmit and display data and information electronically.

The analysis of the ICT sector took into account, according to NACE rev.02, division 26 - Computer and electronic and optical equipment industry for the production sub-sector and section J - Information and communications (which includes divisions 58 - Publishing activities, 59 - Motion picture, video and television program production, audio recording and music editing activities, 60 - Broadcasting and broadcasting activities, 61 - Telecommunications, 62 - Information technology service activities, 63 - computer services).

- **the existence of industrial agglomerations**

In 2018, out of the national total of 845 local units active in the ICT production sub-sector, 91 (10.77%) operate in the North-East Region, a number that places the region on the 4th place at the national level. Most are based in Iasi County - 55%. Concentrations can be noticed in the fields: 2651 - Manufacture of instruments and devices for measurement, verification, control, navigation (Iasi county) and in 2620 - Manufacture of computers and peripheral equipment (Iasi county, Bacău, Suceava).

In 2018, the average number of employees was 2,211, increasing compared to 2013 and representing 6.23% of the national total for the same category.

Regarding **information and communication services**, in 2018, 2,297 active local units are registered, a number higher by 46.30% compared to 2013. In terms of the number of local units active in information and communications at the level of national (25,957) region ranks 4th. In terms of the number of employees, most active local units fall into the category of micro-enterprises (0-9 employees). Most active local units are located in Iasi County (1,089), the predominant object of activity being 62 - Information technology service activities.

At the regional level, in Iasi County, there are 62.6% of the local units operating in 6201 - Custom software development activities (customer-oriented software), 51% of the local units operating in 6202 - *Consulting* activities in information technology in Iasi County, 40% of local units operating in 6311 - *Data processing, administration of web pages and related activities*, 36.36% of 6110 - *Telecommunications activities via cable networks*.

In 2018, the turnover in the information and communications services sector was 3,208 million lei (increasing by 89.37% compared to 2013), the value of net investments is 273 million lei (increasing by 152.78% compared to 2013), exceeding the national growth of 91.93%. The average number of employees, increasing compared to 2013, is 14,980 (8.21% of the national total in the same category).

- **the existence of associative structures**

The ICT Innovative Regional Cluster EURONEST IT&C Hub, ICONIC - Interactive Cluster of New Media Industry and the Regional Innovative Cluster of Molecular and Structural Imaging North-East-IMAGO-MOL are active in the ICT sector. Details of their work are included in section 1.2.3 Clusters and clustering potential.

- **analysis of regional industrial and innovation value chains for the respective field**

At the level of the North-East Region, the value chain identified following the regional entrepreneurship discovery mechanism achieved in 2020 in this field is:

Research and development of ICT technologies and products (hardware & software) -> Companies/Manufacturers of technologies and hardware products (manufacture of computers, robotics, electronic products and communications equipment) → Companies / Manufacturers of software (ICT programs and applications) → ICT service providers (networking, marketing, maintenance, data processing consultancy, design & administration of platforms, portals & web pages and related activities) → Users: individuals (gamification of education, innovative technologies in the learning-assessment process, etc.), public entities (digitization of public services, smart city, efficient use of resources), companies (processes digitized industries: Industry 4.0, Machine Learning, Internet of Things, artificial intelligence; digital textiles; ICT for automotive; e-health).

Regarding the existing critical mass in the region, we mention the following simplified value chain, at the level of 2018:

Manufacturers of technology and products (Division 26 - Computer and electronic equipment industry) – 91 active local units and service providers (61 - Telecommunications, 62 - Information technology services, 63 - Information service activities) - 1,876 active local units → Distributors (4651 - Wholesale of computers, peripheral equipment and software 4652 - Wholesale of electronic and telecommunications components and equipment - 96 active local units → Retailers (4741 - Retail sale of computers, peripheral units and software in specialized stores, 4742 - Retail sale of computer telecommunications in specialized stores) - 235 active local units → Users (individuals, public entities, companies).

- **the innovative nature of the field**

Division 26 - Manufacture of computers and electronic and optical products is part of the high-tech industry category. The following divisions are part of knowledge-intensive services: 58 - Publishing activities, 59 - Film production activities, video and television programs; audio recording and music editing activities, 60 - Broadcasting and transmission of programs, 61 - Telecommunications, 62 - Information technology service activities and 63 - Computer service activities. Thus, the sector can be considered a sector with a catalytic role for other economic activities, whose reconversion from outsourcing to own production, will play an important role in the next period.

- **the region's performance in the field**

- From the point of view of the turnover value, in the ICT sector, the following companies stand out: - for 2620 - Manufacture of computers and peripheral equipment: CYBERNET SRL from Bacău County and I.Q.PLUS SRL, ARTIS IT SOLUTIONS SRL from Jud. Iasi, with turnovers between 10.74 and 6.4 million lei;
- ELSACO ELECTRONIC SRL Botoșani county with a turnover of 108.06 million lei (2651 - *Manufacture of instruments and devices for measurement, verification, control, navigation*) and AE ELECTRONICS SA Bacău county (2611 - *Manufacture of electronic subassemblies*), TOTALGAZ INDUSTRIE SRL Bacău county (2651 - *Manufacture of instruments and devices for measurement, verification, control, navigation*) with turnovers around 45 million lei;

- for 62 - Information technology service activities on the first positions are companies from Iași county. The highest turnover has AMAZON DEVELOPMENT CENTER (ROMANIA) SRL (239.14 million lei, CAEN 6201 - Custom software development activities (customer-oriented software)), followed by SCC SERVICES ROMANIA SRL, 62 million lei CAEN 6209 - Other information technology services activities) and NESS ROMANIA SRL, CENTRIC IT SOLUTIONS ROMANIA SRL, CRF HEALTH SERVICES SRL with turnovers between 80.39 and 35.84 million lei and CAEN 6201 - Custom software development activities (customer-oriented software);
 - for 63 - Information service activities on the first positions are companies from Iași county. The highest turnover has VEO WORLDWIDE SERVICES SRL (37.50 million lei, CAEN 6399 - Other information service activities NEC), SIGNIVIS SRL (18.30 million lei, CAEN 6312 - Web portal activities), INNOVATE INFORMATIONAL TECHNOLOGY SRL (6.17 million lei, CAEN 6311 - Data processing, administration of web pages and related activities).
- **competitive and comparative advantages**

Analyzing the international trade of IT services (telecommunications, IT and information services) at the national level, because no statistical data were identified at the regional level, it is observed that exports of IT services had a value of 3,115.7 million euros, representing 16, 9% of the total value of Romania's service exports. The main markets were: Germany, the United Kingdom, France and the Netherlands. The balance of trade registered a trade surplus of 1,398.8 million euros.⁴⁰

In the North-East Region, in 2018, the graduates with a diploma in university education (bachelor, master, postgraduate courses, doctorate and postdoctoral programs of advanced research) in the field of information and communication technologies (ICT) were in some 961 persons, the region ranking 4th nationally. In the period 2013-2018 the number of graduates registered an increasing trend.

- **the existence of a regional base of competences**

At the level of pre-university education, there are 75 colleges and high schools specializing in Mathematics and Informatics in all counties in the North-East Region.

From the perspective of the academic component, the region has a strong academic infrastructure of education:

- **“Gheorghe Asachi” the Technical University** of Iași with the Faculty of Automatics and Computers, the Faculty of Electronics, Telecommunications and Information Technology and the Faculty of Electrical Engineering, Energy and Applied Informatics, the **Faculty of Mechanics**, all with undergraduate, master's and doctoral educational programs;
- **“Alexandru Ioan Cuza” the University** of Iași with the Faculty of Informatics, with bachelor's, master's and doctoral educational programs, the Faculty of Economics and Business Administration with the specialization Cybernetics, statistics and economic informatics, the **Faculty of Mathematics** with the specializations Mathematics and Mathematics applied, Faculty of Physics with specialization in Computer Physics.
- **“Ștefan cel Mare” the University** of Suceava, with the **Faculty of Electrical Engineering and Computer Science** and the **Faculty of Mechanical Engineering, Mechatronics and Management** with undergraduate, master's degree educational programs; - "Vasile Alecsandri" the University of Bacău, with the Faculty of Engineering (Information Technology and Mechatronics - bachelor, Advanced Mechatronics and Applied Information Technology in Industry - master)⁴¹ and the Faculty of Sciences (Informatics - bachelor, Applied Informatics and Applied Informatics in Science and Technology - master).

⁴⁰ http://www.consiliulconcurentei.ro/wp-content/uploads/2020/01/comertul_exterior_al_romaniei_si_barierele_de_intrare_pe_principalele_piete_europene-1.pdf

⁴¹ Including those with bachelor's degree in other country

- **the existence of RDI and TT infrastructures**

Numerous technology transfer centres and research-development-innovation organizations operate in the region.

The Institute of Theoretical Informatics within the Romanian Academy, Iași Branch, conducts advanced research in the following fields: development of algorithms, methods and linguistic resources for natural language processing; development of formal models and methods for computing and distributed systems, mobile agents, reversible calculation; development of algorithms and methods for analyzing the voice signal with applications in modelling prosodic elements and identifying emotions transmitted by voice; development of methods and algorithms for motion analysis and structural analysis of video sequences in a scene; development of methods, algorithms and techniques for analysis, processing, filtering, segmentation and compression of images and signals; natural and biological inspiration optimization algorithms with applications in image processing; development of algorithms and methods for editing linguistic atlases and dialectal texts; analysis and modelling of complex interaction using process algebras; development of computational models inspired by molecular biology; calculability, complexity, causality in membrane systems with multiset rewriting; development of formal models and methods for computing and distributed systems, mobile agents; systems with fuzzy logic and neural networks.⁴²

The GEA CTT @ IAȘI Technology Transfer Center supports the capitalization of new technologies and scientific results in the field of advanced materials, biotechnologies, information technology and communications. The centre develops collaboration relations between the actors from the research-development sector and the businessmen from the priority industries for the North-East Region and Romania.

Technology Transfer Center (TECHNICAL UNIVERSITY Gheorghe Asachi Iași) - CTT POLYTECH carries out project management and monitoring activities that carry out research-development, innovation, technology transfer, design, consulting, expertise and services at the Technical University „Gheorghe Asachi ”Iași, in the field of information and telecommunications technology (ICT), energy, environment and climate change, eco-technologies and advanced materials.

Technology Transfer Center - Gemini CAD Systems (CTTGCS) Iasi is a technology provider for industries working with textiles, composites or leather, the centre's activity is based on research, development and implementation of software, hardware and workflow solutions for clothing, furniture and automotive, with a focus on computer-aided design and production.⁴³

The iTransfer Technology Transfer Center (CTT-iT) created by the Faculty of Informatics within the “Alexandru Ioan Cuza” University, aimed at information and communication technologies (Internet of the Future; Technologies, tools and methods for software development) and the IT security of infrastructures and services.

The Digital Innovation Zone is a non-profit association established in December 2019, with multi-partner regional cooperation, the representative for the six counties in North East Romania: universities, chambers of commerce, clusters in priority sectors, private partners with expertise in the ICT sector, employment agencies, in connection with partners and service providers at the national level. Its objective is to provide ongoing support for assessing and improving the digitalization of SMEs and local governments in the Northeast Region and supporting them in identifying appropriate technological solutions, partners or sources of funding to implement the solutions they have. need to increase its competitiveness, innovation index and digitization index.r

⁴² <https://acadlasi.org/institut/institutul-de-informatica-teoretica/>

⁴³ Source: <https://www.geminiCAD.com/>

- **correlation with major challenges (including societal)**

The development of the IT sector in the North-East region has had an accelerated evolution lately, which creates an opportunity in the sector specialization in this field. There is also a growing interest in the spread of the circular economy and the digital transformation in the industry, of intelligent water management systems, of basing public policies on better monitoring of environmental factors. The sector is correlated with the global challenge identified in Pillar 2 of the Framework Program for Research & Innovation (2021-2027) grouped in **Cluster 4 Digital, Industry and Space**.

Also, in the North-East region, there is the interest of local actors for the development of biosecurity solutions, cybersecurity, big-data and product traceability, actions related to those targeted by **Cluster 3 Civil Security for society**.

Whereas electrical and electronic equipment continues to be one of the fastest-growing waste streams in the EU, with annual growth rates of 2%, with less than 40% of e-waste being recycled in the EU, the European Commission's initiative for circularity in the field of electronics will promote a longer product life. We mention actions such as ecological design, the "right to repair", the introduction of a common charger, improving the collection and treatment of waste electrical and electronic equipment.

HEALTH SECTOR

For the analysis of the health, sector was taken into account, according to NACE rev.02: division 21 - *Manufacture of basic pharmaceutical products and pharmaceutical preparations, group 325 - Manufacture of medical and dental devices, apparatus and instruments, division 86 - Activities related to human health, class 2660 - Manufacture of equipment for radiology, electrodiagnostic and electrotherapy*.

- **the existence of industrial agglomerations**

In the pharmaceutical industry, out of the 136 active local units existing at the national level in 2018, in the North-East Region only 13 (5th place at the national level) carried out their activity, distributed as follows: 8 in Iași County, 4 in Neamț County and 1 in Bacău County. 11 active local units, out of the 13, had as an object of activity 2120 - Manufacture of pharmaceutical preparations, the region being on the 4th place at the national level (10.38%).

Analyzing the average number of employees in this activity, the North-East Region is on the 2nd place at the national level, with a percentage of 17.71% of the total number of employees in this category (1,770). Compared to 2013, the increase is 4.86%.

Regarding the **production of medical and laboratory devices, devices and instruments**, the region rank 4th nationally, with 162 active local units (12.09%), concentrated in Iași, Suceava, Bacău.

In the activities related to **human health**, 1,961 active local units operate in the region (11.68%), a figure that places the region on the 3rd place at the national level. Compared to 2013, the increase is 97.88%. A concentration is observed in the object of activity 8622 - Specialized healthcare activities (36.82%), followed by 8623 - Dental care activities (30.19%) and 8690 - Other human health activities (18.41 %).

Analyzing the number of private and state health units (hospitals, polyclinics, medical dispensaries, TB sanatoriums, etc.) in the North-East Region, it is found that it is in second place (after Bucharest-Ilfov), holding 14.8 % of the total sanitary units at the national level, in 2018. The total number of sanitary units in the North-East Region in 2018 was 9,117 units. Iași County was in the first place, with some 2,653 units (29.1%), followed by Suceava County (1,863 units). A large number of health units in Iași County, with diversified specializations, is because the city of Iași is a traditional medical

university centre - where the "Grigore T. Popa" University of Medicine and Pharmacy, "Sfântul Spiridon" University Hospital and centres operate, research in this field.

