Project number: **101070737**
Project title: **Boosting Smart Regional Innovation Ecosystems**
Project acronym: **BOOST**
Call: **HORIZON-EIE-2021-CONNECT-01**
Topic: **HORIZON-EIE-2021-CONNECT-01-01**
Granting authority: **European Innovation Council and SMEs Executive Agency**
Project duration: **24 months**

Regional state of the art of the partners' Regional Innovation Frameworks

Document details

Work Package No	WP2
Deliverable Related No	D2.1
Deliverable No	D2
Deliverable Name	Regional state of the art of the partners' Regional Innovation Frameworks
Lead Beneficiary	North-West Regional Development Agency
Type	R (report)
Dissemination Level	PU (public)
Due date	28.02.2023
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Version	V4
Date	January 2023

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Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Innovation Council and SMEs Executive Agency (EISMEA). Neither the European Union nor the granting authority can be held responsible for them.

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1. Executive summary

The **Regional state of the art of the Regional Innovation Frameworks (RIF)** within BOOST project is assessing the current state of the art of the innovation status of the following territories, represented in the project by the 6 partner organisations:

#	REGION / territory	Country	BOOST Partners
1	RO11 – North-West	**Romania**	Transilvania IT North-Western Regional Development Agency
2	BG33 – North East	**Bulgaria**	Bulgarian Business Forums
3	EE0 – Estonia	**Estonia**	Tartu Science Park
4	DK03 – Southern Denmark	**Denmark**	Vejle Kommune
5	ES51 – Cataluña	**Spain**	Cluster Digital Catalunya

Embedded into European context, the analysis first presents briefly the European innovation framework, regarding the innovation status based on main indicators and the main European programmes boosting innovation.

Embedded into national context, the next chapter provides a synthesis of the BOOST countries [Romania - Bulgaria - Spain - Estonia - Denmark], presented in a benchmarking context and in relation to EU average indicators, highlighting strengths and weaknesses form both country perspective and regional perspective, in referral to the BOOST regions only.

The target sectors are the ones defined in the BOOST application form but the approach stays open to be able to include potential innovative sectors in future perspective. The thematic of collaboration that will be primarily addressed have been chosen based on identifying the common priorities from the partners' regions Smart Specialization Strategies (RIS3), being clearly in line with the Green and Digital European priorities[1];

- **Industry 4.0**
- **Cleantech and Green Transition**
- **Health & Well-being**
- **ICT & Digital Transformation**

National innovation frameworks are described in terms of governance, main players, policies, strategies and programmes both national and regional, to better understand how the research - development and innovation system is functioning in each of the BOOST countries analyzed.

1. https://ec.europa.eu/commission/presscorner/detail/en/ip_22_1467

State of the art of each of the 5 BOOST regions, as an extension of the national innovation frameworks, has been described from the perspective of main indicators which contribute to innovation, enclosing economic and social indicators, as well as a SWOT analysis summarizing the sweet and the weak spots.

The scope of the approach was to identify weak spots, near-to-market opportunities and "sweet spots" to be analyzed further on with the stakeholders, preparing the issue of potential measures to be addressed for boosting the innovation in the project target sectors.

2. Methodology

The methodology used for collecting and processing data is the following:

- desk research for identifying latest existing strategies and analysis performed at regional and national level, including EU assessment such as Innovation Scoreboard
- current practices, through used cases, best practices and existing projects, initiatives and programmes, reports and surveys performed until now in the partner regions
- structured interviews by regional facilitators and decision-making actors to evaluate the current extent of innovation level in the target sectors, including digitalization in the public administration and in the manufacturing industries of the involved regions.

Main sources for the data analysis were Eurostat and national statistical offices. Composite indicators were also used as reference from the main European benchmarking sources:

- European Innovation Scoreboard (EIS) – last version issued in 2022
- Digital Economy and Society Index (DESI) - last version issued in 2022
- Regional Innovation Scoreboard (RIS) – last version issued in 2021
- The European Regional Competitiveness Index (RCI) – last version issued in 2019(

The annual **European Innovation Scoreboard (EIS)** provides a comparative assessment of the research and innovation performance of EU Member States and selected third countries, and the relative strengths and weaknesses of their research and innovation systems. It helps countries assess areas in which they need to concentrate their efforts in order to boost their innovation performance. Based on their average performance scores as calculated by a composite indicator, the Summary Innovation Index, Member States fall into four different performance groups.
The new EIS measurement framework distinguishes between ***4 main types of activities***, capturing 12 innovation dimensions and in total 32 different indicators:

- ***Framework conditions*** capture the main drivers of innovation performance external to the firm and cover three innovation dimensions: Human resources, Attractive research systems, and Digitalisation.
- ***Investments*** capture public and private investment in research and innovation and cover three dimensions: Finance and support, Firm investments, and Use of information technologies.
- ***Innovation activities*** capture the innovation efforts at the level of the enterprise, grouped in three innovation dimensions: Innovators, Linkages, and Intellectual assets.
- ***Impacts*** cover the effects of firms' innovation activities in three innovation dimensions: Employment impacts, Sales impacts, and Environmental sustainability.

GDP per capita in purchasing power standards is a measure for interpreting real income differences between countries. Higher income can increase the demand for new innovative goods and services. Economic growth is captured by the average annual growth rate of GDP for 2018-2020. In economies that grow faster, increasing demand may provide more favorable conditions for enterprises to sell their goods and services.

Differences in economic structures are important. In particular, differences in the share of manufacturing industry in GDP, and in the so-called high-tech activities in manufacturing and services, are important factors that explain why countries can perform better or worse on indicators like business R&D expenditures, PCT patents, and innovative enterprises. Medium-high and high-tech industries have higher technological intensities than other industries. Countries with above-average shares of these industries are expected to perform better on several EIS indicators.

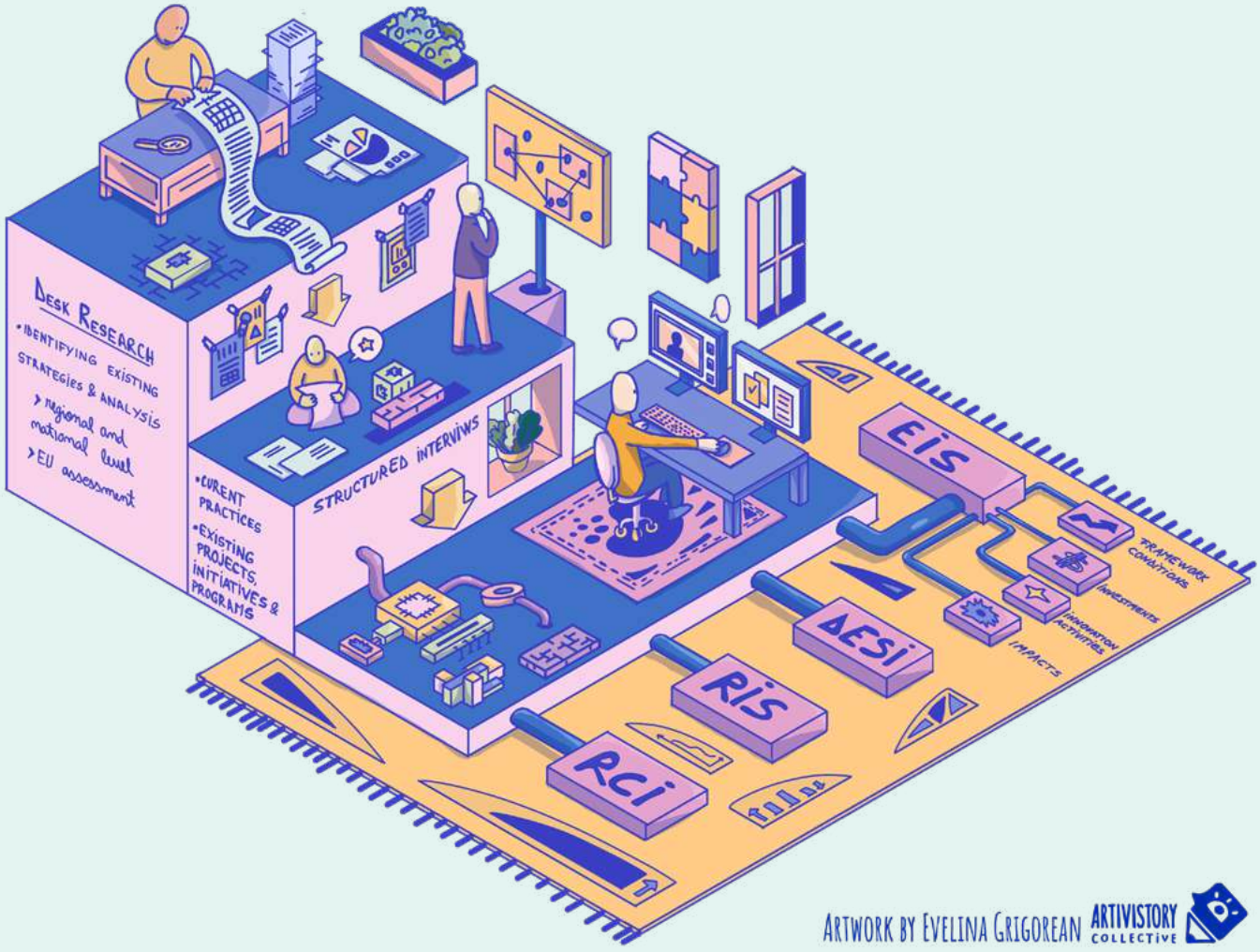
Enterprises can innovate through product or business process innovation, with the latter including process, marketing and organisational innovation. Enterprises can adopt new technologies developed by other enterprises or they engage in intensive in-house research and innovation activities. The capabilities needed by enterprises to innovate are very different in kind and size. More simple aggregate indicators of the percentage of 'innovative' enterprises in a particular country, as those currently used in the EIS, most likely provide information of limited value to policy makers. Instead, innovation indicators should differentiate between 'styles' or 'modes' of innovation in order to provide a clear picture of the structure of innovation capabilities within different businesses, economies, and countries[2]. Enterprise characteristics are important for explaining differences in R&D spending and innovation activities.

The Digital Economy and Society Index (DESI) summarizes digital performance indicators and tracks the progress of EU countries.

The Regional Innovation Scoreboard is a regional extension of the European innovation scoreboard (EIS), assessing the innovation performance of European regions on a limited number of indicators.

The European Regional Competitiveness Index (RCI) measures the major factors of competitiveness for all NUTS2 regions of the EU, taking into account over 70 comparable indicators for the ability of a region to offer an attractive and sustainable environment for firms and residents to live and work.

2. Arundel and Hollanders, 2005


DESK RESEARCH
•IDENTIFYING EXISTING STRATEGIES & ANALYSIS
> regional and national level
> EU assessment
•CURENT PRACTICES
•EXISTING PROJECTS, INITIATIVES & PROGRAMS
STRUCTURED INTERVIWS
EIS
RIS
RCI
AESI
FRAMEWORK CONDITIONS
INVESTMENTS
INNOVATION ACTIVITIES
IMPACTS
ARTWORK BY EVELINA GRIGOREAN
ARTIVISTORY COLLECTIVE

3. European Innovation Framework



Innovation is essential to drive Europe's competitiveness and to ensure the health and well-being of its citizens. Innovation shapes markets, transforms economies, stimulates step changes in the quality of public services and is indispensable to achieve the overarching objectives of the twin green and digital transition.