The manufacture of equipment for **radiology, electrodiagnostic and electrotherapy** in the North-East Region is represented by 2 local units active out of the 29 existing at the national level, both being located in Bacău County. existența structurilor asociative.

The North-East Innovative Molecular and Structural Imaging Regional Cluster-IMAGO-MOL, the BioROne Biotechnology Cluster and the BioNEst Regional Biological Agriculture Cluster are active in the region. Details of their work are included in section **1.2.3 Clusters and clustering potential**.

- **analysis of regional industrial and innovation value chains for the respective field**

At the level of the North-East Region, the value chain identified following the regional entrepreneurship discovery mechanism achieved in 2020 in this field is:

Research & Development & Innovation: development of new medical products (e.g. advanced materials, equipment) and pharmaceuticals (raw materials, ingredients, active substances, pharmaceuticals - design, formulation, testing, quality control), new medical services (e.g. e-Health, monitoring and prevention, diagnostics (laboratory analysis, imaging, etc.)), treatment (drug therapies, intervention procedures), medical recovery) → Production of medical materials, devices and technologies (medical equipment, new materials and products, IT applications, AI, etc.) → Distributors of medical equipment/pharmaceuticals → Service providers medical (hospitals, clinics, medical offices, pharmacies) → User of medical services (health education, counselling) → Waste management in medical units (hazardous, non-hazardous).

Regarding the critical mass existing in the region, we mention the following simplified value chains, at the level of 2018:

Manufacturers (2120 - *Manufacture of pharmaceutical preparations and 2110 - Manufacture of basic pharmaceutical products*) - 13 local active units → Distributors (4646 - *Wholesale of pharmaceutical goods*) - 131 local active units → Traders (4773 - *Retail sale of pharmaceutical products in stores specialized*) - 747 active local units → Users.

Manufacturers and distributors (2660 - *Manufacture of equipment for radiology, electrodiagnostic and electrotherapy and 3250 - Production of medical and laboratory devices, apparatus and instruments*) - 164 active local units → Traders (4774 - *Retail sale of medical and orthopaedic articles in speciality stores*) - 81 active local units → Users the innovative character of the domain.

The pharmaceutical industry, as well as the manufacture of equipment for radiology, **electrodiagnostic and electrotherapy**, are part of the category of **high technology industries**. Also, activities related to human health are part of the category of knowledge-intensive services. With high added value, the sector needs skilled labour.

- **the region's performance in the field**

Antibiotice SA is the largest employer in the field, at the regional level, with an average number of 1,415 employees and a turnover of 365.3 million lei in 2018, having as object of activity NACE 2110 - *Manufacture of pharmaceutical products* the base. It is the main manufacturer of generic anti-infective drugs in Romania and world leader in the production of the active substance Nystatin, for which it also has the USP Reference Standard - international quality recognition standard.

FITERMAN PHARMA SRL registers the highest turnover at the regional level in 2018, in the activity 2120 - *Manufacture of pharmaceutical preparations* (131.85 million lei). It is a dynamic Romanian manufacturer in the medical field: manufacturer of medicines, medical devices, food supplements and derma cosmetics.

PLANTAVOREL SA MEDICINAL PLANTS RESEARCH AND PROCESSING CENTER is a branded unit in the field of research and manufacture of phytotherapeutic products, food supplements, nutritional, cosmetic and spa products from medicinal plants, aromatics, cereals, vegetables, fruits and bee products.

In the activities related to human health, at the regional level, **ARCADIA HOSPITAL SRL** and **ARCADIA POLICLINIC SRL** from Iași, occupy the first 2 positions in terms of turnover (amounting to 76.20 million lei), being followed by **DORNA MEDICAL SRL** from Vatra Dornei, Suceava County.

- **competitive and comparative advantages**

The exports of pharmaceutical products (Chapter 30 according to the Combined Nomenclature) of the region register the value of 44.993 million euros at the level of 2018, representing 5.96% of the national total related to this category and 1.48% of the total regional exports. Iasi County contributes 71.76% to the region's pharmaceutical exports. In terms of time, in the period 2013-2016, there is a sharp increase in exports for pharmaceuticals (over 300%), reaching the value of 55.6 million euros. After the decline in 2017 (42.77 million euros), in 2018 there is a slight increase of 5.81%.

- **the existence of a regional competence-base**

In the region, there is a university study program in the analyzed field:

University of Medicine and Pharmacy "Gr. T. Popa "from Iași, offers complete university study programs (bachelor, master, doctorate) within the Faculty of Medicine, the Faculty of Dentistry and the Faculty of Pharmacy. Also, the Faculty of Medical Bioengineering offers bachelor's and master's specializations in the fields of health and applied engineering sciences. University of Medicine and Pharmacy "Gr. T. Popa " from Iași registers on 01.10.2019 several 417⁴⁴ doctoral students enrolled in the doctoral studies program of the IOSUD Doctoral School UMF Iași.

The Faculty of Biology within the "Alexandru Ioan Cuza" University of Iași organizes bachelor's, master's and doctoral studies in the field of biology, having in its portfolio specializations such as: Biology and Biochemistry (bachelor's degree), Microbial and cellular Biotechnologies and Molecular Genetics (master's degree).

Also, "**Vasile Alecsandri**" the **University of Bacau** provides university courses in Biology - within the Faculty of Sciences, Medical Biology (master), Medical Biology - Program credited by the Order of Biochemists, Biologists and Chemists in the Romanian Health System (master) and the field of Chemical Engineering - specializations Biochemical Engineering (bachelor's degree) and Chemistry of bioactive molecules (master's degree) within the Faculty of Engineering.

"APOLLONIA" University of Iași, offers the specializations of Bachelor of Dentistry, Dental Technique, General Medical Care, Balneophysiokinetotherapy and Recovery within the Faculty of Dentistry.

- **the existence of RDI and TT infrastructures**

The **Iași Branch of the National Research-Development Institute for Biological Sciences** operates in the region, with the Department of Experimental and Applied Biology.

The Institute of Macromolecular Chemistry "Petru Poni" Iași, institute of excellence of the Romanian Academy, has a tradition of over fifty years in fundamental and applied research in the field of organic and inorganic chemistry, chemistry and physics of polymers⁴⁵. There are 10 departments within IMCPP. The Advanced Research Center for Bionanoconjugates and Biopolymers

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<https://www.umflași.ro/ro/universitate/conducereauniversitatii/Rector/Raportul%20receptorului/Raportul%20Rectorului%202018-2019.pdf>

⁴⁵ Source <https://www.icmpp.ro/ro/about.php>

addresses priority thematic areas focused on innovative materials, products and processes and health.

Within the **University of Medicine and Pharmacy “Gr. T. Popa ”** 16 research centres and platforms were established⁴⁶. The Advanced Center for Research - Development in Experimental Medicine - CEMEX, is the first research centre in experimental medicine in Romania, with advanced research infrastructure for the study of human diseases in animal models and the second centre of its kind in Europe. CEMEX offers interdisciplinary animal research facilities, with state-of-the-art technologies and imaging solutions; preclinical research on therapeutic agents (pharma) and the development of new products, transferable to industrial partners.

Within the Romanian Academy, Iași branch, **the Biomedical Research Center operates.**

From the category of companies with RDI activity in the region, we mention **ANTIBIOTICE SA**, with the Research Center for Antibiotics, within which all the development processes of generic drugs are carried out: pharmaceutical development; development of analytical methods, validation of analytical methods; clinical testing - phase I; implementation in production. The Center for Research and **Processing of Medicinal Plants PLANTAVOREL S.A.** aims to research medicinal plants to highlight new active principles, usable in therapeutics, manufacture of phytotherapeutic products for human use, cosmetics and food supplements based on natural active principles.

The Regional Institute of Oncology, through the **Center for Fundamental Research and Experimental Development in Translational Medicine / TRANSCEND** aims to consolidate, develop and enhance the biomedical research capacity of the institute.

- **correlation with major challenges (including societal)**

At the level of the North-East Region, the pharmaceutical biotechnology sector represents a niche of specialization, thus ensuring a high potential in combating this societal challenge. Relevant actors in this field contribute to the development of new treatments and medicines for the prevention and treatment of various diseases, including through the use of biotechnologies. There is also interest in developing biosecurity and e-health solutions. The sector is correlated with the global challenge identified in Pillar 2 of the Framework Program for Research & Innovation (2021-2027) grouped in cluster 1 **Health**.

TOURISM SECTOR

For the analysis of the tourism sector, NACE rev. 02 divisions were taken into account: *55 – Hotels and other accommodation facilities, 56 – Restaurants and other food service activities and 79 – Activities of tourist agencies and tour operators; other booking and tourist assistance services.*

- **existence of services aggregations**

In 2018, in the Hotel and restaurants sector, 3,241 local active units (11.73% of the national total) were active in the North-East Region, which achieved a turnover of 2.047 million LEI (increasing by 121.5% compared to 2013), net investments of 177 million LEI (increasing by 35.11% compared to 2013). Of the 3,241 units, 79.27% were included in the category *Restaurants and other food services activities and 20.73% in the category Hotels and other accommodation facilities*. Most of the units operate in Suceava County (846 - 26.10% of the total), followed by Iași, Bacău and Neamț.

⁴⁶ <https://www.umflasi.ro/ro/cercetare/Centre-si-platforme>

Regarding the average number of employees in this sector, in 2018, the North-East Region ranked fifth at the national level with a percentage of 11.05%. Compared to 2013, the number has increased by 80.27% to 19,914.

In the field of **Activities of tourist agencies and tour operators; other tourist assistance services** in 2018, at the level of the North-East Region, there were 256 local active units, mainly in the counties of Iași, Bacău, Suceava. 59% of them had 7911 – *Activities of tourist agencies as activity object*.

Analysing the tourist reception structures in the North-East Region, their number increased by 45.79% in 2018, compared to 2013. The 1,057 structures place the region on the 4th place at the national level. The structures with the highest regional share are the **agri-tourism boarding houses** (43.33%) and the **tourist pensions** (22%), located mainly in the counties of Suceava and Neamț, the region being ranked 3rd at the national level from their point of view.

The accommodation capacity in operation at the level of the North-East Region increased by 18.55% in the 2013-2018 period, but it remained, on average, at a level of 10% of the total capacity of accommodation in operation at the national level. The *usage index* level (number of nights booked in the region in relation to the accommodation capacity) records the value of 27.5%, with an increasing trend. *The number of nights booked* in the North-East Region increased by 52% in 2018, compared to 2013. *The number of arrivals* in the North-East Region is increasing, too, with 66.29% more in 2018 than in 2013, reaching 1,257,205 tourists, but their level remains around 9.76% of the total arrivals at the national level. *The average duration of stay* (the number of nights booked in the region relative to the number of tourists' arrivals) in the region between 2013 and 2018 is approximately 2 nights/tourist.

Regarding the number of **museums and public collections** and their **number of visitors**, the North-East Region ranks second at the national level, with a percentage of 16.67% (2017) and 14.6% respectively, which means 2,571,166 visitors (2018).

- **the existence of natural and anthropic factors that favour the development of the sector**

The North-East Region has a high tourist potential due to its favourable conditions, the beauty of places, air purity, waters, mountain areas in the counties of Bacău, Neamț and Suceava, as well as the inestimable cultural and religious heritage.

The natural tourist potential of the region consists of 3: the 13 national parks of Romania, namely the Călimani Mountains National Park, Cheile Bicazului National Park – Hășmaș and the Ceahlău National Park, as well as a natural park – Vânători-Neamț and the 129 natural areas that have become “Natura 2000” sites (SCI – habitat protection areas and SPA – areas for birds' protection) – 14 in Bacău, 17 in Botoșani, 30 in Iași, 31 in Suceava, 20 in Neamț, 17 in Vaslui, some of which are "trans county" (sites whose boundaries extend over two or even three counties in the North-East region and neighbouring regions). At the same time, the Ținutul Zimbrului (Ozana Valley area – Vânători Natural Park, Neamț county) and Țara Dornelor are certified by the National Authority for Tourism (NAT) as *eco-tourism destinations*, joining the other three certified areas of the country (Maramureș, Zărnești – Piatra Craiului, Țara Hațegului – Retezat). The development potential of *balneo-therapeutic tourism* is highlighted by the abundance of mineral springs, which could help to develop the *wellness and spa* tourism but integrated with the territory through a diverse range of activities specific to each area, taking into account the high value of the average duration of a tourist stay in these resorts. These include: **Vatra-Dornei, Slănic Moldova, Târgu Ocna, Bălțătesti, Oglinzi, Negulești, Căcica**, etc. Also, the *climateric resorts* **Câmpulung Moldovenesc, Durău** and **Gura Humorului** (Suceava), **Sărata Băi** – where rheumatic diseases are treated (Sărata commune, Bacău county), Moinești (Bacău county) and

the **Nicolina** balneoclimateric resort (Iași county) stand out. The *anthropic tourist heritage* in the North-East Region includes 4,003 monuments of international, national and local interest, according to the heritage list of the Ministry of Culture from 2015⁴⁷. *Religious monuments* form the “traditional backbone” of tourist attractions in the North-East Region, the monasteries from Northern Moldova: Voroneț, Humor, Moldovița, Probota, Sfântul Ioan cel Nou from Suceava, the churches from Pătrăuți and Arbore, and the Sucevița Monastery have been included in the UNESCO World Heritage list. There are 3 clear areas of cultural tourism at regional level – Iași, Suceava, and Neamț, of which in Iași there is the largest number of cultural goods. *The tourist heritage is complemented by the art and folk tradition heritage that has favoured the development of ethnographic tourism in all counties of the region.* *Business and event tourism* is practiced mainly in county towns and in resorts, but most of all in Iași. Mountain tourism benefits from development conditions in the North-East Region due to the potential offered by Eastern Carpathians and mountain resorts where mountain sports can be practiced: Vatra Dornei, Gura Humorului, Piatra Neamț, Durău, Sucevița, Mălini, Câmpulung Moldovenesc, Slănic Moldova and Cârlibaba. In the region, *agritourism* is based on the development of numerous traditional certified products and products associated with a brand image (the "Produced in Bucovina" brand). This aspect supports the “Smart Specialisation through Educated People and Local Products” Slogan .

It is noted that Iași County has the largest number of historical monuments in the North-East Region, representing 41% of all monuments. At the national level, Iași County occupies ranks third (1,634 monuments), after Bucharest (2,651) and Cluj County (1,791).

Also, in the North-East Region, there are many events of tourist interest (theatrical, music festivals, literature, fairs, folk festivals, etc.).

- **existence of associative structures**

The Regional Tourism Cluster – the Bucovina Association for Tourism (Suceava) and the “Ținutul Neamțului” Cluster (Piatra Neamț) are active in the region. Details about their activity are included in section **1.2.3 Clusters and clustering potential**.

- **analysis of regional industrial value and innovation chains for the respective domain**

At the level of the North-East Region, the value chain identified as a result of the regional entrepreneurial discovery mechanism carried out in 2020 in this field is:

Tourist infrastructure holders, sightseeing administrators → **services and packages developers** → **tourist service providers** (individuals, professional associations, companies) → **intermediaries/tourist agencies & tour operators** (marketing, branding, ICT solutions for tourism) → **tourists**

As far as the critical mass that exists in the region is concerned, we mention the following simplified value chain, at the level of 2018:

Tourist infrastructure holders (division 55 – *Hotels and other accommodation facilities*) – 672 local active units & **Museums and public collections** – 127 local active units → **Travel Agencies & tour operators** (7911 – *Activities of tourist agencies* and 7912 – *Activities of tour operators*) – 238 local active units → **Tourists**

- **the innovative character of the domain**

Tourism is a sector where the link between **research and development** is unclear, falling within the category of sectors that **do not create technology but use it**. In the context of smart specialisation,

⁴⁷ <http://www.cultura.ro/lista-monumentelor-istorice>

diversification of the sector's activities would consist of associating it with other sectors that are catalysts for innovation, such as IT&C, creative and cultural industries, environmental protection, agri-food (healthy food), bio-technologies (medical recovery and special nutrition).

- **the region's performances in the field**

In the activity of *Hotels and other similar accommodation facilities (CANE 5510)*, among the top companies with the highest turnover in the region in 2018, there are: COMPLEX HOTELIER UNIREA SA (Iași county) – 21.89 million LEI, PALAS INTERNAȚIONAL RESORT SRL (Iași county) – 21.07 million LEI, MATELO COM SRL (Suceava county) – 19.53 million LEI, DORNA TURISM SA (Suceava county) – 14.57 million LEI, MER-DUM SRL (Suceava county) – 13.85 million LEI.

In the activity of *Restaurants (CANE 5610)*, among the top companies with the highest turnover in the region in 2018, there are: SET-CORPORATION SRL (Suceava county) – 60.67 million LEI, STRONG MND CORPORATION S.R.L. (Suceava county) – 54.24 million LEI, CORSINI RISTORANTE SRL (Suceava county) – 37.96 million LEI.

- **competitive and comparative advantages**

In the North-East Region, the arrivals of foreign tourists in tourist accommodation structures with tourist accommodation facilities increased by 66.30% in 2013-2018, reaching a number of 1,257,205 persons (representing 9.74% of the national total).

Analysing in detail, at the level of agri-tourism boarding houses there is a 91.44% increase of foreign tourists arrivals (201,438 persons) in 2013-2018 period, placing the region on the 3rd place at the national level with a percentage of 17.17%. Regarding the tourist pensions, the region registers a number of 166,258 foreign tourists (an increase of 79.99% between 2013-2018), placing the region on the 3rd place at the national level with a percentage of 13.47%.

In the North-East Region, the **Bucovina tourist destination** has become a brand, being an appreciated tourist destination, included in most of the tourist circuits in Romania. Monuments, monasteries, natural reservations, traditional architectural elements, gastronomic offer, a rich calendar of traditional fairs and folklore events, and air purity⁴⁸ makes the region a landmark on the tourist map of Romania. Also, a brand image has been developed for the **Ținutul Zimbrului** destination, a destination that brings together natural beauty with cultural and spiritual values.

- **the existence of a regional competence base in the respective field**

In the North-East Region, there is a regional competence base for tourism.

At the level of secondary education, there are 40 colleges and high schools with the tourism and food specialisation in all the counties of the North-East Region.

There are also university programmes in the region in the field of tourism at bachelor, master, and doctoral level, dedicated to both skills training and research, which can generate innovation in different segments of this sector. We recall here:

- **“Alexandru Ioan Cuza” University from Iași**, with the Faculty of Economics and Business Administration (Economy of Trade, Tourism and Services), Faculty of Geography and Geology (Tourism and Regional Development), Faculty of History (Heritage and Cultural Tourism), Faculty of Physical Education and Sport (Kinetic Therapy and Special Motricity)
- **“Grigore T. Popa” University of Medicine and Pharmacy from Iasi**, with the Faculty of Medical Bioengineering (Balneophysiokinetotherapy and Recovery), Faculty of Medicine (Nutrition and Dietetics)

⁴⁸ <https://www.pensiuneinbucovina.ro/attractii-turistice-bucovina/ro>

- **“Ion Ionescu de la Brad” University of Agricultural Sciences and Veterinary Medicine from Iasi**, with the Faculty of Zootechnics, specialisation in Engineering and Management in Food Service and Agritourism.
- **“Apollonia” University from Iasi**, Faculty of Dental Medicine (Balneo-physio-kinetotherapy and Recovery)
- **“Ștefan cel Mare” University from Suceava**, with the Faculty of History and Geography (Geography of Tourism, Tourism and Regional Development), Faculty of Economic Sciences and Public Administration (Trade, Tourism and Services Economics, Management of Trade, Tourism and Services Companies, Planning of New Tourism Products and Destination Management), Faculty of Physical Education and Sport (Kinetic Therapy and Special Motricity, Kinetoprophylaxis, Recovery and Body Remodeling, Balneophysiokinetotherapy and Recovery, Nutrition and Dietetics), Faculty of Food Engineering (Food Control and Expertise, Food Engineering, Hygiene Management, Food Quality Control and Food Health Assurance)
- **“George Bacovia” University from Bacău**, with the Faculty of Economics, Legal and Administrative Sciences (The Economy of Trade, Tourism and Services).
- **“Vasile Alecsandri” University from Bacău**, with the Faculty of Movement Sciences, Sports and Health, with Kinetotherapy specialisation field.
- **existența unor infrastructuri CDI și TT** existence of RDI and TT infrastructures

“CE-Mont” Centre for Mountain Economics of the “Costin C. Kiritascu” National Institute of Economic Research (NIER). Its objectives include studying the potential, economic effects and limitations of rural tourism development and mountain agritourism in correlation with the effects on the purpose of fixing young generations to continue traditional agro-zootechnical activities, by supplementing incomes and increasing the quality of life in mountain villages; developing local studies to underpin strategies for the sustainable development of mountainous rural areas.

- **correlation with major challenges (including societal challenges)**

The North-East Region benefits from a special cultural heritage, which can be better preserved and promoted, including through the development of smart marketing and promotion solutions, the promotion of eco-tourism, tourism for a healthy lifestyle and business tourism. This sector is linked with the global challenge identified in Pillar 2 of the Framework Programme for Research & Innovation (2021-2027) grouped in Cluster 2 **Culture, Creativity and Inclusive Society**.

ENERGY SECTOR

For the analysis of the energy sector, the NACE division rev.02 was taken into account: 35 - Production and supply of electricity and heat, gas, hot water and air conditioning.

- **the existence of industrial agglomerations**

The number of local units active in the energy sector in the North-East Region was in 2018, 63. Most local units active in this sector operated in 3511 - Electricity production (24 of which 7 in Iasi County, 6 in Botoșani county, 4 in Neamț and Suceava counties), 3530 - Supply of steam and air conditioning (19 of which 5 in Suceava county, 3 each in Bacău county, Iași, Neamț, Vaslui).

The 63 active local units achieved, in 2018, a turnover of 990 million lei and net investments worth 62 million lei.

In the North-East Region, in 2018, the average number of employees in this activity is 4,647 persons.

- **the existence of natural factors that favour the development of the sector**

According to the list of total powers by counties and by type of energy source⁴⁹ published by TRANSELECTRICA in the section Integration in SEN of power plants from renewable sources, on 28.05.2020, the total power on the component counties of the region as:

County/ E-SRE	Total power ⁵⁰ (MW)						
	classic power plant	cogeneration	aeolian	photovoltaic	hydro ⁵¹	biogas	biomass
Bacău	20,509	59,400	0,230	18,877	0	0	0
Botoșani	12,600	0	0,030	3,289	0,800	0	0
Iași	0	3,600	118,000	5,439	0	0	0
Neamț	0	0	0	0,814	215,077	0	7,755
Suceava	1,200		0,600	0,755	8,883	2,978	57,825
Vaslui	0	0	373,830	0,058	0	0,500	0
Total NE	34,309	63,000	492,690	29,232	224,760	3,478	65,580

Moldavian plateau places the 2 counties on the map of the wind energy potential in Romania. Vaslui County is on the 3rd place at the national level, after Constanța and Tulcea in terms of total power for the wind energy source.

Also, the hydrographic network of Neamț County allows the capitalization of the hydropower potential of the county. Neamț County is on the 1st place at the national level in terms of total power for the hydro energy source.

Suceava County is on the 1st place at the national level in terms of total powers for a biomass energy source.

- **the existence of associative structures**

The Iasi Builders' Cluster and the RENEW Cluster are active in the region.

The RENEW cluster is an environmental cluster, oriented towards new and renewable energy sources with the Technology 4.0 - IT&C component. The founding members include local authorities, academia, companies, catalysts.

The main objectives of the cluster are the development of innovative solutions on the energy-environment thematic area; development of the innovative energy production-use circuit based on microgeneration from RES at the place of consumption; developing strategies to increase productivity and competitiveness for cluster members; developing integrated solutions to reduce energy losses; developing bioeconomic models to reduce CO2 emissions.

Details about the activity of the Iasi Builders Guild Cluster are included in section **1.2.3 Clusters and clustering potential**.

- **analysis of regional industrial and innovation value chains for the respective field**

At the level of the North-East Region, the value chain identified following the regional entrepreneurial discovery mechanism achieved in 2020 in the field of SUSTAINABLE ENERGY is:

Research & Development & Innovation (sustainable ecological raw materials, ecological product design, innovative technologies) → **Production systems and technologies** (technologies for capture, production and recovery of energy from renewable sources, components, smart meters, smart grids

⁴⁹ <https://www.transelectrica.ro/documents/10179/32316/7productie21.pdf/f0e4a9cc-42e5-4d07-9189-e421659664c7>

⁵⁰ The data presented are those registered after 2009, after the application of ANRE order 59/2013.

⁵¹ Only micro-hydro power plants that appeared after 2009 are included in the hydro section.

and applications and storage solutions) → Primary production energy (extraction, generation, storage) → Transport (reduction of network losses) → Service provider (local / regional / national energy company) → Distribution (reduction of network losses) → Use (optimization of plant operation and flows technological (refurbishment, automation of energy efficient processes / equipment / energy recovery & storage solutions), reduction of energy consumption (education + consumption behavior + intelligent infrastructure).

Regarding the critical mass existing in the region, the value chain is incomplete.

- **the innovative character of the field**

The energy sector is a sector of activity with great economic potential, a **high technology sector**, in which the development of new activities will be an important element in the future.

- **the region's performance in the field**

The companies in the region with the highest turnover in 2018 from division 35 - Production and supply of electricity and heat, gas, hot water and air conditioning are VEOLIA ENERGIE IAȘI S.A. (3530 - Supply of steam and air conditioning, 104.29 million lei), GAZ EST SA Vaslui (3522- Distribution of gaseous fuels through pipelines, 86.93 million lei), THERMOENERGY GROUP S.A. Bacău (3530 - Supply of steam and air conditioning, 65.42 million lei).

In the top of companies in the region with the object of activity 3511 - Electricity production according to the value of turnover for 2018, the first 5 places are occupied by MEVCER SRL Vaslui (18.44 million lei), INTO ENERGY SRL Iași (4, 58 million lei), GREEN ENERGY FARM SRL Iași (3.62 million lei), RIG BIOMASS SRL Iași (2.90 million lei), ECOTERRA BIOGAS SRL Suceava (2.45 million lei).

- **competitive and comparative advantages**

The North-East region has a high level of energy independence.

- **the existence of a regional base of competences**

At the level of pre-university education, there are 11 colleges and high schools with electrical specialization in the counties of Bacău, Botoșani, Iași, Neamț and Suceava.

In the region, there are complete undergraduate, master's, doctoral programs in the fields of Electrical Engineering, Energy Engineering, Engineering and Management, Applied Engineering Sciences.

- **"Gheorghe Asachi" Technical University with the Faculty of Electrical Engineering, Energy and Applied Informatics** (Power Electronics and Electrical Drives, Electrical Systems, Applied Informatics in Electrical Engineering, Electrical Systems Engineering, Energy Management, Economic Engineering in Electrical, Electronic and Energy, Applied Informatics in Electrical Engineering - bachelor's degree; Energy Conversion and Motion Control, Advanced Electrical Systems, Energy Management - Environment Management of Energy Systems, Engineering and Management in the Context of Globalization - master; Electrical Engineering, Energy Engineering - PhD)
- **"Ștefan cel Mare" the University of Suceava with the Faculty of Electrical Engineering and Computer Science** (Energy Management, Energy and Information Technologies - Bachelor; Modern Systems for Energy Process Management, Advanced Techniques in Electrical Machines and Drives - Master; Electrical Engineering - PhD)
- **"Vasile Alecsandri" the University of Bacau** with the Faculty of Engineering (Industrial Energy - bachelor's degree; Modern equipment and technologies in energy - master's degree)

- **the existence of RDI and TT infrastructures**

We shall mention here the following research-development-innovation organizations:

- **INCERC - Iași Branch - National Institute for Research-Development in Constructions, Urbanism and Sustainable Urban Territorial Development**, scientific research and technological development unit with activity in the field of renewable energy;
- **The research centre "Energy, Mechatronics and Informatics" within the University "Vasile Alecsandri" Bacau**, has as research subdomains: optimizing the operation of energy installations; measurements and automation; computer modelling, simulation and programming; hardware systems and computer networks;
- **The aerodynamics and hydrodynamics laboratory, within the "Gheorghe Asachi" Technical University, Iași**, with research directions: aerodynamics of profiles; new aerodynamic profiles for wind turbines; hydrodynamics of kinetic turbines; experimental validation of numerical models in aerodynamics and hydrodynamics;
- **ENERED efficient and sustainable energy research platform, within the "Gheorghe Asachi" Technical University, Iași**
 - **correlation with major challenges (including societal)**

The North-East region has a high level of energy independence, including the use of renewable energy sources, but energy efficiency (rational use of energy) is an area where improvement measures are needed. At the level of the North-East Region, the Sustainable Urban Mobility Plans (SUMP) are in the implementation stage, where the local public authorities have finalized these documents (e.g. Iași, Suceava, Bacău). The urban mobility plan is the instrument of territorial strategic planning through which the territorial development of the localities in the periurban/metropolitan area is correlated with the mobility and transport needs of people, goods and goods. (Law no. 350/2001, Annex 2). The sector is correlated with the global challenge identified in Pillar 2 of the Framework Program for Research & Innovation (2021-2027) grouped in cluster 5 Climate, energy and mobility.