Europe can compete effectively with leading economies across the globe by building a true pan-***European innovation ecosystem*** underpinned by thriving ***regional innovation ecosystems*** and capitalising on the experience, needs, vision and perceptions of an increasingly diverse range of individuals, companies and places.

The 2022, the **European Innovation Scoreboard 2022**[3] confirms that the EU remains a good place to innovate. Innovation performance has increased for the EU by about 10% points since 2015 (with a peak in 2020) and there has been noticeable progress in the EU's global position, in particular due to strong performance increases in the following indicators:

- Broadband penetration
- Venture capital expenditures
- International scientific co-publications

But significant divergences remain among the Member States, and are even widening. We need to take action to address this innovation divide at EU, national and regional level. For this to happen, we need to boost public and private investments in R&D, set the right framework conditions to allow innovation to flourish, and ensure that innovative solutions find their way to the market to benefit people and the planet.

3. https://research-and-innovation.ec.europa.eu/statistics/performance-indicators/european-innovation-scoreboard_en

To address this challenge, the Commission adopted in July 2022 the **New European Innovation Agenda**[4]. It puts an important focus on closing the innovation divide in Europe and aims to position Europe at the forefront of the new wave of deep tech innovation and start-ups. Building on Europeans' entrepreneurial mindset, scientific excellence, the strength of the Single Market and democratic values, the New Innovation Agenda presents five flagship actions: improve access to finance for European start-ups and scale-ups; improve the conditions for innovators to experiment with new ideas through regulatory sandboxes; help create "regional innovation valleys" that will strengthen and better connect innovation players through Europe; attract and retain talent in Europe, and improve policy-making tools.

The process of convergence within the EU is still continuing, where lower performing countries are growing faster than higher performing countries. Between 2021 and 2022, performance has improved in 19 Member States, most strongly in Czechia, Ireland, and Finland (at 7.5%-points or more), and has declined for 8 Member States, including ***Estonia***, France, Germany, Italy, Latvia, Luxembourg, Malta, and ***Romania***, with performance declining strongest in Estonia (-8.9%-points). One year back, between 2020 and 2021, performance has improved for 20 Member States, most notably for Cyprus and ***Estonia***, and performance has declined for 7 Member States, including France, Ireland, Latvia, Luxembourg, Netherlands, Portugal and Slovakia.

- ***Innovation Leaders:*** 5 countries with innovation performance above 125% of the EU average: Belgium, ***Denmark***, Finland, Sweden, and starting from EIS 2022, the Netherlands

- ***Strong Innovators:*** 7 countries with performance between 100% and 125% of the EU average: Austria, ***Estonia***, France, Germany, Ireland, Luxembourg and starting from EIS 2022, Cyprus

- ***Moderate Innovators:*** 8 countries below the EU average with performance between 70% and 100% of the EU: Czechia, Greece, Italy, Lithuania, Malta, Portugal, Slovenia and ***Spain***

- ***Emerging Innovators*** with performance below 70% of the EU average: ***Bulgaria***, Croatia, Hungary, Latvia, Poland, ***Romania*** and Slovakia.

4. https://research-and-innovation.ec.europa.eu/strategy/support-policy-making/shaping-eu-research-and-innovation-policy/new-european-innovation-agenda_en

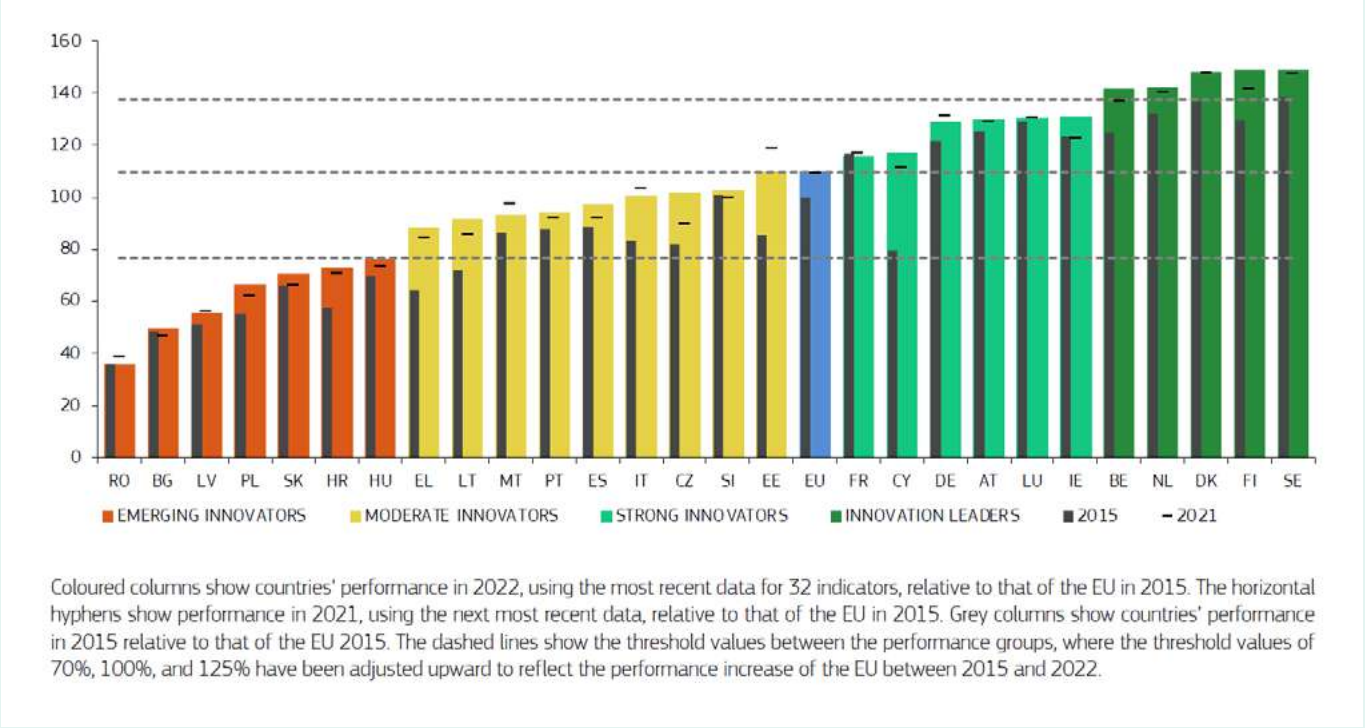


Figure no. 1. Performance of EU Member States' innovation systems
Source: EU Innovation Scoreboard 2022

During 2014-2021, performance has improved strongest in *Digitalisation* (38%-points), due to a 52% performance increase for *Broadband penetration.*
During 2015-2022, performance has improved most in *Innovators* (39.8%-points), in *Linkages* (35.0%-points), and in *Finance and support* (21.5%-points), due to a very strong increase in *Venture capital expenditures*.
During 2021-2022, performance has improved in 7 dimensions and strongest in *Digitalisation* (9.5%-points) and *Finance and support* (9.2%-points), and decreased in 5 dimensions, most strongly in Linkages (-11.1%-points). For the individual indicators, the highest increase is in *Venture capital expenditures* (20.1%-points) and *Broadband penetration* (18.2%-points) and the highest decrease in *Job-to-job mobility* of *HRST* (-23.5%-points) and *Enterprises providing ICT training* (-18.8%-points).

According to EIS 2022, during 2015 - 2022, there are significant differences in performance change for the different dimensions and indicators at EU level. The difference between the respective blue and black coloured bar shows the change in the most recent year. Performance changes are measured as the relative to EU scores minus 100.

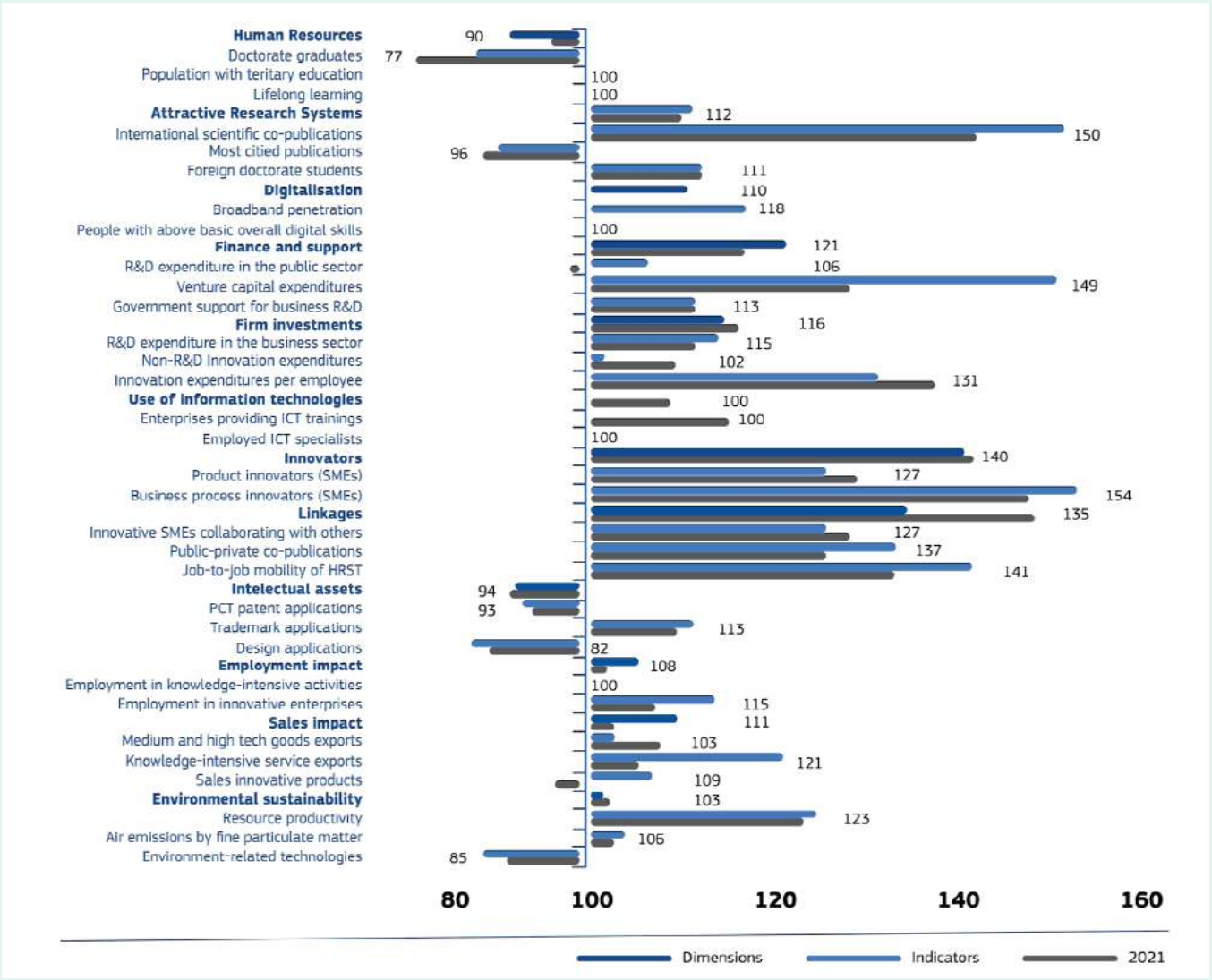


Figure no. 2. EU Performance change between 2015 and 2022 by dimension and indicator
Source: EU Innovation Scoreboard 2022

According to the EIS 2022, the distribution between innovating and non-innovating enterprises, differentiated between six Innovation profiles, is the following in the EU:

- About 11% of enterprises are In-house innovators with market novelties. These enterprises are most frequent among large enterprises (29%).
- About 12% of enterprises are In-house innovators without market novelties. These enterprises are also more common among larger enterprises (19%).
- In-house business process innovators account for 11% of enterprises. There are no significant differences in the relevance of this profile among the different size classes.
- Innovators that do not develop innovations themselves account for 12% of enterprises. About 3% of enterprises are Innovation active non-innovators.
- *Non-innovators* account for more than half of EU enterprises:
- *Non-innovators* with potential to innovate account for 20% of all enterprises, and these enterprises are most frequent among the small enterprises (21%)
- *Non-innovators* without disposition to innovate form the largest group accounting for 31% of all enterprises, ranging from only 14% among the large enterprises to 34% among the small enterprises.