ENVIRONMENTAL SECTOR

For the analysis of the average sector, the NACE divisions rev.02 were taken into account: 36 - Water collection, treatment and distribution, 37 - *Wastewater collection and treatment*, 38 - *Waste collection, treatment and disposal; recyclable materials recovery activities*, 39 - *Decontamination activities and services*.

- **the existence of industrial agglomerations**

In the field of water distribution; sanitation, waste management, decontamination activities, the number of active local units in the North-East Region in 2018 was 330. Regarding the county distribution, in Iași county, there were 25.5% active, and in Bacău county 23.6 % of these. The turnover achieved, in 2018, was 1,386 million lei (increasing by 44.52% compared to 2013), the region is on the 6th place at the national level, and the net investments were of 154 million lei (3rd place at the national level with 13.07% of the total).

Most active local units carry out waste collection, treatment and disposal activities; activities for the recovery of recyclable materials (254), of which 101 local active units carry out activity 3811 - *Collection of non-hazardous waste, followed by 76 local active units carrying out activity 3832 - Recovery of sorted recyclable materials*.

The average number of employees in 2018 in this sector of activity was 12,832⁵², a figure that places the region in 4th place nationally.

- **analysis of regional industrial and innovation value chains for the respective field**

⁵² According to INS, Observation Unit: Other units in the budget sector, Enterprise, Public administration units, Local public administration units, Craft and consumer cooperation units

At the level of the North-East Region, the value chains identified following the regional entrepreneurial discovery mechanism achieved in 2020 in this field are:

WATER value chain

Research & Development & Innovation (sustainable ecological raw materials, ecological product design, innovative technologies) → **Production of systems and technologies** (Innovative wastewater recirculation / reuse technologies, advanced water quality monitoring and control systems (incl. Priority and emerging pollutants), components, pipelines, pumping stations, water tanks, smart meters, networks and smart applications, sensors, and storage solutions) → Capture and extraction of water from natural sources → **Service provider** (regional operator) → **Drinking water treatment** (monitoring, quality control) → **Transport and Distribution** (smart networks and applications , network loss reduction, smart meters) → **Use: Industry** (optimization of plant operation and technological flows: refurbishment, process automation / loss reduction / recovery, water reuse & storage, consumption reduction and efficiency); households (consumer education, consumption reduction / efficiency + smart infrastructure) → **Wastewater collection** (sewerage network) → **Wastewater treatment** (recirculation and reuse in industry and agriculture, nutrient recovery, sludge management from sewage treatment plants) → **Issue**

WASTE value chain / CIRCULAR ECONOMY

Waste generation (from agriculture and animal husbandry, industry, household consumption, hazardous waste) → **Service / collection providers** (local, regional, national operators) → **Waste processing and treatment** (advanced ecological sorting and treatment technologies) → **Management waste**: recovery of components and / or secondary materials from products / waste → reuse and recovery of waste through recycling or other operations (optimization of integrated waste management systems) → traceability of recycled waste (digital technologies for tracking the route of new products) → **Research & Development & Innovation**: ecological design (intelligent, modular, recyclable eco-design, with regional identity); **development of new materials/products/services**; innovative production models (smart factoring: flexible production, zero waste, low water use, renewable energy, digitization); **innovative consumption models** (sustainable products - prevention of single-use, use of second-hand products, maintenance and repairs, including with recovered spare parts) → **Prevention or reduction of quantities of waste generated** (minimization at source of waste generated, education + behavior consumption + smart infrastructure).

- **the innovative nature of the field**

According to Eurostat, this is a sector of activity with high economic potential, not yet exploited, a high technology sector, in which the development of new activities will be an important element in the future.

- **the region's performance in the field**

The companies with the highest turnover in 2018, at division level 38 - Waste collection, treatment and disposal; activities for the recovery of recyclable materials are COVIAL-CVA SRL Iași (3832 - Recovery of sorted recyclable materials, 103.52 million lei), SALUBRIS SA Iași (3811 - Collection of non-hazardous waste, 70.91 million lei), COLECT METAL SRL Iasi 3832 - Recovery of sorted recyclable materials, 67.07 million lei).

In the activity of wastewater collection and treatment (NACE 3700), the highest turnover in 2018 is held by SC BLUECO WASTE SRL Bacău (2.34 million lei), followed by EUROMARKET WATER & WASTEWATER ENGINEERING SRL Iași (1.77 million lei) and LITEANU SRL Vaslui (1.72 million lei).

In the activity of water capture, treatment and distribution (NACE 3600), APAVITAL SA Iași registers the highest turnover in 2018 (159.25 million lei).

- **the existence of associative structures**

The RENEW Cluster is active in the region, an environmental cluster, oriented towards new and renewable energy sources with the Technology 4.0 component - IT&C.

- **the existence of a regional base of competences**

At the level of pre-university education, there are 25 colleges and high schools specializing in environmental protection in all the component counties of the North-East Region.

In the region there are complete undergraduate, master's, doctoral programs in the fields of Environmental Science, Environmental Engineering, Environmental Management, Biology, Chemical Engineering. We shall mention here:

- **"Alexandru Ioan Cuza" University of Iași**, with the Faculty of Biology (Ecology and environmental protection - bachelor's degree, Environmental counselling - master's degree), Faculty of Geography and Geology (Environmental geography - bachelor's degree, Current environment and sustainable development - master's degree) "Ion Ionescu de la Brad" University of Agricultural Sciences and Veterinary Medicine from Iași with the Faculty of Horticulture (Environmental Engineering - bachelor's degree);
- **"Ștefan cel Mare" the University of Suceava** with the Faculty of Forestry (Ecology and environmental protection - license);
- **"Vasile Alecsandri" the University of Bacău with the Faculty of Engineering** (Engineering and environmental protection in industry - bachelor's degree, Environmental protection management in industry - master, doctoral studies in environmental engineering) and the Faculty of Sciences (Ecology and environmental protection - bachelor's degree, Valorization biological resources and environmental protection - master);
- **„Gheorghe Asachi" Technical University of Iași with the Faculty of Chemical Engineering and Environmental Protection "Cristofor Simionescu"** (Engineering and environmental protection in the industry, Inorganic substances engineering and environmental protection - license, Environmental Management, Management, waste treatment and recovery and Environmental Management and sustainable energy, Environmental quality control - master, Environmental Engineering - PhD).

- **RDI and TT infrastructure**

Regarding research-development-innovation organizations and technology transfer centres, we shall mention:

- **CERNESIM** - Integrated Center for Environmental Science Studies for the North-East Development Region
- **Research Center "Environmental Engineering and Impact Assessment"** and Laboratory of analysis and control for environmental factors - LACMED, accredited by RENAR, within the Technical University "Gheorghe Asachi", Iasi
- **INCDSB Bucharest** - Iași Branch - Iași Institute of Biological Research
- **INCDSB Bucharest** - Piatra Neamț Branch - CCB "Stejarul" Piatra Neamț
- **INCERC - Iași Branch - National Institute for Research-Development in Constructions**, Urbanism and Urban Sustainable Territorial Development
- **"Petru Poni" Institute of Macromolecular Chemistry**
- **Environmental Resources and Biotechnologies Research Center** within the "Vasile Alecsandri" University of Bacău

Also, the **POLYTECH Technology Transfer Centre** carries out project management and monitoring activities that carry out research-development, innovation, technology transfer, design, consulting, expertise and services at the Technical University „Gh. Asachi "Iași, in the field of information and

telecommunications technology (ICT), energy, environment and climate change, eco-technologies and advanced materials. The center obtained, between 2009-2018, 103 patents.

- **correlation with major challenges (including societal)**

The **environment** field benefits from the existence of innovative solutions for the efficient use of resources, from regional actors interested in realizing partnerships of educational programs, advanced research, related infrastructure and access to international education and research networks. Among the opportunities, we mention the reorientation of waste management strategies (circular economy), the attractive investment climate, the existence of ideas for demonstration-experimental projects that can be used, digitization. Objectives such as extending the level of environmental education to all levels are proposed in the future; increasing investments in clean technologies and equipment and implementing circular economy mechanisms in companies; development of digitization solutions, warning and monitoring techniques accessible to the general public; increasing the collaboration between the private environment and the research-development-innovation organizations, for the development of innovative solutions.

The action plan on the circular economy provides for measures to prevent and manage plastic, packaging and construction waste.

Given that packaging waste from Europe reached a record level in 2017 (173 kg per capita, the highest level ever recorded), for the reuse / recycling of packaging on the EU market in a viable way From an economic point of view, the European Commission will strengthen the essential requirements for packaging and take measures to reduce (excessive) packaging and packaging waste, design packaging to be reused and recycled, and reduce the complexity of packaging materials.

To increase the use of recycled plastics and contribute to a more sustainable use of plastics, the Commission will address the issue of the presence of microplastic particles in the environment through actions such as: restricting intentionally added microplastic particles, developing and harmonizing measurement methods of unintentionally released microplastic particles, labelling, standardization, certification and regulatory measures for the unintentional release of microplastic particles.

Regarding the construction waste, the Commission will pay particular attention to insulating materials, as they generate an increasing flow of waste.

From the point of view of the efficient use of water resources, the new Water Reuse Regulation will encourage approaches that respect the principles of circularity regarding the reuse of water in agriculture. The European Commission will facilitate the reuse and efficient use of water, including in industrial processes.

CHAPTER 3 – DEVELOPING A GLOBAL VISION FOR THE FUTURE OF THE REGION

The Smart Specialisation Strategy received input from local actors (through the process of consultation and entrepreneurial discovery), which ensures a high level of ownership. Through the active Academic Advisory Commission and the Regional Innovation Consortium, the strategy and selection criteria of the projects in the portfolio were agreed on before the first projects were submitted.

The development of the North-East Smart Specialisation Research and Innovation Strategy was carried out in order to:

- achieve a better concentration of development resources and focus investments in the North-East Region in areas with competitive advantages and high added value;
- better use the region's skills and RDI facilities and correlate them with the technological reality of the regional industry;
- increase the share of applied research and focus it on priority areas, through better collaboration/cooperation with the regional business environment and progressively increase the funding for research and innovation attracted from private sources;
- bring the regional economic and innovation system out of isolation, propelling it to a trans-regional and international perspective;
- identify projects of strategic importance for the region to steer the financial flow towards maximising the impact of initiatives aimed at systematically integrating and exploiting competitive resources (human capital, creativity, clusters, technology transfer, etc.).

In this respect, the Strategy contains proposals for concrete actions aimed at:

- a) identifying the regional competitiveness determinant drivers, which can compete to give a "new blast" to the regional economy in sectors and niches with specialisation potential, focusing in particular on:
 - human resources (harnessing local intelligence - higher qualifications and lifelong learning are essential for the development of the knowledge-based economy),
 - R&D infrastructure and its use at optimum and high efficiency parameters (a prerequisite for sustainable development),
 - public-private partnership (indispensable for the implementation of R&D results and the absorption of structural funds),
 - industrial clusters (engine for the growth and exploitation of cutting-edge technologies).
- b) concentrating resources on key priorities and development needs by linking them to national and European development strategies and funding sources;
- c) defining of a continuous entrepreneurial discovery mechanism capable of stimulating concrete initiatives for the governance and implementation of the North-East RIS3

Vision and Mission Statement

Status-quo in 2020 (moment t0, scenario without intervention)

Currently, the North-East Region holds competitive advantages at the European level, mainly through low value-added products, whose main advantage is their price (lower, due to cost advantages). Innovation is still quartered in certain areas of excellence, without its impact being disseminated to all companies in the economy. Development (especially technological) is hampered by the quality of the training and availability of the labour force, as well as the insufficient development of business

networks and clusters. As such, in a scenario without intervention, the current regional economic profile would be unsustainable in the long run, further blocking the Region on the last place at national level in terms of the GDP per capita.

Development vision for 2027 (time t1, scenario with intervention)

The North-East Region creates, transfers and implements innovation systematically, sustainably and with societal benefits, in the following key areas – agri-food & wood industry, textiles, health, tourism, ICT, energy and the environment.

Regional strengths to be harnessed in order to implement the vision:

- Existing resources (human, material, financial);
- Regional skills in innovation, achieving and trading knowledge and technologies;
- Already available support infrastructures;
- Tradition in education and research, accumulated expertise in key economic sectors;
- The brand of traditional products of the region.

The missions of the main organisations in the Region for the implementation of the vision (through specific interventions in the period t0-t1)

- Innovative enterprises, business networks and regional clusters – generate innovative ideas, assimilate innovation, disseminate it to other companies within the sector, coagulate resources and means in value chains with regional impact and global effect;
- The education system – builds up a workforce connected to the latest technologies and promotes a culture of innovation and entrepreneurship among young generations, stimulates the orientation of economic activities towards new technologies, according to market requirements;
- The entrepreneurial ecosystem – promotes the use of creativity to solve the complex problems of the regional ecosystem, supports the emergence of new start-ups in areas with specialisation potential, provides support services for entrepreneurs and intrapreneurs in order to incubate and accelerate new economic activities;
- RDI and technology transfer structures – broker the link between companies' needs for technological development and improving their own economic performance, by providing knowledge (research, design, innovation, and specialised consultancy services, stock of intellectual property rights, etc.) and the material base for research, modelling, testing, demonstration, prototyping (laboratories, pilot stations, etc.) through direct and indirect services offered on a regular and professional basis;
- Public administration – supports the development of RDI and technology transfer infrastructures, lobbies to attract funding sources, contributes to the animation, creation and functioning of innovative environments (innovation incubators, business accelerators, clusters, living lab, technology transfer centres, technological information centres, scientific and technological parks, industry liaison offices, etc.); contributes to the monitoring of the smart specialisation strategy.

The key-values that will drive regional actors to fulfil their mission are:

- Partnership
- Creativity
- Work
- Responsibility

"Smart specialisation through educated people and local products" **Slogan**

CHAPTER 4 – IDENTIFICATION OF SMART SPECIALISATION NICHES AND PRIORITIES

In the context of the revision of the North-East RIS3 for the preparation of the 2021-2027 programming period, North-East RDA conducted a new (third) edition of the **Regional Entrepreneurial Discovery Process-EDP “North-East Connect”**.