	Share of enterprises				Share of employment			
	Small	Medium	Large	Total	Small	Medium	Large	Total
In-house product innovators with market novelties	8.5%	16.1%	29.4%	10.7%	9.2%	17.2%	44.8%	29.6%
In-house product innovators without market novelties	11.2%	15.2%	19.4%	12.3%	11.4%	15.6%	19.7%	16.8%
In-house business process innovators	10.7%	12.2%	11.0%	11.0%	11.1%	12.2%	8.6%	10.1%
Innovators that do not develop innovations themselves	11.1%	13.8%	12.0%	11.6%	11.7%	14.0%	7.7%	10.2%
Innovation active non-innovators	3.0%	4.5%	4.3%	3.3%	3.2%	4.6%	2.9%	3.4%
Non-innovators with potential to innovate	21.5%	15.3%	9.3%	19.9%	21.1%	14.4%	5.9%	11.5%
Non-innovators without disposition to innovate	34.0%	22.9%	14.5%	31.3%	32.4%	22.0%	10.4%	18.4%

Table no. 1. Distribution of enterprises and employment for seven Innovation profiles in the EU
Source: EU Innovation Scoreboard 2022

According to EIS 2022, R&D expenditures in the public and business sector - In 2020, the volume of R&D expenditures in the public sector decreased for 6 and increased for 21 Member States, whereas the indicator value decreased for only 2 and increased for 22 Member States. The decrease in the volume of R&D expenditures in 2020 for 6 Member States is higher[11] than in 2019 and 2018 (respectively no and one Member State), but differences seem to be too small to assume a possible impact of Covid-19 on R&D expenditures in the public sector.

The **Digital Economy and Society Index (DESI 2022)** shows that most of the member states are progressing towards digital transformation. Nonetheless, the adoption of key digital technologies by business, such as artificial intelligence, still remains low. Also, insufficient level of digital skills hamper the prospects of future growth, as more and more services are shifted online. The digital targets proposed at EU level to be reached by 2030[5] are to increase basic digital skills (to a minimum of 80% of the population), to increase the number of ITC specialists, the digital transformation of businesses as well as of the public administrations/ public services .

As for DESI 2022, these are the following public levels of the digitalisation per EU average:

- 65% of e-Government users (raising from 61% in 2020)
- 81% open data
- 75 (from 100 max) digital public services for citizens
- 82 (from 100 max) digital public services for business

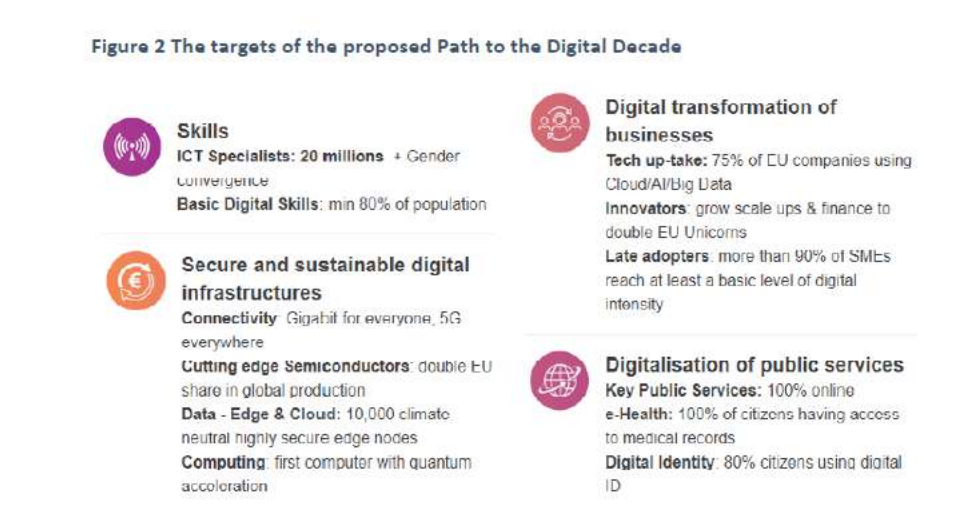


Figure no. 3. The target of the proposed Path to the Digital Decade Source: European Comission

5. 2030 Digital Compass: the European way for the Digital Decade: https://eur-lex.europa.eu/legal-content/en TXT/?uri=CELEX%3A52021DC0118

According to **Regional Innovation Scoreboard 2021**, for 225 regions out of 240, performance has increased over time. Performance has decreased for only 15 regions, including 4 regions in France, 3 in Denmark and Germany, 2 in Romania, and one each in Czechia, Slovakia, and Switzerland.
When comparing to the growth performance of the EU, 40% of the EU regions have improved their performance relative to the EU but 60% have seen their performance worsen compared to the EU. The share of regions with positive performance change relative to the EU is highest for the Moderate Innovators (50%) and lowest for the Emerging Innovators (25%). Over time, there has been a process of convergence in regional performance with decreasing performance differences between regions.

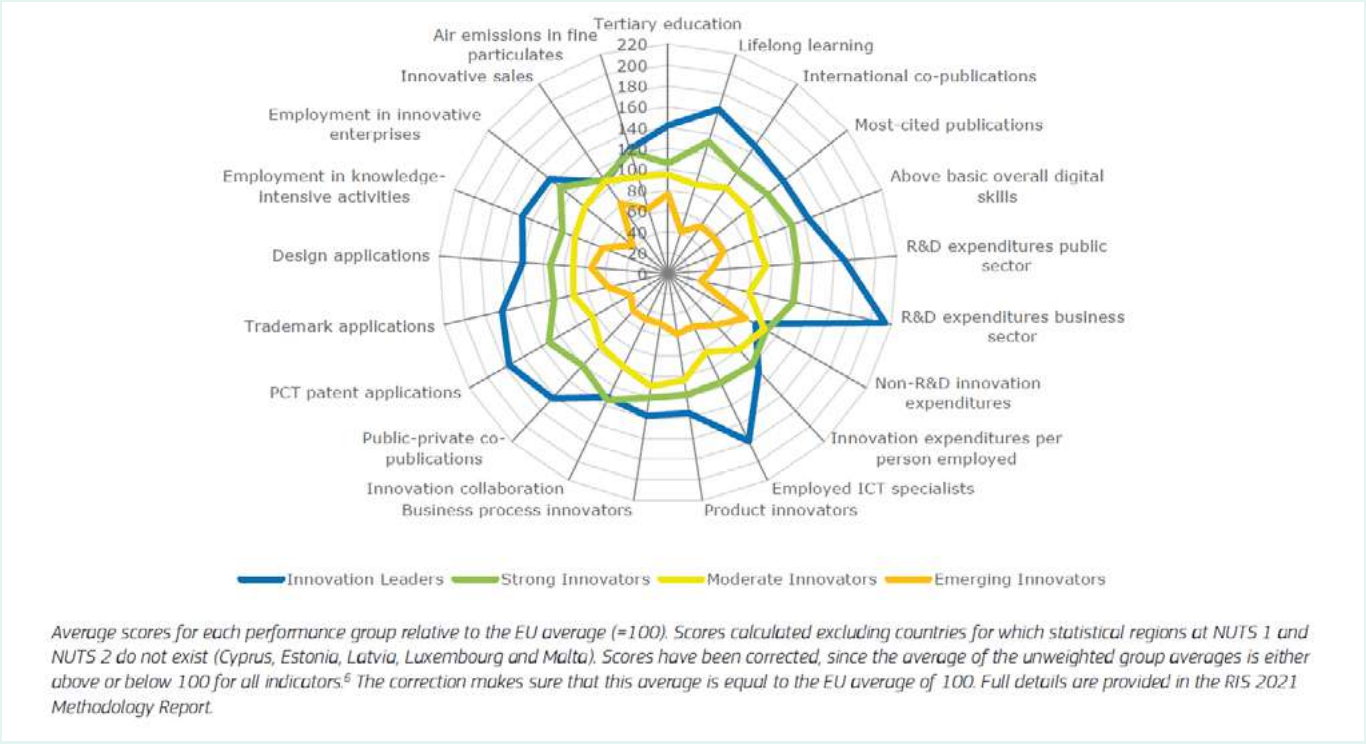


Figure no. 4. Average indicator scores by regional performance group
Source: Regional Innovation Scoreboard 2021

Smart specialization strategies play a central role in strengthening regional innovation ecosystems so that they are better equipped to stimulate and sustain economic growth. They provide the framework for European Regional Development Fund (ERDF) support for research and innovation to the tune of an estimated EUR 56 billion for the 2021-2027 period. Thematic Smart Specialisation Platforms and partnerships have also become key tools for connecting innovators with similar or complementary strengths and priorities in all Member States and regions, including in technology areas that are key for the twin green and digital transition.

European Cluster Collaboration Platform (ECCP) provides both an overview of the specialisation and the impact of such clusters across 201 European regions, and EU programmes including the work of the **Enterprise Europe Network** (EEN) facilitate critical connections to international partners and supply chains reflecting the importance of openness and trade partnerships for the EU's economy. The Commission has also launched the Common Mapping of Innovation Supporting Actors initiative to provide a comprehensive mapping of innovation supporting actors and state of the art supporting facilities across all regional innovation ecosystems throughout Europe.

Commission's update of the EU Industrial Strategy of 5 May 2021. The update takes full account of the new circumstances following the COVID-19 crisis to drive Europe's industrial transformation to a more sustainable, digital, resilient and globally competitive economy. It proposes new measures to strengthen the resilience of our Single Market and addresses the need to better understand and respond to our dependencies in key strategic areas. With SME at its core, the update also offers new measures in support of Europe's transition across industrial ecosystems. The update of the industrial strategy also stressed that tailored support to enable SMEs and start-ups to embrace the twin transitions is essential, given that SMEs are a primary vehicle of innovation in the various industrial ecosystems.