The methodology for the entire process was developed on the basis of the methodological guidelines included in **Annex no. 2 – North-East RIS3 Methodological Guidelines** and the EDP methodology recommended by the Ministry of Public Works, Development and Administration and validated by the Joint Research Center of DG Regio-Commission. Carried out in several stages, the process has been adapted to the online environment as a result of the COVID-19 epidemic and preventive measures taken at country level.

The process aimed at revalidating areas and niches with specialisation potential, updating the vision, targets and priorities of intervention, necessary to be implemented in 2021-2027 for each area of specialisation, updating the monitoring and evaluation system based on analysis of regional innovation potential, analysis of competitive and comparative advantages for sectors with specialisation potential and skills mapping as set out in **Annex no. 3 – Areas of competence**.

After running 12 entrepreneurial discovery workshops, the following smart specialisation areas and niches for North-East Region were identified:

Domain	Niches
AGRI-FOOD & WOOD INDUSTRY	Smart-farming Agricultural products for non-food purposes Environmental impact of agriculture Biosecurity and food safety Forestry sector and timber industry
ENERGY SECTOR	Alternative energy sources Energy efficiency
ENVIRONMENT SECTOR	Water (innovative solutions) Air (innovative solutions) Circular economy
TEXTILE SECTOR	High-tech processes and applications in textiles Technical and functional textiles Digital fashion
IT&C SECTOR	Industrial modernisation

	Cybersecurity Traceability and Big Data Smart-city and smart-village Development of new IT&C products hardware & software and test solutions
HEALTH SECTOR	Medical and pharmaceutical biotechnologies Precision medicine Prevention medicine e-Health Biosecurity (veterinary collaboration – human medicine)
TOURISM SECTOR	IT&C solutions for tourism Creative marketing and promotion Healthy lifestyle tourism Eco-tourism Business Tourism Cultural tourism

After defining priority areas and specialisation niches, the purpose of the EDP workshops had focused on defining the innovative development vision and the necessary implementation strategies. For this purpose, the following elements were proposed for each sector with specialisation potential: Priority strengths, opportunities and challenges that are listed in **Annex no. 4 – North-East Connect Results**.

Based on the elements identified in the sectoral SWOT analyses, together with the participants in EDP workshops we set sectoral ambitions and innovative development objectives for each area with SMART potential.

AGRI-FOOD & WOOD INDUSTRY	ENERGY SECTOR	ENVIRONMENT SECTOR	HEALTH SECTOR	TEXTILE SECTOR	IT&C SECTOR	TOURISM SECTOR
<p>T: Promotion of regional products in North-East Region through marketing on all sales channels of local agricultural and non-agricultural products, at least 50 %</p> <p>SO1: Improving access to finance for all categories of farmers producing or using innovation.</p> <p>SO2: Encourage/promote the development of biodiversity and standardise indigenous products according to European standards</p> <p>SO3: Measures to certify agricultural and non-agricultural products and their quality in accordance with European standards</p>	<p>T: Development of the energy sector in the North-East Region through the use of green energy and energy efficient technologies to improve the quality of life of the population</p> <p>SO1: Expanding the level of education for sustainable energy at all levels through partnerships between education – the private environment (e.g. organising internships, study visits and extracurricular activities)</p> <p>SO2: Developing and implementing innovative solutions for energy efficiency (reducing energy consumption and minimising greenhouse</p>	<p>T: Ensuring a clean environment for the current and future generation by adopting best environmental practices with economic development and social progress, together with the national targets assumed by the European Ecological Pact</p> <p>SO1: Expanding the level of education for the environment at all levels through partnerships in the educational environment – the private environment for organising internships, study visits and extracurricular activities</p> <p>SO2: Increasing investments in clean technologies and equipment and</p>	<p>T:(a) Health for all: Have a healthier population and be able to treat our patients in the region</p> <p>(b) Health as a driving force for innovation-generating economic development, (sales) health services on the basis of which to create an income-educing regional health industry</p> <p>SO1: Development of public-private partnerships – educational environment, education and training programmes for prevention and early detection of diseases</p> <p>SO2: Increasing investment in medical and pharmaceutical innovation through the use of advanced,</p>	<p>T: North-East Region to become a European textile technology hub</p> <p>SO1: Enhancing collaboration between academia/research and industry/private environment (curricula, internships, technology transfer).</p> <p>SO2: Developing solutions to digitise links on the textile value chain (production, marketing & sales, promotion)</p> <p>SO3: Developing local, regional and international partnerships to identify and implement innovative solutions</p>	<p>T: In 10 years, the North-East Region becomes the national and European pole of ML, AI, Data Management and Cybersecurity, by using regional human capital</p> <p>SO1: Increasing the degree of specialisation and the number of human resources.</p> <p>SO2: Digitisation of companies and public administration and infrastructure development for Data and Cybersecurity</p> <p>SO3: Development of innovative and competitive SMEs in the field, including through the creation of R & D departments and investment in technological</p>	<p>T: North-East Region to become a more attractive/tendering region, more visible and accessible to tourists</p> <p>SO1: Discovering and harnessing the potential of all geographical areas of the region, by developing innovative products and packages</p> <p>SO2: Digitisation of the value chain in tourism (applications, marketing, promotion, etc.)</p>

	<p>gas emissions)</p> <p>SO3: Development and implementation of energy production solutions at the place of consumption, by harnessing the potential of existing renewable energy resources in the region</p>	<p>implementation of circular economy mechanisms in companies</p> <p>SO3: Development of digitalisation solutions, warning and monitoring techniques available for general public</p> <p>SO4: Increasing collaboration between the private sector and R & D-innovation organisations, in order to develop innovative solutions</p>	<p>greener and more efficient technology lines</p> <p>SO3: Digitalisation (internal and external) of health institutions and the uniformisation of information flows</p>		<p>infrastructure</p> <p>SO4: Developing partnerships between academia-research and the private sector/industry</p>	
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To define the intervention priorities of the North-East Region's Research and Innovation Strategy for Smart Specialisation, the following were taken into account:

- the outcome of the economic context analysis for the regional innovation potential of competitive and comparative advantages, the SWOT analysis identifying priority areas where there are comparative advantages (critical mass, a large number of employees), specialisation and clustering initiatives, competences for R&D;
- the result of the entrepreneurial discovery process and public consultations conducted between March and July 2020, through which sectors and niches were identified with high potential for development concerning the social impact;
- linking with the priorities of European and national public policies for innovation and competitiveness, defined in Romania's operational strategies and programmes for 2021-2027, namely the National Strategy for Research, Innovation and Smart Specialisation, National Competitiveness Strategy, North-East Regional Operational Programme 2021-2027 and Operational Programme for Smart Growth, Digitalisation and Financial Instruments 2021-2027, Operational Programme for Health 2021-2027, Operational Programme for Sustainable Development 2021-2027;
- linking with the priorities included in the North-East Regional Development Plan 2021-2027 of which is part of the Research and Innovation Strategy for Smart Specialisation of the North-East Region.

The implementation strategies defined in the entrepreneurial discovery workshops started from an intervention base developed by North-East RDA, based on the specific objectives projected under the Cohesion Policy Objective 1, A Smarter, more competitive Europe and funding directions foreseen under the Operational Programmes for the 2021-2027 programming period mentioned above.

North-East RIS3 Horizontal Priorities

The Research and Innovation Strategy for Smart Specialisation of the North-East Region is designed to act in the following directions:

Horizontal priority 1: Development of innovation competences

This level is fundamental, absolutely necessary for the long-term success of all the other measures of the strategy. This is because it addresses the issue of *mentalities* – those that create the context in which equipment, buildings or research-innovation-technology-transfer services will be used, as well as the issue of *innovation skills*, especially at the level of future generations – which will benefit from the present investments in the research-innovation and technology transfer and which will be responsible for managing them in the future.

Horizontal priority 2 – Support the creation of new innovative companies and the growth of companies active in the North-East Region

It is not enough to prepare a high-level human resource with special innovation skills – young people and entrepreneurs should be encouraged to start a new business (start-up and spin-off) capable of capitalising on the results of research in priority areas. Active companies need support to upgrade their technology, to digitise, internationalise, increase their ability to apply circular economy solutions and attract resources to finance investments. To innovate means risk, but also means the ability to validate an innovative concept, to promote new products/services, to develop new

technologies and systems of organisation/marketing. This is why encouraging companies to innovate is essential. TI&C companies in the region can develop smart solutions for the development of local communities (smart city, smart village), which will ensure increased efficiency and quality of public services, interoperability of monitoring and management systems, improving dialogue with civil society to improve quality of life.

Horizontal priority 3 – Developing the regional R&D capacity and promote collaboration with the industry

The region's R&D-innovation capacity is not sufficiently developed and new investments in infrastructure and equipment are needed to ensure diversification and updating of the region's R&D supply with current developments. RDI organisations need to be linked to the needs identified in the entrepreneurial discovery process. RDI organisations need support in preparing marketing strategies, connecting with markets and suppliers, preparing and obtaining patents. On the other hand, it is necessary to promote research projects in the public-private partnership, projects that contribute to the creation/development of common testing, certification, etc. As regards the provision of regional technology transfer services that are not significant at the time of T0, this needs to be strengthened by the appropriate establishment and equipment of technology transfer structures, possibly the development of existing ITTE infrastructures, to ensure a steady and professional flow of innovative and technological support services offered to the regional business environment. Existing innovative firms need to be supported and stimulated by the ITTE to become drivers for the development of smart specialisation sectors.

Horizontal priority 4 – Support clustering and internationalisation initiatives

In order not to remain a random result of a happy situation, innovation must be supported systemically. From this point of view, in the North-East Region, it is considered that the optimal solution for action is through the creation, consolidation and support of business networks and clusters to support the integration of members into impact value chains. CDI organisations must be linked with European best practices, supported to promote international projects that contribute to increasing the performance and reputation of regional research, through collaborations within and outside the region (especially in S3 Thematic Platforms), capitalising on Horizon Europe's funding opportunities, adherence to transnational associative structures, within the initiatives of the European Institute for Innovation and Technology (EIT) – Knowledge and Innovation Communities (KICs), etc. Companies performing international activities are better performing, so it is necessary to connect SMEs in the region to associative structures (clusters, business networks) participation in technology fairs, brokerage activities, etc., directly or with the support of specialised facilitators such as the Enterprise Europe Network. The regional innovation ecosystem can also benefit from attracting and locating foreign investors in the region to carry out production and development activities in SMART fields.

Horizontal priority 5 – Administrative capacity and technical assistance

North-East RDA, as coordinator of the North-East RIS3, identified the following major needs: The training of key competences (sectoral and horizontal) within the innovation micro-ecosystems associated with entrepreneurial discoveries in each area with regional smart specialisation potential, training of competences for the employees of accredited innovation and technology transfer entities, for the delivery and promotion of services and for international retelling, developing the capacity of research teams from public universities in the region to identify research results with market potential, develop and implement their marketing strategies, development of the administrative capacity of the Regional Innovation Consortium, the Academy Consultative Commission and employees of North-East RDA, to update, monitor and evaluate the results of the North-East RIS3.

CHAPTER 5 – DEFINING THE POLICY MIX AND THE ACTION PLAN

5.1 Priorities, measures, types of projects

Horizontal priority 1: Developing skills for innovation

Measure 1.1: Partnerships for development/updating the educational curricula and synchronising the training offer with the current technology level in smart priority areas

Priority shall be given to actions such as:

- The development of “curricular partnerships” to update the offer of specialisations and the theme of courses taught in vocational and dual technical high schools, universities relevant to the region’s smart specialisation fields;
- Long life learning (ECDL)/Education for adults/entrepreneurs;
- The development of multidisciplinary curricula in universities oriented towards creating entrepreneurial skills for new business models, innovation and change management;
- The development of adult education and lifelong vocational training programmes;
- Developing skills to cope with digitalisation;
- The university-private partnerships to develop projects for all stakeholders (students and companies).

Measure 1.2: Facilitating internships of pupils, students, masters, PhD students in industry and development of extracurricular activities dedicated to creativity and innovative attitude

Priority shall be given to actions such as:

- Organise study visits in companies (open doors) and accompanying them with training programmes (such as “how it’s made” or presentations of new technologies);
- Awareness campaign to increase students’ interest in the profession of engineer;
- Organise internships/internships in innovative enterprises in priority sectors (through scholarships or other facilities) for pupils, students or masters;
- Organisation of “on the job” internships;
- Development and implementation of education programmes such as “simulated enterprises” to facilitate the implementation of innovative ideas of students and students;
- Organise some competitions of innovative ideas or projects, including in partnership with companies from the Region – such as “Olympics/day of little inventors”;
- Organisation within the EITT of “idea laboratories” to solve concrete problems proposed by companies;
- Participation of pupils, students and master students in competitions of innovative ideas and projects organised nationally or internationally (through scholarships or other facilities);
- Develop technical extracurricular activities (by purchasing equipment, renovations and upgrading of spaces) for pupils and students;
- Scholarships for Bachelor, Master and PhD. Programs (co-financed by companies and funded by grants) for the development and support of research themes proposed by companies.

Measure 1.3: Developing pedagogical skills in regional pre-university and university education and acquaintance of teachers with new trends and technologies relevant to Smart domains

Priority shall be given to actions such as:

- Support teachers in developing new pedagogical skills;
- Gamification of the educational process;
- Investments for the digitisation of pre-university and university education;

- Mapping the critical mass of companies (with/grade/innovation possibilities), establishing communication and dissemination channels for setting short and medium term training strategies;
- Actions to acquaint teachers with new trends and technologies (including participation in international events and economic missions);
- The participation of universities and research centres for exchange of experience and know-how in interregional cooperation projects in smart priority areas;
- Adhering of universities and research centres to European platforms and networks dedicated to innovative development;
- Campaigns to encourage responsible university training, focused on the challenges of the responsible community (graduation, dissertation, PhD papers).