NextGenerationEU [through National Recovery & Resilience Plans], worth EUR 750 billion, is contributing to a more inclusive, resilient and better prepared economy and society. This cannot be achieved without reforms and investments in innovation and research. Member States dedicated on average 26% of their Recovery and Resilience Facility (RRF) allocation to the digital transformation, above the compulsory 20% threshold.

In support of Europe's global lead in innovation, **Horizon Europe** is the world's largest research and innovation programme ever, with a budget of over €95.5 billion for 2021-2027. Horizon Europe will promote excellence and provide valuable support to top researchers and innovators to drive the systemic changes needed to ensure a green, healthy and resilient Europe.

Other EU programmes supporting innovation are **EU4Health, Digital Europe, SINGLE Market.**

The new European Research Area (ERA) will create a single and borderless market for research, innovation and technology across the EU, while boosting the market uptake of research and innovation results. Enabling innovation ecosystems across Europe will be essential to unleash its full innovation potential through stronger creation and diffusion of innovation. Europe needs a landscape where all innovation actors operate in a flexible, effective and collaborative way, drawing on the strengths and diversity of national, regional and local innovation ecosystems.

As future opportunities, New European Innovation Agenda**, embedded into 2030 Digital Compass, will pave the way for the Digital Decade. A guidance document** is expected to be published in the first half of 2023, containing relevant use cases of regulatory sandboxes, test beds and living labs in order to support policymakers and innovators in their approach to experimentation in the EU. A staff working document will provide an overview of the main existing experimentation clauses and regulatory sandboxes in EU law, and support will be provided for innovators to identify areas and establish an experimentation space, such as regulatory sandboxes, living labs or test beds, which could facilitate the deployment of disruptive technologies through future calls.

The Commission will also support the **creation of the GovTech Incubator in 2023**: an agreement for cross-border collaboration between digitalisation agencies for the deployment of innovative digital government solutions through Digital Europe programme.

The revised State Aid Framework for Research and Development and Innovation (RDI) will include, upon adoption, **a new rule allowing Member States to grant aid for the construction and upgrade of testing and experimentation infrastructures.** This will ensure that the RDI framework together with the General Block Exemption Regulation (GBER) can help Member States support the delivery of the European Green Deal and the Commission's Industrial and Digital strategies.

The Commission will also launch **testing and experimentation facilities for AI innovation** at a European level in 2023. These will allow innovators to test state-of-the art solutions and products in real-world environments and at scale.

4. Overview of the National and Regional Innovation Status

BOOST partnership is made up of 3 organizations from 2 modest innovator countries [Romania and Bulgaria], 1 from a moderate innovator country [Spain], 1 from a strong innovator country [Estonia] and 1 organization from a lead innovator country [Denmark] - according to the European Innovation Scoreboard 2022.

4.1 Country innovation status

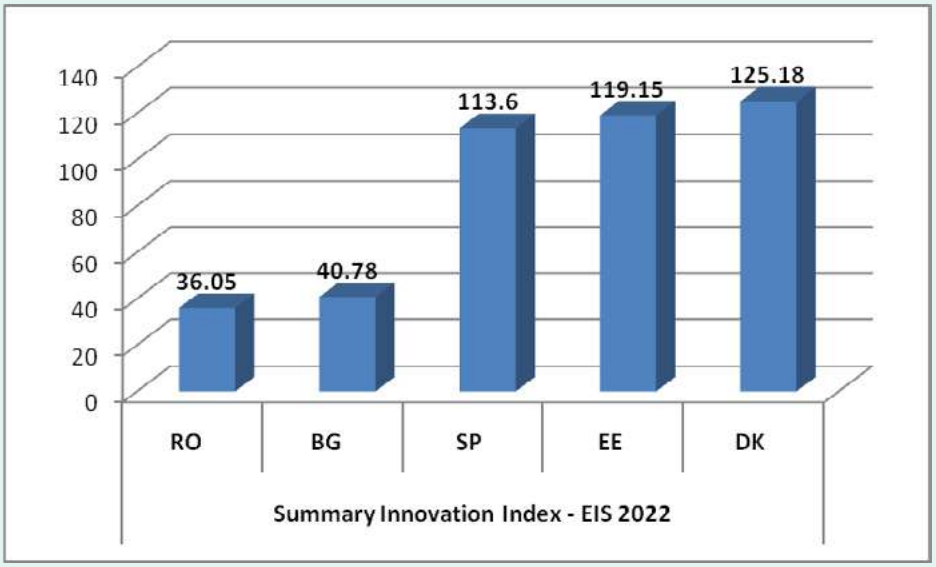
According to EIS2022, these are the main findings for country profiles related to innovation.

COUNTRY	Main PERFORMANCE structural differences against the EU average
ROMANIA • Emerging Innovator • performance at **32.6%** of the EU average • ranked last place in EIS 2022 • performance gap to the EU is becoming larger.	● Romania has lower per capita income but a faster growing economy. ● Manufacturing takes up a larger share of the economy, with SMEs accounting for a larger share of turnover. ● Enterprise births, entrepreneurial activity and FDI net inflows add positively to the innovation climate ● the absence of top R&D spenders add negatively. ● Romania has a lower share of In-house product innovators with market novelties and a higher share of non-innovators with potential to innovate. ● Ease of starting a business ● Entrepreneurial training and government procurement are below the EU average.
BULGARIA • Emerging Innovator • performance at **45.2%** of the EU average • ranked 2nd last place in EIS 2022 • performance gap to the EU is becoming larger	● Bulgaria has lower per capita income but a faster growing economy. ● Manufacturing takes up a larger share of the economy, with SMEs accounting for a larger share of turnover. ● Enterprise births, entrepreneurial activity and FDI net inflows add positively to the innovation climate ● the absence of top R&D spenders add negatively. ● Romania has a much share of non-innovators that have no interest to innovate ● It is more difficult to start a business ● entrepreneurial training and government procurement are at the same level as the EU average.

COUNTRY	Main PERFORMANCE structural differences against the EU average
SPAIN • Moderate Innovator • performance at **88.8%** of the EU average • ranked 16th in EIS 2022 • performance gap to the EU is becoming larger	● Spain has lower per capita income and a slower growing economy. ● Business service takes up a larger share of the economy, with SMEs accounting for a larger share of turnover. ● Enterprise births and FDI net inflows add positively to the innovation climate ● Entrepreneurial activities and top R&D spenders add negatively. ● Spain has a much higher share of non-innovators with potential to innovate ● Spain has a below average share of in-house product innovators ● It is more difficult to start a business ● entrepreneurial training and government procurement are at the same level as the EU average.
ESTONIA • Moderate Innovator • performance at **89.7%** of the EU average • ranked 12th in EIS 2022 • performance gap to the EU has almost disappeared	● Estonia has lower per capita income but a faster growing economy. ● Manufacturing takes up a larger share of the economy, with SMEs accounting for a larger share of turnover. ● Entrepreneurial activity and FDI net inflows add positively to the innovation climate ● top R&D spenders add negatively. ● Estonia has an above average share ok in-house product innovation without market novelties ● Ease of starting a business is above average ● entrepreneurial training is above EU average.
DENMARK • Innovation leader • performance at **134.4%** of the EU average • ranked 3rd place in EIS 2022 • performance lead over the EU is becoming larger	● Denmark has higher per capita income and a faster growing economy. ● Manufacturing takes up a smaller share of the economy, with SMEs accounting for a larger share of turnover. ● top R&D spenders add positively ● Enterprise birth and entrepreneurial activity add negatively to the innovation climate ● Innovation profiles - data not available ● Ease of starting a business and entrepreneurial training are above average

4.2 Benchmarking the national innovation status

The disparities in terms of Summary *Innovation Index* per counties, as a composite indicator reflecting the country's innovation level, are reflected in the graph next by, with the extremes Romania (among) the lowest in EU and Denmark among the highest in EU.



Main indicators related to innovation are presented in the table below (source: EIS 2022), per country and against EU average. The green cells highlight steady increases in the respective indicator, in the last 7 years (since 2015). The indicators are compared to the EU average considered 100%. [ex: Digitalisation level in Romania, Bulgaria and Estonia in 2022 was below EU average, while in Spain and Denmark it was above; at the same time, Broadband penetration was higher than EU average in Romania, Spain and Denmark]. DESI 2022 indicators have also been included, the ones related to the digitalisation level.

COUNTRY Innovation Indicator 2022	**Performance relative to EU in 2022 [EU = 100%]**				
	RO	**BG**	**SP**	**EE**	**DK**
SUMMARY INNOVATION INDEX	**32.6**	**45.2**	**88.8**	**99.96**	**143.8**
Human resources	**19.2**	**33.5**	**127.6**	**132.2**	**170.1**
Attractive research system[6]	**35.5**	**27.6**	**96.6**	**124**	**195.6**
Digitalisation	**86.7**	**47**	**149.8**	**86.6**	**152.2**
*Broadband penetration	135.9	69.2	146.2	69.2	153.8
*Digital skills	22.7	18.2	154.5	109.1	150
Finance and support	**29.5**	**22.6**	**74.5**	**92.8**	**111.2**
*R&D expenditures in the public sector	10.6	22.7	75.8	100	143.9

6. Attractive research systems indicators is composed of: (1) International scientific co-publications, (2) most cited publications and (3) Foreign doctorate students

*Venture capital expenditures	63.2	36.1	99.6	134.5	130.3
*Government support for business R&D	7.7	4.2	38.8	26.9	43.6
Firm investments	**12.2**	**35.1**	**62.4**	**93.7**	**83.1**
*R&D expenditure in the business sector	15.5	35.8	49.3	62.8	120.9
*Non R&D innovation expenditures	13.8	62.5	81.3	140.3	101.6
*Innovation expenditures per employee	8.2	13.2	58.7	83.3	37.3
Use of information technologies	**13**	**35.9**	**91.3**	**127.2**	**156.5**
*Enterprises providing ICT training	12.5	18.8	100	81.3	162.5
*Employed ICT specialists	13.6	54.5	81.8	177.3	150
Innovators (SMEs)	**4.6**	**56**	**50**	**95.3**	**117.2**
*Product innovators	9.9	78.8	59.6	92	120.2
*Business process innovators	0	36	41.8	98.3	114.5
Linkages [7]	**7.4**	**34.4**	**88.5**	**163.9**	**218**
*Innovative SMEs collaborating with others	0	56.9	57	154.8	127.6
Intellectual assets	**32.7**	**74.1**	**78.1**	**120.3**	**143.3**
*PCT patent applications	22.8	36.8	64.2	62.4	130.6
*Trademark applications	57.5	113.2	109.8	186.7	114.7
*Design applications	20.1	83.9	63.8	129.3	190.6

The economic indicators related to innovation, as well as the innovation profiles are indicated incomparison in the table below, highlighting in green the highest value between the target countries and in pink the lowest. Denmark is scoring high in economic performance indicators while Estonia has excellent innovation profiles. Romania scores lowest in both indicators categories.

7. Linkages indicators is composed of: (1) Innovative SMEs collaborating with others, (2) Public-private co-publications and (3) Job-to-job- mobility of HRST

Indicator EIS 2022	Performance relative to the EU average					
ECONOMY PERFORMANCE	RO	BG	SP	EE	DK	EU
GDP/ capita (PPS)	22.200	17.000	26.900	26.400	41.100	31.200
% Employment share in manufacturing	18.9	18.7	12.5	18.4	11.3	16.4
● % of which High and Medium high-tech	34.5	23.1	32	23.3	43.1	38
% Employment share in services	34	41.3	48.2	40.3	41.3	41.1
● % of which Knowledge-intensive services	26.5	28.8	32.1	33.4	36	35.8
INNOVATION PROFILES % of enterprises	RO	BG	SP	EE	DK	EU
In-house product innovators with market novelties	2.4	7.8	6.2	13.2	n/a	10.7
In-house product innovators without market novelties	5	6.4	7.1	26.7	n/a	12.3
In-house business process innovators	3.5	5	10.6	13.1	n/a	11
Innovators that do not develop business themselves	3.4	7.6	3.5	13.1	n/a	11.6
Innovation active non-innovators	0.2	3.3	2.8	4.7	n/a	3.3
Non-innovators with potential to innovate	29.4	15.8	43.2	12.3	n/a	19.9
Non-innovators without disposition to innovate	56	54.1	26.6	16.9	n/a	31.3

In terms of digitalisation, according to DESI 2022, the level is constantly increasing, both for integration of digital technologies in business (including e-commerce) and also for digital public services (including open data). Estonia, Denmark and Spain have the digitalisation index above the EU average (71%), while Bulgaria and Romania are part of the group of low-performers among EU Member States when it comes to digitalisation.

DIGITALISATION Indicators for 2021 (as for DESI 2022)	RO	BG	SP	EE	DK	EU
Digitalisation level (%)	40%	60%	78%	92%	85%	71%
eGovernment Online services (%)	56%	68%	94%	96%	98%	81%
Digital in private sector	24%	20%	39%	41%	58%	39%

4.3 Dynamics, strengths & weaknesses

Between 2015-2022, EU performance has been increasing with an average of 9.9% points. In the table below, each BOOST country can be followed, specifically with the indicators having strongest increase or decrease.
Strengths and weaknesses related to the main innovation indicators are also pointed out in the table below.

Country	STRENGTHS	WEAKNESSES	2015-2021	+ Strong INCREASE since 2015	- Strong DECREASE since 2015
RO	Broadband penetration Venture capital expenditures	Business process innovators Innovative SMEs collaborating with others	**+0.2**	Venture capital expenditures Public-private co-publications	Non R&D innovation expenditures
BG	Product innovators Trademark applications Design application	Innovation expenditures per employee Government support for business R&D	**+1.6**	Product innovators Innovative SMEs collaborating with others	Design applications Enterprises providing ITC trainings
ES	Sales of innovative products Digital skills Broadband	Business process innovators R&D expenditure in the business sector Government support for business R&D Innovative SMEs collaborating with others	**+8.6**	Sales of innovative products Public-private co-publications	Government support for business R&D Enterprises providing ITC trainings
EE	Trademark applications Employes ITC specialists	Government support for business R&D	**+24.4**	Business process innovators	Government support for business R&D R&D expenditure in the public sector
DK	Public-private co-publications	Innovation expenditures per employee Government support for business R&D	**+134.4**	Venture capital expenditures Public-private co-publications	Innovation expenditures per employee

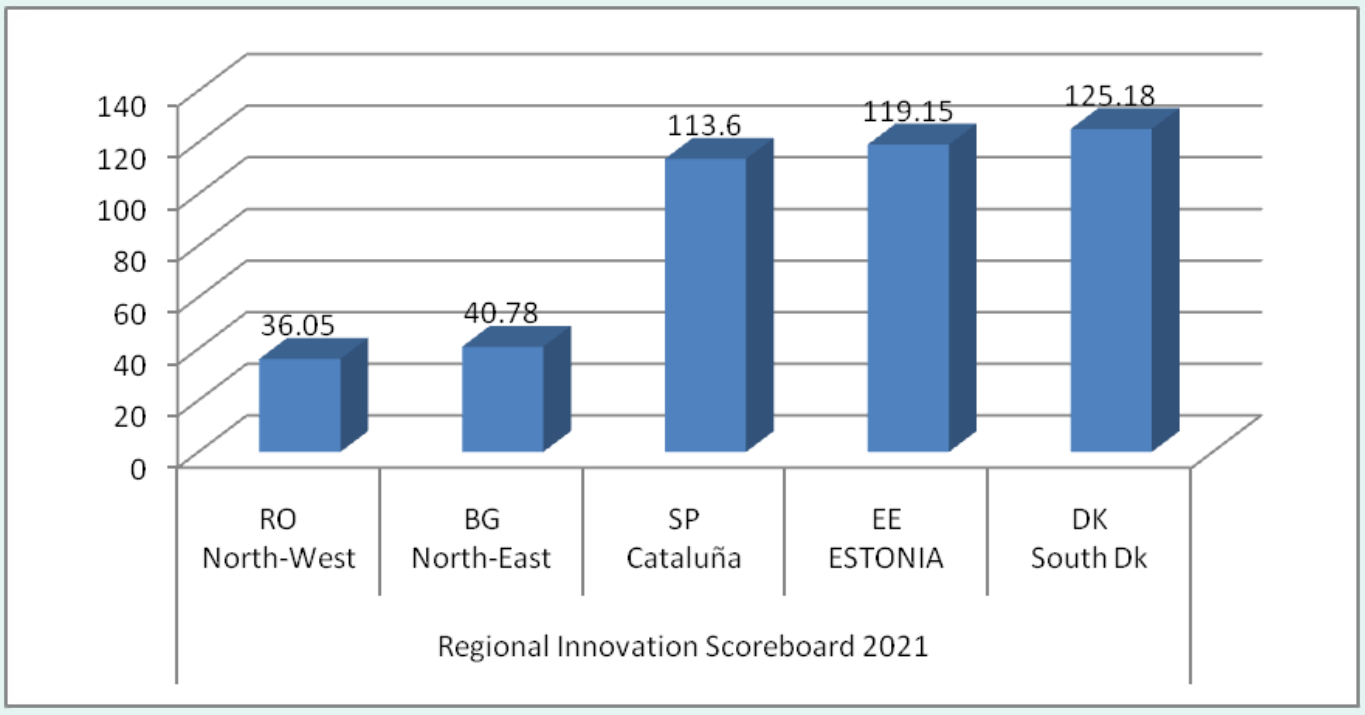

ES
RO
DK
BG
EE
ICT TRAININGS
ENTERPRISES
DIGITAL SKILLS
SALES OF INNOVATIVE PRODUCTS
BROADBAND
BUSINESS PROCESS INNOVATORS
R&D EXPENDITURE
VENTURE CAPITAL EXPENDITURES
INNOVATIVE SMES COLLABORATING WITH OTHERS
PUBLIC-PRIVATE CO-PUBLICATIONS
GOVERNMENT SUPPORT FOR BUSINESS R&D
TRADEMARK APPLICATIONS
PRODUCT INNOVATORS
EMPLOYEES ICT SPECIALISTS
R&D EXPENDITURE IN THE PUBLIC SECTOR
INNOVATION EXPENDITURES PER EMPLOYEE
STRENGTHS
WEAKNESSES
STRONG INCREASE
STRONG DECREASE
ARTWORK BY EVELINA GRIGOREAN
ARTIVISTORY COLLECTIVE

4.4 Benchmarking the regional innovation status

BOOST partnership is acting in 2 emerging innovator regions, 1 moderate and 2 strong innovator regions (according to the Regional Innovation Scoreboard 2021):

#	REGION / territory	Region name in national language	Country	Regional innovation status
1	RO11 – North-West	Nord-Vest	Romania	**Emerging**
2	BG33 – North East	Severoiztochen	Bulgaria	**Emerging**
3	EE0 – Estonia	Estonia	Estonia	**Strong**
4	DK03 – Southern Denmark	Syddanmark	Denmark	**Strong**
5	ES51 – Cataluña	Cataluña	Spain	**Moderate**

According to the **Regional Innovation Scoreboard 2021** - which is considering each region against the EU average of 100% - from BOOST regions, Southern Denmark, Catalonia and Estonia are above EU average, while North-East Romania and North-East Bulgaria are situated less than half below the EU average.



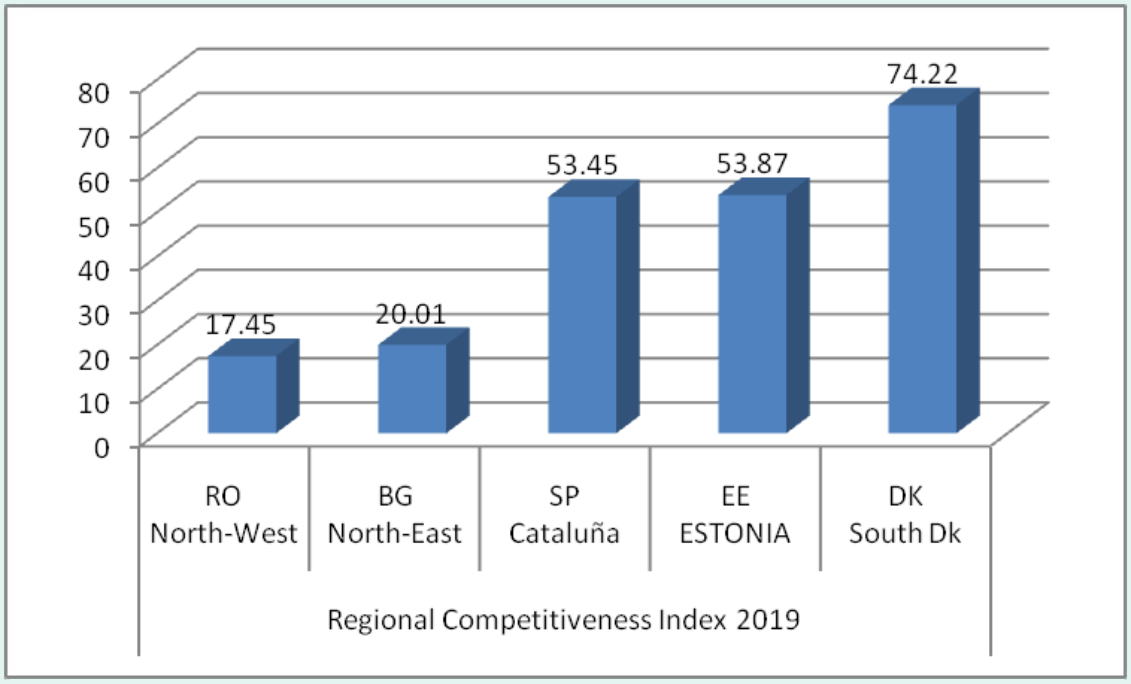
The innovation composites indicators have been compared in the table below for each of the BOOST regions, taking into account digitalisation, R&D expenditures level, SMEs innovation and intellectual assets values. The highest values are marked in green and the lowest in pink.