Horizontal priority 2: Supporting the creation of new innovative companies and the growth of active enterprises in the North-East Region

Measure 2.1: Developing the capacity of the entrepreneurial innovation ecosystem to create, mature and internationalise start-up/spin-off in areas of smart specialisation

Priority shall be given to actions such as:

- Investments for the creation and development of the incubators and the business accelerators, including team skills training and promotion of incubation/acceleration services;
- The creation or development of the incubators or business accelerators, non-financial and financial assistance programmes for the creation of the start-up teams, training of skills, attitudes and entrepreneurial culture;
- The creation or development of incubators or business accelerators, support and pre-acceleration programs dedicated to the start-ups (0-1 year) to develop a minimum viable prototype and launch it on the market;
- The creation or development of incubators or business accelerators, programmes to accelerate the processes of maturing and evolution of the start-ups (0-1 year) after the first customer and connecting them to European and global entrepreneurial markets and ecosystems;
- The creation or development of incubators or business accelerators, of programs for attracting and establishing in the region start-ups / SMEs from other countries;
- Developing and equipping innovative entrepreneurial living-lab communities, where innovation in regional smart fields is tested and demonstrated, which contributes to the integration of regional value chains;
- Developing “shared resources” initiatives (packaging lines, cold stores);
- The development of existing business support bodies (business centres, industrial parks) to streamline their economic results, including through self-assessment activities and peer review, training and coaching, twinning with similar structures.

Measure 2.2: Support for technological and sustainable development of innovative companies

Priority shall be given to actions such as:

- Investment to facilitate the growth and technological development of companies; advanced technological lines;
- Investment for the digitisation of companies;
- Implementing digital solutions to optimize and monitor consumptions;
- Investments for the promotion of cybersecurity solutions;
- Digital transformation of businesses by adopting digital technologies and tools;
- Validation of innovative concepts in SMEs – innovation vouchers;

- Financing innovative SME projects, which receive the Seal of Excellence label in the COSME Programme;
- Implementation of circular economy mechanisms in regional enterprises;
- Training of operators on the use of automated lines;
- Participation in fairs/internationalisation;
- Promotion, marketing, branding, advertising including through the application of digital solutions for sales and marketing.

Measure 2.3: Support for the implementation by innovative SMEs of financial instruments

Priority shall be given to actions such as:

- Develop business-angels networks;
- Attracting venture capital funds to the region;
- Promoting guarantee and lending schemes for innovative business ideas.

Measure 2.4: Smart solutions for the local community development

Priority shall be given to actions such as:

- Smart city solutions;
- Interoperability of public services;
- Database security;
- E-health solutions;
- Renewable energy production.

Horizontal priority 3: Developing regional R&D capacity and promoting collaboration with the industry.

Measure 3.1: Strengthening regional research-innovation capacity in response to the needs identified in the EDP

Priority shall be given to actions such as:

- R&D-innovation activities related to the needs identified in the entrepreneurial discovery process promoted by research organisations;
- Investments in the proprietary RDI infrastructures; organisations/companies, for the creation, development or modernisation of research-innovation endowment;
- Acquisition of knowledge and services by RDI organisations to prepare the research supply for the market (know-how transfer, marketing, obtaining/validating/protecting patents, etc.).

Measure 3.2: Promoting the collaboration between RDI organisations and the business environment

Priority shall be given to actions such as:

- R&D-innovation projects through multi-actor collaborations;
- Development of joint testing facilities/platforms;
- Developing facilities for product certification;
- Projects promoting research solutions in response to the demand for open innovation;
- Innovation partnership projects for big companies-SMEs;
- Investments in pilot projects related to the results of innovative interregional partnership projects.

Measure 3.3 Development of regional technology transfer capacity

Priority shall be given to actions such as:

- Investments for the creation or development of nationally accredited ITT infrastructure and services (including team skills training, promotion of services and international networking);
- Investments in SMEs to implement technology transfers, including the acquisition of services from RDI organisations or technology transfer entities.

Horizontal priority 4: Supporting clustering and internationalisation initiatives

Measure 4.1: Creation and strengthening of business networks and clusters

Priority shall be given to actions such as:

- Strengthening the capacity of the business network or cluster to manage and operate the value chain, including internationalisation and connection to collaborative platforms/networks;
- Direct investments in start-ups and SMEs that are members of a cluster to develop new industrial products or services, in conjunction with the needs highlighted in the value chain analysis;
- Research-innovation projects carried out by the managing entity of a cluster for the benefit of increasing the competitiveness of member companies.

Measure 4.2: Promoting interregional and international cooperation in the RDI domain

Priority shall be given to actions such as:

- Participate, as an associate partner, in the implementation of innovative projects approved under the centralised European interregional cooperation programmes or Horizon Europe (transfer of know-how and best practices);
- Participation in the activities of the JRC Smart Specialisation Thematic Platforms (Platforms S3), including the formation of interregional strategic alliances for the preparation and submission of innovative projects in S3 areas of common interest;
- Adherence to transnational associative/partnership bodies and participation in preparatory activities for project submission within the initiatives of the European Institute of Innovation and Technology (EIT)- Knowledge and Innovation Communities (KICs), European Network of the Regions for Innovation and Research (ERRIN), etc. Support services to internationalise the activity of companies in smart potential, offered through the European Enterprise Europe Network platform.

Measure 4.3: Attracting foreign direct investments in Smart priority areas

Priority shall be given to actions such as:

- Elaboration of the regional marketing strategy;
- Development of a regional portfolio of information and promotion tools dedicated to foreign investors;
- Creating the regional ecosystem for services to attract foreign investment related to the development priorities of the region.

Horizontal priority 5: Administrative capacity and technical assistance

Measure 5.1: Development of North-East RIS3 implementation, monitoring and evaluation systems

Priority shall be given to actions such as:

- Preparation of annual implementation North-East RIS3 reports;
- Review and update North-East RIS3;

- Development of analysis and studies for monitoring and evaluation of North-East RIS3;
- Technical assistance for the development of guidelines for specific calls for funding launched at regional level;
- Technical assistance for the evaluation and selection of innovative projects submitted under specific funding calls launched at regional level;
- Promotion of North-East RIS3;
- Updating information on North-East RIS3 on the eye@RIS3 platform;
- Participation in self-assessment and peer review activities.

Measure 5.2: Develop the administrative capacity of the actors involved in the development, implementation, monitoring, evaluation and review of North-East RIS3

Priority shall be given to actions such as:

- Development of the administrative capacity for North-East RIS3 management (evaluation of the administrative capacity of the Regional Innovation Consortium, the Academic Advisory Commission of the North-East RIS3 Management Office and the Sectoral Specialisation Office within RDA, development and implementation of a technical assistance program (training, workshops, study visits) for selected representatives from these structures, evaluation of results);
- Technical assistance and training for the North-East RDA team and members of the Regional Innovation Consortium and the Academic Advisory Commission in connection with the management of North-East RIS3;
- Ensuring the technical secretariat for the North-East Regional Innovation Consortium and correlation function with the Strategic Planning Committee in relation to the Regional Development Plan;
- Ensuring correlation function with the National Strategy for Research, Innovation and Smart Specialisation through the Steering Committee for Smart Specialisation.

Measure 5.3: Development of competencies at the level of entities involved in the entrepreneurial discovery process

Priority shall be given to actions such as:

- Development of skills at the level of entities involved in the entrepreneurial discovery process, in particular SMEs and RDI organisations appropriate to support smart specialisation (mapping the needs of sectoral and horizontal key skills training within the innovation micro-ecosystems associated with entrepreneurial discoveries in each field with potential for regional smart specialisation, development, implementation and evaluation of the skills training program);
- Creating a regional one-stop-shop structure, dedicated to supporting promoters and RDI projects; including as a regional technology observer;
- Training in innovative project management skills;
- Establishment of a Digital Innovation Hub including the function of regional digital observer;
- Providing information and training services for potential ROP funding beneficiaries.

5.2 Regional Action Plan

The North-East RIS3 aims to steer the efforts of regional actors towards common objectives and to generate synergies between their actions; as a result, intelligent specialisation will be achieved through the generated projects, submitted and implemented by a variety of organisations in the North-East Region, acting in a coordinated manner.

To this end, the Regional Innovation Consortium with the support of the Academic Advisory Commission will support the North-East RDA in its effort to stimulate the implementation of each priority in the strategy.

The operationalisation of the North-East RIS3 and implementation of the proposed priorities and measures envisages the following policy mix:

- 1) **Launching strategic initiatives** – At the beginning of 2015, the North-East RDA and the of Northern Netherlands Alliance started developing a long-term cooperation programme North-East Romania – North Holland. This initiative has enabled the identification of common elements in the smart specialisation strategies of the two regions, the identification of common challenges and complementarities, the definition of a package of measures based entirely on the principles of smart specialisation with societal benefits through an interregional entrepreneurial discovery mechanism. Operating on similar principles, the European Commission’s Smart Specialisation Thematic Platforms will be promoted to encourage the accession of local actors.
- 2) **Exploiting the funding opportunities offered by the 2021-2027 national operational programmes.** As the Management Authority for North-East ROP 2021-2027, the North-East RDA developed the content of the programme, ensuring a good correlation between the investment needs identified in North-East RIS3 and Priority Axes 1. North-East a smarter region and 2 North-East a digital region. The North-East RDA participates in the regional-national correlation process for S3 in Romania, being a member of the Coordination Committee for Intelligent Specialisation⁵³.
- 3) **Changing the strategic agenda of current operators** – because many of the challenges identified and the development solutions proposed in the EDP exercises have the possibility to be addressed through the current funding programmes, the governance structures of the North-East RIS3 will insist on providing support to potential beneficiaries to prepare quality projects to increase the chances in national and international competitions. The creation of RDI One-stop-shop and Digital Innovation Hub structures in the region will contribute to this goal.
- 4) **Establishment of the regional S3 forum.** Mapping the value chains with regional impact and identifying the key actors in each value chain as well as the local public authorities, representatives of knowledge institutes and the regional non-governmental sector have laid the foundations of the regional innovation ecosystem with quadruple helix representativeness. Strengthening the innovation micro-ecosystems attached to each area with smart specialisation potential will be pursued through the promotion of administrative capacity and institutional building projects.

Analysing the nature of the measures in the strategy, it becomes clear that:

- all measures may be implemented at the same time as there are no relations of precedence between them;

⁵³ North-East Road map RIS3 in Lagging regions TA Project and the Regional Action Plan for policy mix.

- all measures are necessary throughout the implementation period of the Strategy (2021-2027) and there is no order of priorities between them.

The implementation of the strategy will be carried out on the basis of the next **Regional Action Plan**.

Priorities and Measures	Target Group	Eligible Beneficiaries	Funding Source	Agri-food & Wood industry	Energy	Environment	Health	Textiles	ITC	Tourism
Horizontal priority 1: Developing skills for innovation										
Measure 1.1: Partnerships for development/updating the educational curricula and synchronising the training offer with the current technology level in smart priority areas	Teachers from the regional public education system, management staff of regional companies	Technology high schools, vocational and dual schools, universities, partnerships between them, partnerships between them and companies in the fields of smart specialisation	Educational and Employment Operational Programme (EEOP) 2021-2027 ERASMUS Plus	✓	✓	✓		✓	✓	
Measure 1.2: Facilitating internships of pupils, students, master's and PhD students in industry and development of extracurricular activities dedicated to creativity and innovative attitude	Pupils, students, master's and PhD students and teachers from the regional education system, management staff of regional companies	Technology high schools, vocational and dual schools, universities, EITT, children's clubs or similar organisations, in partnership with companies in the fields of smart specialisation	EEOP 2021-2027 ERASMUS Plus			✓	✓	✓	✓	
Measure 1.3: Developing pedagogical skills in regional pre-university and university education and familiarising teachers with new trends and technologies relevant to Smart domains	Teachers from secondary vocational and dual technical education, universities, management staff of regional companies	Technology high schools, vocational and dual schools, universities, partnerships between them and companies in the fields of smart specialisation	EEOP 2021-2027 ERASMUS Plus				✓	✓	✓	
Horizontal priority 2: Supporting the creation of new innovative companies and the growth of active enterprises in the North-East Region										
Measure 2.1: Developing the capacity of the entrepreneurial innovation ecosystem to create, mature and internationalise start-up/spin-off in areas of smart specialisation	Entrepreneurs, intrapreneurs, corporate employees, pupils, students, masters and PhD students	Entities with the status of incubator/business accelerator, business centre, industrial park	North-East Operational Programme (NE ROP) 2021-2027 EEOP 2021-2027	✓			✓		✓	
Measure 2.2: Support for technological and sustainable development of	Employees	SME	NE ROP 2021-2027 Smart Growth, Digitalization and	✓	✓	✓	✓	✓	✓	✓

innovative companies			Financial Instruments Operational Programme (SGDFIOP) 2021-2027 OP Sustainable Development 2021-2027							
Measure 2.3: Support for the implementation of financial instruments by innovative SMEs	Entrepreneurs Corporate employees	Organisations with the status of financial intermediary Banks	NE ROP 2021-2027 SGDFIOP 2021-2027		✓	✓	✓			
Measure 2.4: Smart solutions for local community development	Employees of local public authorities Citizens, companies, civil society	Local public authorities, Smart solutions providers	NE ROP 2021-2027 SGDFIOP 2021-2027 SOP Health 2021-2027		✓	✓				✓
Priority 3: Developing the regional R&D capacity and promoting collaboration with the industry										
Measure 3.1: Strengthening regional research-innovation capacity in response to the needs identified in the EDP	Researchers, university teachers	Research organisations, innovation companies	NE ROP 2021-2027 SGDFIOP 2021-2027 SOP Health 2021-2027	✓	✓	✓	✓	✓	✓	✓
Measure 3.2: Promoting collaboration between RDI organisations and the business environment	Researchers, university teachers, corporate employees	Research organisations, companies, partnerships between them	NE ROP 2021-2027 SGDFIOP 2021-2027 HOP 2021-2027	✓	✓	✓	✓	✓	✓	✓
Measure 3.3: Development of regional technology transfer capacity	Employees of SMEs, CDI organisations Research-development-innovation and technology transfer accredited entities	Research-development-innovation and technology transfer accredited entities SMEs	NE ROP 2021-2027 SGDFIOP 2021-2027		✓	✓	✓	✓	✓	✓
Horizontal priority 4: Supporting clustering and internationalisation initiatives										
Measure 4.1: Creation and strengthening of business networks and clusters	Companies from the Region Management entities and members of regional business networks and clusters	Clusters Management Entities and Business Networks Companies	NE ROP 2021-2027	✓	✓	✓	✓	✓	✓	✓

Measure 4.2: Promotion of interregional and international cooperation in the field of RDI	Member organisations of regional business networks and clusters	Member organisations of regional business networks and clusters Other regional business networks and clusters	NE ROP 2021-2027 SGDFIOP 2021-2027 Horizon Europe Interreg Europe Interreg Danube	✓	✓	✓	✓	✓	✓	✓
Measure 4.3: Attracting foreign direct investment in Smart priority areas	Potential foreign investors	Local public authorities and companies North-East RDA	Own resources, projects promoters			✓		✓		
Horizontal priority 5: Administrative capacity and technical assistance										
Measure 5.1: Development of North-East RIS3 implementation, monitoring and evaluation systems	North-East RDA employees, members of the North-East Regional Innovation Consortium, members of the regional innovation ecosystem (representatives of the quadruple helix)	North-East RDA	NE ROP 2021-2027	✓	✓	✓	✓	✓	✓	✓
Measure 5.2: Development of administrative capacity of actors involved in the development, implementation, monitoring, evaluation and review of the North-East RIS3	North-East RDA employees, members of the North-East Regional Innovation Consortium, members of the regional innovation ecosystem (representatives of the quadruple helix)	Technical assistance and training providers	NE ROP 2021-2027 Technical Assistance Operational Program (TAOP) CE DG Reform	✓	✓	✓	✓	✓	✓	✓
Measure 5.3: Development of competencies at the level of entities involved in the entrepreneurial discovery process	Members of the regional innovation ecosystem (representatives of the quadruple helix) promoters of innovative projects	Technical assistance and training providers who undertake the one-stop-shop development Delegated entity for DIH management	NE ROP 2021-2027 TAOP 2021-2027 CE DG Reform	✓	✓	✓	✓	✓	✓	✓

CHAPTER 6 – CORRELATION OF RIS3 NORTHEAST WITH OTHER STRATEGIC DOCUMENTS

Between 2014-2020, Romania has prepared, for the finalization of the Partnership Agreement and the Operational Programmes, two strategies: the 2015-2020 National Strategy for Competitiveness (NSC), the 2014-2020 National Strategy for Research, Development and Innovation (NSRDI).