- Estonia has on average the highest values (considered at the country level since Estonia does not have statistical regions due to the fact that the country population is comparable to NUTSII EU regions)
- followed closely by Southern Denmark and then by Catalunya (SP)
- the lowest ranks are for North-West Romania, which scores the less in all considered benchmark indicators
- North-East Bulgaria is highest that North-West Romania in all considered indicators

REGIONAL Innovation Indicator 2021	Performance relative to EU in 2021 [EU = 100%]				
	RO North-West	BG North-East	SP Cataluña	EE ESTONIA	DK South Dk
SUMMARY INNOVATION INDEX	36.05	40.78	113.6	119.15	125.18
Digitalisation *Digital skills	13.69	16.22	152.86	109.09	211.42
*Employed ICT specialists	29.99	38.13	38.13	177.27	81.91
Employment in innovative enterprises	-	42.85	74.10	196.45	138.42
***R&D expenditures** in the public sector	18.31	19.72	80.28	101.61	88.73
***R&D expenditures** in the business sector	5.5	20.47	72.02	63.57	85.83
Firms *Non R&D innovation expenditures	30.96	83.31	99.8	184.56	97.26
Firms *Innovation expenditures per employee	26.95	43.79	102.85	97.77	109.54
Innovators (SMEs)					
*Product innovators	72.43	67.35	76.19	226.71	119.83
*Business process innovators	-	24.9	62.21	216.31	120.01
*Innovative SMEs collaborating with others	20.43	37.64	76.41	323.84	153.02

Intellectual assets					
*PCT patent applications	19.61	24.29	76.52	62.34	109.32
*Trademark applications	44.24	93.41	198.51	199.36	142
*Design applications	49.5	159.01	89.17	96.80	120.5

According to the European Regional Competitiveness Index (RCI) 2019 - which 100 points is considered to be the highest value - from BOOST regions, Southern Denmark is situated at 3 quarters, Catalonia and Estonia at half and North-East Romania and North-East Bulgaria less than a quarter.



The innovation and technological readiness indicators have been also highlighted in the table below, with maximum half way on the innovation parameters for Estonia and almost the highest value for the technological readiness in Southern Denmark. Highest values are marked in green and the lowest in pink.

Only Southern Denmark is having a positive standard deviation regional competitiveness index higher than the EU average (+ in *Z-Scores**), Catalonia and Estonia being close below under EU average, while for the two regions from Romania and Bulgaria is far negative.

REGIONAL Competitiveness Index 2019	Performance relative to EU in 2019 [EU = 100%]				
	RO North-West	BG North-East	SP Cataluña	EE ESTONIA	DK DK South Dk
Z-Scores*	*-1.14*	*-1.07*	*13.52*	*-0.16*	*0.39*
Regional Competitiveness Index	17.45	20.01	53.45	53.87	74.22
Innovation	15.18	13.94	54.52	56.16	46.57
Technological readiness	30.45	13.52	64.98	65.95	95.31

**The regional z-score is a measurement of the relationship of the regional RCI value to the EU RCI mean (average), measured in terms of standard deviations from the mean. If a z-score is 1, it indicates that the data point's score is one standard deviation above the EU average. Positive values show higher than EU-mean score; negative values are lower than the EU-mean score.*

The detailed REGIONAL ANALYSIS of the state of the art of the innovation performance indicators in each of the BOOST regions are to be found in the last part of this document, as follows:

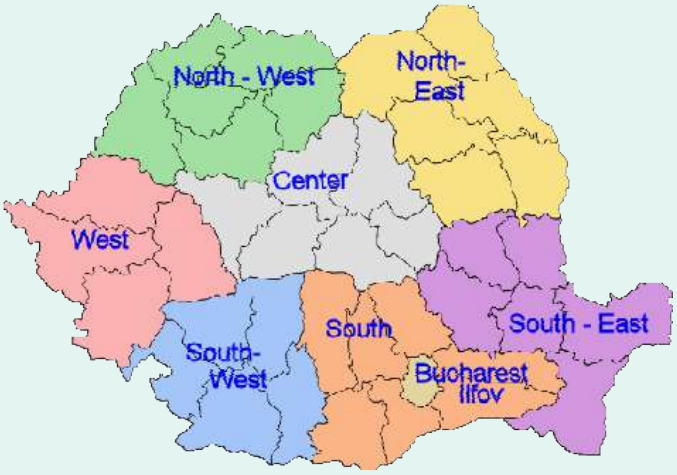
- North-West ROMANIA regional analysis of the innovation status
- North-East BULGARIA regional analysis of the innovation status
- Catalunya SPAIN regional analysis of the innovation status
- ESTONIA country analysis of the innovation status
- Southern Denmark regional analysis of the innovation status

5. National & Regional Innovation Frameworks

This chapter will introduce the ***specificities of each of the innovation governance systems*** in each BOOST country, how the ***regional innovation system*** (if exists) is embedded into the national one, as well as ***main policies, strategies and programmes*** whose role is to support and boost innovation both at private and at public level.

5.1. ROMANIA - national & regional innovation framework

Romania has 8 development regions at NUTS2 level, which have no legal and administrative status, but play an important role in the implementation of the Cohesion Policy programmes and regional statistics. They were established in 1998 by the regional development law, currently updated by **Law no.315/ 2004.**



According to RIS 2021, all Romania regions are Emerging Innovators. Regional performance differences are high in Romania with the best performing region, București – Ilfov (RO32), performing more than 3.4 times as well as the lowest performing region, Sud-Vest Oltenia (RO41). Performance relative to the EU in 2014 has improved for six regions and declined for two regions.
In each development region is functioning one regional development agency (RDA), which is a non-governmental and non-profit body of public utility, with legal personality, operating in the field of regional development.
The RDAs are responsible for coordinating the design and implementation of regional development strategies and plans, being the executive bodies of the corresponding Regional Development Councils, composed by appointed elected mayors and county council presidents. In the previous programming period, the RDAs acted as Intermediate Bodies for the ROP 2014-2020 and currently are Managing Authorities for the eight regional-level Regional Programmes (RP) in 2021-2027.

5.1.1. Research, development & innovation GOVERNANCE

In Romania, the institutional framework for Research, Development and Innovation (RDI) System has been changing in the past decades. The governance system has been modified following governmental changes, involving the creation of new entities or the shift of responsibilities between existing ones. The current situation is displayed in the figure below.

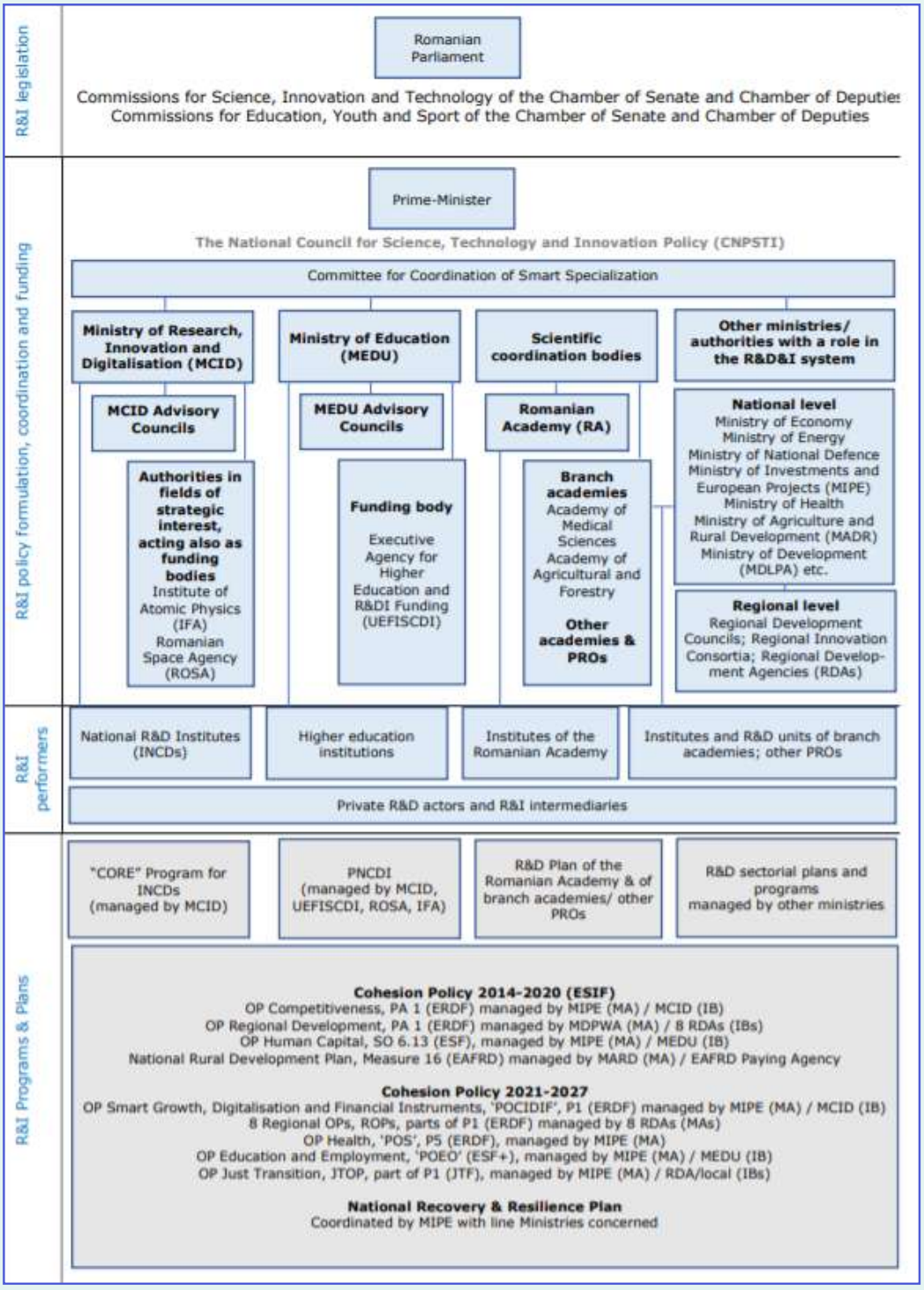


Figure no. 5. Romanian R&G governance system

RDI legislation - The Commission(s) for Science, Innovation and Technology of the Chamber of Senate and the C**hamber of Deputies of the Romanian Parliament** have the mission to develop the legal framework and prepare the budget law. In December 2020, the former Commission(s) for Education, Science, Youth and Sport of the Romanian Parliament were split, to better reflect the new organisation of the Romanian Government, with two different ministries being in charge of science, innovation and technology on the one hand (currently Ministry of Research, Innovation and Digitalisation) and Ministry of Education, on the other.

RDI policy formulation, coordination and funding - The National Council for Science, Technology and Innovation Policy (CNPSTI) is a consultative body, under the Prime Minister's authority, on R&I matters. Its task is to advise the government in this field and follow-up and monitor strategy and policies.

The State Authority for RDI in Romania is the **Ministry of Research, Innovation and Digitization (MCID).** The MCID develops, updates and ensures the institutional framework for the implementation of the National Strategy for Research, Innovation and Smart Specialisation (SNCDI until 2021, SNCISI from 2022). It coordinates government policy at the national level, monitors the level of R&D activity, and conducts, in some cases, programmes or parts thereof. It establishes the strategic objectives included in the N**ational Plan for Research, Development and Innovation (PNCDI)**, as well as some other specific instruments for the implementation of SNCDI/SNCISI in accordance with the priorities of the Government. MCID is advised by 6 consultative bodies: National Council for Scientific Research (CNCS), Romanian Committee for Research Infrastructures (CRIC), Advisory Board for R&D&I (CCCDI), National Council for Ethics in Scientific Research, Technological Development and Innovation (CNECSDTI), National Council for Technology Transfer and Innovation (CNTTI) and Committee for Coordination of Smart Specialisation (CCSI).

MCID is coordinating 43 National R&D Institutes (INCD) and 2 specialised executive agencies: Romanian Space Agency (ROSA), and Institute of Atomic Physics (IFA) . .

The Romanian Academy (RA) functions autonomously. The RA has its own chapter in the state budget, and its research institutes conduct their activities on the basis of their own research plans, under the direction of the scientific sections of the Academy.

The Ministry of Education (ME) is the central public authority responsible for public education, training and scientific research at the universities. ME manages the National Strategy for Tertiary Education 2015-2020, monitors the application of the Law of National Education, and allocates state funds for public universities, amongst other responsibilities. MEDU is supported by councils, agencies and consultative bodies.

The Executive Agency for Higher Education and R&I funding (UEFISCDI), under ME, is the executive agency for part of the programmes of the National Research, Development and Innovation plan (PNCDI). UEFISCDI manages some, but not all of PNCDI components based on a contract concluded with the National Authority for R&D/MCID. Along with the responsibilities for funding higher education and research, UEFISCDI is responsible for the coordination of various programmes and sub-programmes of PNCDI, such as "Human Resources", "Increasing the competitiveness of the Romanian economy through Research, Development and Innovation", "European and international cooperation", and "Fundamental and frontier research".

Other Ministries play a role in the RDI system are: the Ministry of Economy and Ministry of Entrepreneurship and Tourism; the Ministry of Agriculture and Rural Development (MADR); the Ministry of Health; the Ministry of Investments and European Projects (MIPE); the Ministry of National Defence; the Ministry of Energy and the Ministry of Finance.

National Contact Points for European R&D&I programmes are national structures established and financed by governments in all EU member states and the states associated with the framework programme, helping the potential beneficiaries in accessing these programmes.

- **Horizon framework programmes** - there are currently 36 NCPs in Romania, coordinated by MCID. The NCPs are hosted mostly by MCID departments and governmental agencies but also by public universities or national research institutes.

At regional level, the **Regional Development Agencies**, NGOs of public utility as executive bodies of the Regional Development Councils, have the role to act towards regional development and innovation support, including as their roles in the implementation of the Cohesion Policy, in charge of the Regional (Operational) Programmes.
Starting with 2020, the **National Authority for Digitalisation (ADR)** has been set up under the direct subordination of the Prime Minister/ of the Government, with the role to elaborate and coordinate the implementation of the strategies and public policies related to digitalisation/ ITC.

5.1.2. Research, development & innovation SYSTEM

The national research and development system is functioning according to Law 324/ 8th July 2003 and is made up of all the public and private law units and institutions with legal personality, whose object of activity is research and development and includes the following categories:

- National research and development institutes;
- Research institutes, centres or stations of the Romanian Academy and research and development institutes of branch academies;
- Accredited higher education institutes or their structures;
- Research and development institutes or centres organised within national companies, national companies and autonomous regions of national interest

Public law units and institutions can be:

- Research and development institutes, centres or stations organised as public institutions;
- Research and development institutes or centres organised within national companies, national companies and autonomous regions or central and local public administration;
- International research and development centres established on the basis of international agreements;
- Other public institutions or their structures whose object of activity is research and development.

Private law units and institutions:

- Research and development units organised as companies;
- Commercial companies and their structures whose object is research and development;
- Accredited private higher education institutions or their structures;
- Non-governmental organisations whose activities include research and development.[8]

Romania's research, development and innovation (RDI) system comprises 263 public RDI organisations and about 600 enterprises. Of the public organisations, 56 are authorised public universities, 46 are national R&D institutes (43 of which are coordinated by the Ministry of Education), and 65 are research institutions and centers of the Romanian Academy.

Innovation and technological transfer entities[9] are periodically authorized by the national level according to HG 406/2003, to capitalize the results of the technological research and development towards the business sector. They can be public or private, organized within existing organizations or separately and can be the following:

- innovative business incubator centers
- technological transfer center
- technological information center
- industry liaison offices
- scientific and technological parks.

Currently, there are 44 ITT entities in Romania (40 accredited and 4 provisionally accredited), which, together with 4 S&T Parks, constitute the National Network for Technology Transfer and Innovation (RENITT). The network provides different types of specialized services to public and private customers, including:

- assistance for innovation and technology transfer activities, development of experimental models and prototypes, exploitation of intellectual property rights;
- technology information, technology audit, technology forecasting;
- legal advice on legislation at national, European and international level;
- physical or virtual incubation for innovative SMEs.

8. [https://www.cdep.ro/pls/legis/legis_pck.htp_act_text?idt=49343]
9. *HG 406/2003 for the approval of Methodological Norms specific regarding the constitution, operation, evaluation and accreditation of innovation infrastructure entities and technological transfer and Ministerial Order no. 3686/11.04.2008 of the Ministry of Education, of Research and Youth (MECT) for approval Procedures regarding the accreditation of infrastructure entities of innovation and technological transfer*

5.1.3. POLICY & STRATEGIES boosting research, development & innovation

AT THE NATIONAL LEVEL, in Romania, the national government body responsible for research and innovation policy making and implementation is the Ministry of Research, Innovation and Digitization (MCID).
Main policy instrument for the RDI in Romania is the **National Plan for Research, Development and Innovation (PNCDI)**. There was a large gap between the planned budget for PNCDI for the period 2014-2020, set at €7b, and the actual budget spent, which by the end of 2020 reached only 11% of the planned amounts, with total allocations of €785m (according to data communicated by MCID). In 2020, to form the bridge until the adoption of the subsequent Strategy and Plan, PNCDI III was extended until adoption of PNCDI IV. The new PNCDI covers the period 2022-2027.

In the programming period 2014-2020, **Smart Specialisation Strategies (S3)** in Romania have been implemented both at national and at regional level, each level being guided by specific methodologies for the identification and operationalisation of priorities and performing distinct activities:

A. At national level, MCID is acting as coordinator of research-innovation and smart specialisation policy in Romania, the national funding programmes associated with RDI and the regulatory framework. S3 at national level is implemented mainly through PNCDI but also through other FEDR operational programmes which finance research and innovation. Projects related to the national S3 priorities are eligible for funding from the main funding instruments linked to national and EU programmes coordinated by other ministries.

- **2014-2020**: national S3 was equal to the **National Research and Innovation Strategy (NRIS)[10] 2014-2020** and was addressed to 4 priorities: (i) Bioeconomy; (ii) ICT, Space and security; (iii) Energy, environment and climate change (iv) eco-nano-technologies and advanced materials.
- **2021-2027: The National Strategy for Research, Innovation and Smart Specialisation (SNCISI)[11]** , elaborated under MCID coordination, was approved during 2022. The strategy identified updated S3 priorities: (i) Bioeconomy; (ii) Digital economy and space technologies; (iii) Energy and mobility; (iv) Advanced manufacturing; (v) Functional advanced materials; (vi) environment and eco-technologies; (vii) Health.

B. At regional level, S3 priorities have been defined in the regional S3 strategies elaborated by the 8 development agencies and approved by the Regional Development Councils, They were enforced for 2014-2020 period and currently updated for 2021-2027. Each region has set up a Regional Innovation Consortium, with a consultative role for S3 processes. The S3 strategies define areas of local strength and priority for each region, in correlation with the Regional Development Plans.
Under the 8 RPs in preparation for 2021-2027, the new regional S3s will form part of the enabling condition to access Cohesion Policy Funds under Policy Objective 1[12]

Strategy for the Digital Agenda of Romania 2015-2020 - to be updated for the current period.

10. https://uefiscdi.gov.ro/strategia-cdi-2014-2020
11. https://www.research.gov.ro/uploads/comunicate/2022/strategia-na-ional-de-cercetare-inovare-i-specializare-inteligent-2022-2027.pdf
12. https://ec.europa.eu/research-and-innovation/sites/default/files/rio/report/PSF-RO-Final-Report_03.06.2022.pdf

Romania's Startup Ecosystem Strategy with national coverage has been elaborated by RoStartup in 2022, under the coordination of North-East RDA. The analysis of the current portfolio of public instruments reveals weaknesses on program design, while a variety of new modalities of public support for entrepreneurship could be considered. The strategy is not embedded into the national innovation support framework, but is a valuable initiative and document to be considered and inspired from, in further designing of the BOOST Action Plan.

AT THE REGIONAL LEVEL, in Romania, there is no regional innovation policy authority. The support of innovation at regional level is justified by the strategic and programmatic documents developed at the local and regional level. In the North-West Region, the most important are the following, addressing regional and local development, urban (& rural) regeneration, competitiveness and innovation, coordinated by regional or local authorities, as follows:

	STRATEGY	Level Regional/ Local	Responsible authority
A	**Regional Development Plan & Strategy**	regional	North-West Regional Development Agency
B	**Regional Smart Specialisation Strategy**	regional	North-West Regional Development Agency
C	**Sustainable Urban Mobility and Smart Cities Strategy**	regional	North-West Regional Development Agency
D	**County Strategies**	local	County Councils
E	**Integrated Urban Development Strategies**	local	Local councils/ municipalities
F	**Smart City Strategies / or Digital Transformation Strategies**	local	Local councils/ municipalities

A. North-West Regional Development Strategy

The regional context is represented by the elaboration of the Regional Development Plan and Strategy, for a period of 6-7 years, process coordinated by regional development agencies. **The Regional Development Plan (RDP)** enclosing the Regional Development Strategy - is the main planning document at regional level and reflects the relevant development policies at national level in relation to the specific needs at regional level, but also with the strategic policy directions of the other main donors to the regional development programmes related to the respective region. The document is considered the strategic basis for projects initiated at regional level and can be taken into account by national authorities for the basis of funding programmes for the next programming period. The objectives of the Regional Development Strategy promoted through the RDP follow the needs identified at the regional level through various instruments: public consultations, working groups, taking over project ideas proposed at the local and county level, etc. Equally, the identified development priorities were aligned with the main strategic objectives of the EU cohesion policy, in particular the types of interventions financed by the European Regional Development Fund (ERDF). Among the priorities of the North-West Regional Development Strategy 2021-2027, *Priority 1 aims to increase the competitiveness of the region by supporting the innovation ecosystem and economic activities in the fields of smart specialization, supporting the digitalization process of the economy, promoting entrepreneurship and stimulating research and innovation.*

B. Smart Specialisation Strategy for the North-West Region of Romania

At the level of the North-West Region, the first Regional Innovation Strategy was developed for the period 2005-2008, with the general objective of increasing the attractiveness and competitiveness of the North-West Region by creating a support system for innovation and by promoting a culture of innovation.