These have been aligned in terms of smart specialisation areas, in order to be able to provide funding in the 2014-2020 cycle. Subsequently, the Regional Development Agencies (RDAs) developed Smart Specialisation Strategies at the level of each development region in order to be able to detail regional specificities and substantiate the financial allocations within the Regional Operational Programme (Axis 1).

The North-East RDA, with the support of a broad regional partnership, developed in 2013, as a component part of North-East Regional Development Plan 2014-2020 (the regional economic development component), the Regional Strategy for Research and Innovation through Smart Specialisation RIS3 NORTH-EAST. This programmatic document is designed as a necessary tool for making investments efficient (results / cost ratio) and effective (impact / objective ratio), in terms of research, development and innovation.

RIS3 North-East underwent an extensive update and review process completed in December 2017, which took into account the evolution of the development of the region, the need to reconfirm the sectors of smart specialisation, to introduce a continuous mechanism of entrepreneurial discovery for the governance and the implementation of RIS3 North-East, updating information on the demand and supply of innovation and technology transfer services, defining a strategy to promote technology transfer and to identify a portfolio of projects that will receive funding through the ROP 2014-2020 Axis 1 Promotion of Technology Transfer Services.

The new programming period, 2021-2027, provides an opportunity for a new update of the Strategy in line with the new objectives of the European Union's Cohesion Policy, in particular PO 1 - "A smarter Europe, by promoting an innovative and intelligent economic transformation". The goal of Policy 1 directly aims at the cohesion of Europe's regions by implementing strategies for Intelligent Specialisation (regional and national), pursuing the fulfilment of the following 4 specific ERDF objectives: *Development of research and innovation capacities and adoption of advanced technologies; Capitalisation on the benefits of digitalisation, for the benefit of citizens, companies and governments; Boosting growth and the competitiveness of SMEs; Development of skills for smart specialization, industrial transition and entrepreneurship.*

Beyond the regional level, the 2021-2027 programming period also brings transformations at national level, by achieving a 2021-2027 National Strategy for Research, Innovation and Smart Specialisation, which reflects uniformly the objectives of all central and regional institutions.

6.2 Correlation with other European strategies and planning documents

The areas of specialisation introduced in the Research and Innovation Strategy for Smart Specialisation of the North-East Region are correlated with the following strategic planning documents at European level:

- Regulation on the future EU Framework Programme for Horizon Europe (European Commission, 2018, EC COM 435 final) which finances investments in research and innovation with a budget of EUR 80.9 billion);
- EC Communication on "The Future of ERA", the European Research Area (ERAC 2020) - with its instrument proposed by the European Commission - ERA CHAIRS, which ensures the integration

of research organisations from convergence regions into the European Research Area and increases their innovative potential;

- “Renewed European Agenda for Research and Innovation” (European Commission, 2018 COM 306 final);
- EC COM, 2017 on The role of smart specialisation in the cohesion policy;
- Multiannual Financial Framework 2021-2027;
- 2020 EC Country report on Romania (EC SWD, 2020 522 final);
- The Smart Specialisation Platform S3, managed by the Joint Research Center (JRC) of DG Regio and the Institute for Technological and Scientific Design (IPTS) in Seville, a unit created to provide methodological and informational support to Member States and regions developing S3;
- New thematic platforms for smart specialisation activated at European level for the following sectors: energy, agri-food and industrial modernisation.

6.3 Correlation of RIS3 North-East specialisation fields with NSIRIS 2021-2027

The Research and Innovation Strategy for Smart Specialisation of the North-East Region for the period 2021-2027 aims at continuing and capitalising on the results of the North-East RIS3 Strategy 2014-2020. The aspects related to the correlation of the North-East RIS3 with the National Strategy for Intelligent Research, Innovation and Specialization (NSIRIS) 2021-2027 are:

- Correlation at the level of **sectoral objectives** with the priorities and measures included in North-East RIS3; the complementarity of the investment programmes proposed for the operationalisation of the North-East RIS3, respectively North-East ROP 2021-2027 with the Smart Growth, Digitalization and Financial Instruments Operational Programme (SGDFIOP) 2021-2027 (operational program that supports the implementation of the research-innovation policy at national level in ERDF), the Education and Employment Operational Programme (EEO) 2021- 2027 (operational program supporting the development of human capital at national level in FES +), Horizon Europe Programme (EC centralised program supporting research and innovation at European level in ERDF), Interregional Cooperation Programmes (EC centralised European programmes that enable the implementation of macro-regional strategies at European level in the ERDF).
- Correlation of **entrepreneurial discovery mechanisms** - aiming at the complementarity of methodologies for identifying areas with potential for smart specialisation; SNCISI aims to identify emerging technological areas with technological export potential; In addition, the National Strategy for Research-Innovation and Intelligent Specialisation (NSRIIS) aims to map the areas and niches of smart specialisation identified in the 8 development regions, offering the possibility of clustering some specialisation niches in order to increase the critical mass and indicate areas where interregional cooperation can be developed in Romania.
- Correlation of **monitoring, evaluation and governance mechanisms** of smart specialisation strategies - at national level it is intended to set up a common set of monitoring indicators, a common mechanism for collecting data on smart specialisation projects promoted (see also [section 6. Integration of monitoring and evaluation mechanisms](#)). Also, at national level, the Steering Committee for Intelligent Specialisation ensures the coordination of NSRIIS, together with the National Committee for Scientific Research and the Steering Committee for Research-Development-Innovation. Within the SCIS, RDAs are members, as regional RIS3 coordinators.

6.4 Correlation of RIS3 North-East with the North-East RDP 2021-2027

The Research and Innovation Strategy for Smart Specialization of the North-East Region is included in the North-East Regional Development Plan 2021-2027. This programming document, approved by the

Council for North-East Regional Development in 2020, provides the strategic framework and represents the instrument through which the region promotes its priorities and interests in the economic and social field.

Therefore, there is a good correlation between RIS3 North-East priorities and the 4 measures proposed in the Regional Development Strategy, Priority 1, as shown in the comparative table below:

Research and Innovation Strategy for Smart Specialisation of the North-East Region 2021-2027	North-East Regional Development Plan 2021-2027 (RDS North-East)
<p>Horizontal Priority 2: Supporting the creation of new innovative companies and the growth of active business in the North-East Region</p> <p>Measure 2.1: Development of the entrepreneurial ecosystem capacity to innovate to create, mature and internationalise start-ups / spinoffs in areas of smart specialisation</p> <p>Measure 2.2: Support for the technological and sustainable development of innovative companies</p> <p>Measure 2.3: Support for the implementation of financial tools for innovative SMEs</p> <p>Measure 2.4: Smart solutions for the development of local communities</p> <p>Horizontal priority 3: Development of the research and innovation capacity and promotion of the collaboration with the industry</p> <p>Measure 3.1: Strengthening the research-innovation capacity at regional level, in response to the needs identified in the EDP</p> <p>Measure 3.2: Promoting collaboration between RDI organizations and the business environment</p> <p>Measure 3.3: Development of technological transfer capacity in the region</p>	<p>Priority 1: Developing a competitive economy</p> <p>1.1 Stimulating innovation-research capacities and promoting the adoption of advanced technologies</p> <p>1.2 Supporting the establishment of new, competitive and sustainable companies, in areas of local and regional interest</p> <p>1.3 Improving the competitiveness of companies by increasing the productivity in value added sectors</p> <p>1.4 Improving competitiveness through increased access to information technology services and communications</p>

6.5 Linking North-East RIS3 areas and thematic partnerships in European S3 platforms

The thematic partnership "Smart Regional Investments in Textile Innovation" - Platform For Smart Specialisation S3 for Industrial Modernisation (S3P industry).

Since 2016, the North East region, as a **co-leading region (co-partner)** alongside the Valencia region, has been part of the **Regional Investments for Textiles Innovation Partnership** under the **S3 Thematic Platform for Industrial Modernisation**.

As part of this partnership, an analysis of the Textile sector in the North East region has been carried out which identified the sector's value chain. An analysis of innovation and research potential has been carried out to identify areas of interest.

The working areas of the partnership are:

1. Sustainability and circular economy (responsible Region – Catalonia)
2. Digitisation & Industry 4.0 (responsible Region – Emilia Romagna)

3. Technical and intelligent textiles (responsible Region – Norte)
4. Innovation based on design and creativity (responsible Region – Lombardia)

The North-East region is also a member of the **EURATEX** organisation – **the European Apparel and Textile Organisation**, as well as the **REGIOTEX** network - a network supporting the thematic partnership Regional Investments for Textiles Innovation. Launched by EURATEX on the **European Technology Platform for the future of textiles and clothing (ETP)**, REGIOTEX has contributed to a new way of working together among members of this Action Group, examples being the TEXTILE 2030 or TEX4IM initiatives.

The Textile innovation thematic partnership will contribute to the achievement of many of the 17 Sustainable Development Goals on the United Nations 2030 Agenda.

The "Bioenergy" thematic partnership - Smart Specialisation Platform S3 for Energy (S3P Energy)

Bioenergy is a common priority of smart specialisation for several regions in the EU. Consequently, in 2016, the **Smart Specialisation Platform on Energy** supported the development of an interregional partnership for Bioenergy and smart specialisation, which is currently working on four priority areas: biofuels, biomass, biogas and knowledge transfer.

This **Bioenergy thematic partnership** is led by the regions of Lapland (Finland) and Castile and Leon (Spain) and involves 31 other regions (France, Portugal, Italy, Romania, Finland, Spain, Hungary, Estonia, Poland, Slovakia, Slovenia, Croatia, Sweden, Germany, Greece) committed to building a common front in the development of bioenergy based on bioenergy from forest waste as well as non-agricultural crops for sustainable regional growth. In line with the EU's objectives, bioenergy counts for about two thirds of renewable energy production in the European Union and is one of the main energy sources contributing to the 20% renewable energy target for 2020.

Through this interregional partnership initiative, the participating regions want to develop a common ground for cooperation through the joint development of tasks such as mapping, pilot activities and joint investments.

In 2017, the North-East region joined the Bioenergy thematic partnership and carried out the bioenergy (biomass) mapping of the region – production, consumption and capacity.

On the basis of the first steps (survey, workshops, etc.) undertaken in the partnership, specific areas for trans-regional collaborations have been identified:

- Biomass installations in rural areas/communities;
- Plants for biogas (materials, cooperatives, etc.),
- Thermal energy - heating and cooling;
- Forest management models;
- Small-scale electricity generation using wood pellets and chips;
- Build awareness and exchange of best practices.

The "Water Smart cities" thematic partnership - Smart Specialisation Platform S3 for Industrial Modernisation (S3P-Industry)

The main purpose of the thematic partnership (WST) is to strengthen the innovation capacity of European regions, in addition to the efficient use of resources, to facilitate new investments based on the innovation infrastructure and new technologies for sustainable water resource management. The effective and interdisciplinary collaboration between partner regions and regional cluster organisations will respond to the challenges of industry through advanced technological solutions to address European water territories. The European society and economy in different territories must address the following trends that will determine the competitiveness of the European water industry:

- **Strengthening infrastructure flexibility:** aging infrastructure and low investment in operation and maintenance; persistent and emerging pollutants, water losses in the system and scarce resources need to be addressed through a combination of innovative and nature-based solutions, opening the traditional water sector to new technologies that help improve efficiency and productivity in water management;
- **Digitisation:** Industry 4.0 also brings many opportunities for economic development in the water sector. *Business Intelligence, Big Data* – acquisition and management, sensors, robotics, virtual reality are new elements that could facilitate water management for various water users and use types;
- **Circular economy** introduces a new paradigm for current water technologies. Resource recovery, sludge recovery, water reuse, efficiency and energy production are new challenges that should be taken into account in basin management plans for various water consumers.
- **Facilitating multilateral governance**, as water must be managed according to water users: urban and industrial water consumers who have to meet different requirements while managing the common and single resource, especially in small municipalities.

In 2019, the North-East Region joined the **Water Smart Territories** thematic partnership, initiated under the **Intelligent Specialisation Platform S3** by three leading European regions (Aragón - Spain, Centre Val de Loire - France, Friesland Province - Netherlands). As its objectives and initiatives are shared by many European stakeholders, 20 new regions and countries (Spain, Romania, Czech Republic, Italy, Finland, Portugal, France, Greece, Latvia, Malta, Scotland) have joined this thematic partnership.

The **WST partnership launch event** (September 2019, Brussels, Belgium) presented **25 ideas for cooperation/potential co-investments** that can be turned into **interregional projects** in European partner regions. New projects and joint activities will underpin regional cooperation through innovations that go beyond the most advanced techniques and technologies at the moment. Out of the 25 project ideas mentioned above, 6 were chosen to be developed and implemented in the partner regions and the North-East Region has joined 3 of these proposals (project ideas development workshop, December 2019, Zaragoza, Spain):

- **Digitisation of water utilities** (reduction of losses, reduction of energy consumption, reduction of operating costs);
- **Biotechnological solutions for water treatment and wastewater treatment** (increase circularity and re-use of water for the population and industry; propose common solutions to meet water needs in different industries (regional pilot stations); increase resource use, deal with emerging pollutants; upgrading current technologies with granular sludge based bio-systems, improved bio-processes, new biocatalysts, etc.);
- **Technologies for the removal of organic pollutants from sludge** (there are multiple differences between the challenges encountered at regional level regarding the management of sludge from water treatment plants and the intention is to create a platform that presents all these solutions).

The “Personalised Medicine” thematic partnership – Smart Specialisation Platform S3 For Industrial Modernisation (S3P industry)

Personalised medicine is a medical model that uses the characterisation of phenotypes and genotypes of individuals (e.g. molecular profiling, medical imaging, lifestyle data) to adapt the right therapeutic strategy for the right person at the right time to determine the predisposition to disease, to ensure timely and targeted prevention. Thus, personalised medicine is highly technology-oriented and will also enable the development of preventive medicine.

The sensitivity of new diagnoses, the access to omics data and the recognition that early detection is often crucial blur the boundaries between health and disease. Chronic diseases, often linked to changes in the general lifestyle and the increase in the average age of the population, put healthcare systems

under pressure. The development of personalised medicine will not only support the growth of healthy life years, but will also ensure the sustainability of our healthcare systems.

The partnership has been established to accomplish the potential of personalised medicine. The partner regions already have robust ecosystems that combine biomedical, technological and data-based expertise. Bringing together these ecosystems will achieve greater added value and stimulate the deployment of personalised medicine, with an innovative approach to health and care in Europe.

The North-East Regional Development Agency joined the Personalised Medicine Partnership in January 2019, contributed to the detailed mapping of developing trends and relevant industry and technology actors in the different parts of the value chain (e.g. infrastructure, end-users), to enable the identification of strengths, barriers and needs. The mapping document, developed through the joint effort of partners, aligns complementary assets and infrastructure and helps integrate value chains across different technology sectors to create added value and innovative applications.

The North-East ADR has developed a portfolio of personalised medicine project ideas, in collaboration with the members of the North-East Molecular and Structural Imaging (IMAGO-MOL) Regional Innovation Cluster and the BioROne Cluster, whose implementation, in cooperation with the members of the partnership, will help to identify new solutions for health, well-being and health care. The project ideas and the collaboration opportunities between partners were presented and discussed at the partnership working meetings held on a six-monthly basis.

The "High-Tech Farming" thematic partnership – Agri-Food Smart Specialisation Platform S3 (S3P AGRI-Food)

Since 2017, North-East RDA has been a Member of the **High Tech Farming** thematic partnership of the **Agri-Food Thematic Platform S3**. The work of this partnership is supported by the **European Regions for Innovation in Agriculture, Food, and Forestry (ERRIAF)** network, which brings together 43 regions from 13 EU Member States, and whose priorities are aligned with the Platform's priorities. Thus, the North East RDA is also a member of the **High-Tech Farming** and **Biorregions** working groups of ERIAFF, taking part in numerous workshops, conferences and webinars.

These meetings covered topics such as: the adoption of advanced agro-technologies in small and family farms; new solutions for the early detection of pests and diseases; the improvement of animal health and welfare, presented as models of good practice and successful examples to stakeholders in the North-East Region.

The North-East RDA acted as a promoter of the ERIAFF network, playing an important role in the inclusion in the network of a new member: the Dniester Euroregion.

The link between the regional areas of smart specialisation and the initiatives at national and European level

Industrial Modernisation Platform (S3P-Industry) – Thematic areas and correspondence with North-East RIS 3

North-East RIS3 Priority Sectors	Agri-Food & Wood Industry	Textile	Energy	Environment	Health	ITC	Tourism
Thematic Areas							
Advanced Manufacturing for Energy Related Applications (ADMA)			X	X			

<i>Energy)</i>							
Advanced materials for batteries			X	X		X	
Artificial intelligence and human-machine interface			X	X	X	X	
Bioeconomy	X		X	X	X		
Chemical industry	X		X	X			
Cybersecurity			X		X	X	
Digitisation and safety for tourism					X	X	X
Efficient and sustainable manufacturing	X	X	X	X	X	X	
High-performance manufacturing by 3D printing		X	X	X	X		
Hydrogen valleys				X			
Medical technology					X	X	
Mining industry				X			
New products with nano-technologies				X	X	X	
Personalised medicine					X		
Photonics	X		X	X	X	X	
Smart regional investment in textile innovation		X	X	X		X	
Safe and sustainable mobility			X	X		X	
Integration of SMEs in Industry 4.0	X	X	X	X	X	X	X
Social economy							
Sports					X		X
Water Smart Territories	X	X	X	X	X		

Agri-Food Platform (S3P Agri-Food) – Thematic areas and correspondence with North-East RIS 3

North-East RIS3 Priority Sectors	Agri-Food & Wood Industry	Textile	Energy	Environment	Health	ITC	Tourism
Thematic Areas							
Consumer involvement	X				X		
High-tech agriculture	X		X	X		X	
Nutritious ingredients	X		X	X	X		
Smart sensors for the food industry	X		X			X	
Traceability & Big Data	X					X	

Energy Platform (S3P Energy) – Thematic areas and correspondence with North-East RIS 3

North-East RIS3 Priority	Agri-Food &	Textile	Energy	Environment	Health	ITC	Tourism
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Sectors	Wood Industry						
Thematic Areas							
Bioenergy	X		X	X			
Geothermal energy			X				
Marine renewable energy			X	X		X	
Smart grids			X			X	
Solar energy			X				
Sustainable constructions	X	X	X	X		X	X

CHAPTER 7 – GOVERNANCE OF THE RESEARCH AND INNOVATION STRATEGY FOR SMART SPECIALISATION IN THE NORTH-EAST REGION

The partnership structure proposed to coordinate the governance of the North-East Smart Specialisation Research and Innovation Strategy in 2021-2027 will be called the Regional Innovation Consortium (RIC).

The North-East RDA released an Operational Instruction for the selection of applications received from the institutions, organisations and companies in the North-East Region for a full/alternate membership of the RIC based on an application assessment and selection mechanism approved by the North-East Regional Development Council (RDC).

The role of the Regional Innovation Consortium is to:

- Provide feedback on the structure and policy mix included in the North-East RIS3;
- Endorse the North-East RIS3;
- Endorse the portfolio of North-East RIS3 priority projects;
- Propose the start of possible upgrading/reviewing processes of the North-East RIS3;
- Contribute to identifying the sources of information necessary for the monitoring and evaluation of North-East RIS3;
- Propose possible structural and legislative changes;
- Propose and monitor inter-regional cooperation initiatives;
- Endorse the annual implementation reports of the North-East RIS3;
- Identify and attract funding sources for the evaluation studies required for North-East RIS3.

This structure includes representatives of the following types of entities:

- R&D institutes, universities, research centres and stations, technology transfer entities;
- Companies, innovative companies, SMEs, clusters;
- Institutions and organisations governed by public law; public companies with RDI activities;
- NGOs and other associative structures.

The composition of the RIC and the Academic Advisory Committee (AAC) is approved by the North-East Regional Development Council. The members list of the Regional Innovation Consortium is set out in **Annex 1 – RIC and AAC Membership**. The RIC operates based on its Internal Rules.

The maximum number of members in this structure is 36, to which is added the North-East RDA, with the following role:

- to ensure the Presidency and the Technical Secretariat for the Regional Innovation Consortium and its Advisory Commissions;
- to appoint sectoral specialists for each vertical area of specialisation in North-East RIS3;
- to ensure the monitoring and evaluation of North-East RIS3;
- to contribute to the identification of regional areas with specialisation potential;
- to coordinate the mapping of value chains related to the North-East RIS3 domains;
- to keep permanent contact with the business environment and knowledge institutes (smart domain coordination teams);
- to support the process of continuous entrepreneurial discovery for defining development solutions and their materialisation into viable projects;
- to encourage cooperation between quadruple helix actors and interregional cooperation;
- to ensure the connection with the European Smart Specialisation Platforms (Energy, Agri-food, Industrial Modernisation).

The North-East RDA is the organisation that initiated the process of developing the North-East RIS3. According to the law, the RDA is the regional development policy coordinator responsible for developing, attracting resources for implementation and monitoring the North-East RDP. According to its mission, the North-East RDA is a facilitator and promoter of the regional development process, encouraging cooperation and partnership. The North-East RDA is responsible for the implementation as Managing Authority of the Regional Operational Programme 2021-2027 in the North-East Region. The North-East RDA has experience in developing strategies, regional action plans and projects aimed at innovative development, with a specialised department established in 2001, today with 7 employees.

In addition to the CRI, the Academic Advisory Commission was set up to provide support to the North-East RDA for improving the content of the North-East RIS3. This working group includes representatives of the regional academic environment.

The Consortium also has a Funders Advisory Group, with the role of indicating the financing opportunities for the projects in the North-East RIS3 regional portfolio and providing information on the implemented projects. This commission includes:

- Representatives of the Intermediate Bodies for the operational programmes implemented in the North-East Region;
- Representatives of the departments of the Ministries that implement financing programmes from national and international funds as Managing Authority;
- Representatives of other relevant funders at regional level;
- The regional technological observatory activated by the Executive Unit for Financing Higher Education, Research, Development and Innovation (EUFHERDI);
- County statistical directorates.

By the date of the review of this Strategy, 6 meetings were organised with the governing structures of North-East RIS3, respectively RIC and AAC: July 2018, November 2018, May 2019, July 2019.

CHAPTER 8 – INTEGRATION OF MONITORING AND EVALUATION MECHANISMS

8.1 Monitoring

Monitoring and evaluation must take into account the performance framework agreed for the RIS3 North-East (specific vision and objectives, horizontal priorities and measures with targets and measurement indicators). See section *5.1 Priorities, measures, types of projects*.

Monitoring will be carried out on the following levels:

- **At RIS3 project level** – project results are measured (activities effect on the target group aimed by the project); output indicators (result of activities implementation) and result indicators are measured; necessary information to assess the achievement level of indicators will be collected from project documentation, annex to the funding application (ex-ante questionnaire regarding the beneficiary innovation level), interim and final monitoring reports of the project; in order to have access to this information, the process coordinator cooperates with Managing Authorities of the programmes from which the project is funded;
- **At RIS3 measure level** – cumulatively measured the outcome of implemented projects within the same type of intervention (number of applications, eligibility rate, success rate; the degree of achievement of intervention specific indicators) and their impact on beneficiary innovation level (ex-post questionnaire applied to the beneficiary at the end of project implementation); the indicators set is linked to the performance framework of the operational programme from which the measure is predominantly funded; in order to have access to this information, process coordinator cooperates with Managing Authorities of the programmes from which the project is funded;
- **At RIS3 priority level** – the effect of implementing all measures under a priority is measured; the impact indicator will be obtained from: Annual Implementation Reports of the Operational Programmes for the period 2021-2027, prepared by Managing Authorities/Intermediate Bodies, the nationally managed programmes reports (e.g. National Research – Development and Innovation Plan) and from the statistics of funding programmes managed directly at European level (e.g. Horizon Europe);
- **At RIS3 area/domain level** – 1 to 3 indicators will be set to reflect the achievement degree of the proposed specific objectives, to evaluate what extent has the smart specialisation occurred (reconversion of traditional activity sectors, activity diversification in emerging sectors and increased activity in catalyst type sectors). The interest of local actors in this area and niches identified by EDP (number of applications from various calls, eligibility rate and success rate), applicants and beneficiaries perception on the adequacy level of launched calls (source - regional study) are measured. It will also monitor the evolution of micro-ecosystem of associated innovative actors (source: questionnaire for entrepreneurial discovery facilitators).
- **At the strategy level**, the proposed targets to achieve the strategic vision of the strategy will be monitored.

The results of the proposed monitoring actions will be centralized in a Monitoring Report prepared by North-East RDA every 2 years starting with 2023.

The main purpose of the Monitoring Report is to highlight the state of play regarding the Smart Specialisation Strategy implementation and to propose recommendations to make its implementation more effective. Therefore, the report will have the following minimum structure:

- Introduction: the monitoring report will have an introductory section indicating information regarding the period covered by the monitoring report, data sources used to assess progress in the strategy implementation, difficulties encountered;
- Chapter 1: this section describes the carried out activities in the monitoring process;
- Chapter 2: this chapter presents the measures and actions that have been the subject of the monitoring process. Recommendations will then be made to make individual measures and actions implementation more effective;
- Final conclusions: The report concludes with an overall assessment of the progress made in implementing the Smart Specialisation Strategy.

The monitoring report will be presented in the plenary of the Regional Innovation Consortium, in order to analyse the progress made in implementing the Strategy.

8.2 Evaluation

The evaluation will be carried out on the following steps:

2025 Mid-term evaluation in order to:

- assess the implementation level of the strategic interventions (measures) included in strategy (analyse related to the launched project calls, potential beneficiaries responsiveness also by specialisation areas, look for possible solutions to adjust funding conditions and make the entrepreneurial discovery process more efficient);
- assess progress towards the proposed targets, by measuring context indicator set evolution; indicators values will be obtained from secondary sources – statistical data provided by the National Institute of Statistics (e.g. TEMPO online database), Eurostat, European Innovation Scoreboard, Regional Innovation Scoreboard;
- assess the administrative capacity of the regional innovative ecosystem to support the innovative processes needed for smart specialisation (identifying opportunities and developing viable project ideas, attracting resources to implement projects and programmes to support smart specialisation);

2027 Assessment for next cycle preparation:

- the objectives of the previous evaluation will be resumed, supplemented by an evaluation of bottlenecks that obstruct the diffusion of innovation in the region.

2029 Post-implementation evaluation:

- the results at the end of strategic interventions implementation will be evaluated (all projects will be finalized), the achievement of specialisation specific targets and regional impact will be assessed.

The evaluation will also be done based on key data highlighted by the monitoring reports during the strategy implementation through an evaluation report carried out in the middle and at the end of the implementation period.

The evaluation reports will be presented in the plenary of the Regional Innovation Consortium, to establish efficiency measures of RIS3 North-East implementation process.

The evaluation of the regional impact of the Strategy implementation will be based on an indicators system set out in **Annex 5**.

ANNEXES

Annex No.1 – Componente of the Regional Innovation Consortium and the Academic Advisory Commission

Annex no.2 – Methodological guidelines for North-East RIS3

Annex No.3 – Areas of competence

Annex No. 4 – Connect Nord-Est 2020 Results

Annex No. 5 – North-East RIS3 - Monitoring and Evaluation Indicator System