For the period 2013-2020, the North-West Regional Development Agency elaborated the Smart Specialization Strategy of the region within a participatory process, with the support from the EC Joint Research Center, funded by a preparatory action of the European Parliament and part of the pilot project of DG Regio and Urban Policy for less developed regions "Lagging regions".

The S3 strategy was updated during 2020, taking into account the new legislative package on the implementation of European funds related to the 2021-2027 financial framework.

The project's portfolio of the S3 is the result of an extensive consultation process of key actors at the regional level, especially through Entrepreneurial Discovery Process (EDP) workshops, but also through other methods, especially open announcements, launched In this regard.

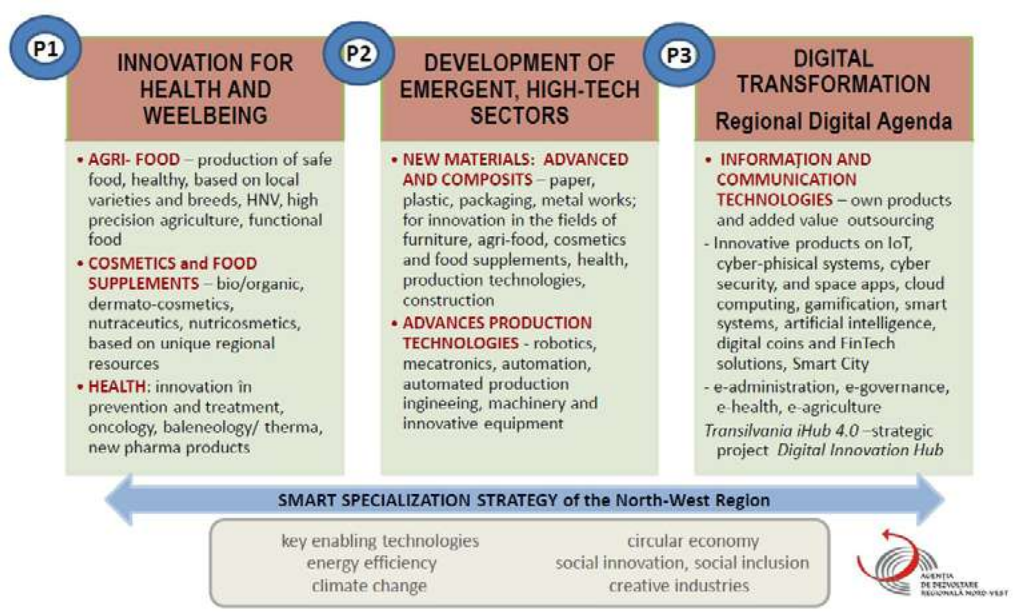


Figure no. 6. – Pillars of Smart Specialisation Strategy 2021-2027
Source – Smart Specialisation Strategy of the North-West Region 2021-2027

The smart specialization sectors in the North-West Region of Romania are grouped on 3 main pillars:

Pillar I - INNOVATION FOR HEALTH AND WELFARE
Objective: To support innovation in areas with a tradition in the region to improve the health and well-being of a large number of inhabitants.

The priority areas targeted – *agri-food, cosmetics and food supplements, health* - are characterized by the existence of a critical mass of businesses and employees and/or intense research and development activity. All three areas have a direct impact on the quality of life of the population and can exploit the same types of unique natural resources. In particular related to BOOST target sectors, the ones related to HEALTH are mainly:

- Bio-cosmetics and natural food supplements, without chemical additives, especially:
- Dermatocosmetics; nutricosmetics, nutraceuticals, fitochemical/ fitoproducts, natural plant extracts, algae, sericigenous insects etc. for cosmetics and food supplements;

•Oncology, especially personalized treatments with nutraceuticals, fitochemical/ fitoproducts, innovation in prevention and treatment;
• Balneology,
• Implantology,
• Transplants,
• Nutrition, curing diabetes,
• Psychology, psychiatry
• Blood substitute based on hemoglobin (disruptive innovation);
• Innovative pharmaceutical and health products or services.

Pillar II - DEVELOPMENT OF EMERGING SECTORS

Objective: To exploit the results of R&D based on advanced technologies for the development of emerging specific economic activities in line with global trends.

The pillar is about identifying technologies and new materials that do not adversely affect (do little or no harm to) the health of the population, that support the concept of sustainability, reducing pollution, making systems, resources and raw materials more efficient and improving climate change.

• Composite materials obtained from recycling waste from the furniture industry
• Solutions for a circular economy
• New packaging materials for conserving food
• Intelligent biocompatible materials
• Advanced, composite, and other new materials, functional covering of materials, nanomaterials (paper, plastic, ceramics, types of metal, etc.)
• Composite materials based on vegetable fibers
• Robotics, mechatronics, automation, advanced production engineering, additive manufacturing (i.e. rapid prototyping)
• Innovative machinery and equipment for electricity production, especially from renewable sources, which are more energy efficient and are more environmentally friendly
• Solutions for a circular economy
• Increasing energy efficiency in production

Pillar III - DIGITAL TRANSFORMATION: Regional Digital Agenda

Objective: Digitize the economy and society, supported by the ICT sector's transition to innovation

Digital technology, in the context of Industrial Revolution 4.0, is one of the most important drivers of global development and progress. The main sub-sectos are:

• Internet of Things; Cloud computing, Gamification;
• Cyber physics systems, spatial applications for civil use;
• Intelligent systems, artificial intelligence;
• Crypto currencies and FinTech, smart city solutions (with emphasis on energy efficiency);
• E-administration

The potential of digital technologies and services to contribute to bridging the development gap, providing solutions to existing global challenges and increasing European industrial competitiveness should also be harnessed at regional level. Thus, the digitisation of the economy and society, supported by a developed and innovation-driven ICT sector, is necessary not only to maintain regional competitiveness in the long term, but also to support innovation.

C. Regional Strategy for Sustainable Urban Mobility and Smart Cities of the North-West Region 2021-2027

The proposed vision envisages the North-West Development Region in 2030 as a smart territory supported by a network of interconnected and innovative cities that use technology to facilitate sustainable development. Thus, innovation, the relationship between the administration and the citizens and the care for the efficient use of resources are the key to the progress of the region. The North-West smart region will rely on a digital network of localities consisting of regional, county, micro-regional and local innovation centers and cities that are developing on smart city levels depending on their potential: tourism, energy - environment, quality of housing, education, etc. At the local level, municipalities and cities will have data collection infrastructure, sensor networks and other devices that form IoT (internet of things) networks, generate complex data sets available to the general public and used.

D. Country Strategies

The County Development Strategies identify the real development needs of the counties, on a consultative basis (working groups, survey among the population and the business environment, consultations, public debates), which ensures consensus on priorities of development of the county, in defining the directions of strategic action, in the short, medium and long term, and in their transposition into a portfolio of projects, which will ensure the premises for the implementation of the strategy.

The County Councils are considering the preparation of a comprehensive document that will substantiate the decision-making process regarding the medium and long-term strategic development of the county. Usually the process is assisted by strategic consultants.

This document takes into account and integrates the following aspects: current and perspective trends in the development of the county; the major problems and development potential that, through its mobilization, could contribute to solving them; sectorial and comprehensive strategies relevant for the development of the county; large-scale plans and projects that influence the development of the county; guidelines regarding regional and national development; the guidelines of strategic documents and sectoral policies at the level of the European Union ("EU"); major aspects that mark the development of the EU and the Euroregion; other documents that will be identified during the process as being relevant for the county's strategy.

E. Integrated Urban Development Strategies

The integrated urban development strategy represents the framework that guides the process of identifying the strategic directions of intervention and choosing the order of the objectives for which they will be allocated resources, with the aim of determining the progress of the urban community. This process contains planning operational, which provides a structure of: programs, projects, actions, measures, which will be taken in a set time frame, of the necessary resources, of the expected results, as well as the responsibilities that must be assumed.

Each Integrated Urban Development Strategy presents the strategic objectives of the municipality, the key objectives, the strategic projects and the strategic profile of the municipality are presented.

- The Integrated Urban Development Strategy (IUDS) for the Municipality of Cluj-Napoca and its Metropolitan Area (CMA) is the main strategic planning document in the above-mentioned territories for the 2021-2030 period. Basically, it reunites under the umbrella of a common vision for development, as agreed and assumed by all the relevant actors from the local ecosystem

(administration, academic environment, business environment, non-governmental environment, and the civil society, etc.), the next year's intervention priorities in all the areas, from mobility, urban regeneration, digitalization, education, health or inclusion to local and metropolitan governance.

- The Integrated Urban Development Strategy (IUDS) for the Municipality of Oradea to summarize the priority directions of intervention for the 2021 – 2027 horizon, aiming at the optimal and responsible use of available resources to ensure an integrated urban planning. The strategy targets both the Municipality of Oradea and the communes that have voluntarily associated within the Metropolitan Area of Oradea, territorial entity with legal personality, established around the residence of county, as a polarizing urban center and integrating 11 other contiguous territorial administrative units, which they are also part of the functional urban area of Oradea Municipality.
- The Integrated Urban Development Strategy (IUDS) for the Municipality of Baia Mare and its Metropolitan Area (CMA). The document, developed by specialists, includes the most important projects that the Local Public Administration of the Municipality of Baia Mare wants to implement in the period 2015-2030. Among the most important development plans are the creation of a large industrial park, a creative industries center. To these are added other important projects that concern the social component, but also the rehabilitation and development of the urban infrastructure. Compared to the old integrated strategy, which focuses more on the social area, the current development strategy emphasizes the development of the economic segment.
- The Integrated Urban Development Strategy of the Municipality of Satu Mare 2016 - 2025 was developed in accordance with the provisions of the Sustainable Development Implementation Framework Document published by the Ministry of Regional Development, Public Administration and European Funds, as well as with Regulation (EU) no. 1301/2013. The strategic planning process generated a document capable of supporting the efficiency of city administration, which respects the principles of sustainable development and ensures coherence and agreement with regional, national and European policies.
- The Integrated Urban Development Strategy of the Municipality of Zalău 2024-2030 started from the diagnosis of the urban context, of the main problems and challenges at the local level identified in the preliminary analysis phase, built with the support of the Zalău City Hall and 4 working groups (local economic development; urban development and resilience; digitization and innovation and community development and smart governance). The permanent participation of local stakeholders in the stages of realizing the strategy represents a fundamental element for ensuring a transparent process, based on participation, representativeness and adaptation to the real local needs of the community.
- The Integrated Urban Development Strategy of the Municipality of Bistrita for the period 2021-2030 is currently developed.

F. Other innovation related strategies

Cluj-Napoca has a Digital Transformation Strategy since 2021. The key strategic factors are:

- Smart living - integrating digital technologies in the community's life
- Digital skills and digital inclusion
- Interconnected digitalisation

The operationalisation of Cluj-Napoca Digital Transformation Strategy[13] will be undertaken by multiple departments within public institutions, and public managers, in cooperation with other stakeholders. Access to data will help take the right decisions and generate coherent public policy projects. The digital transformation will use all available resources and will involve, through permanent partnerships, citizens, the public sector, academia, private companies, clusters, non-profit organizations and innovation centres. It is also planning to establish 'digital ambassadors' within the city hall departments to propose and support digital transformation projects.
The prioritization of action directions and projects will be done by the new department created for this purpose in the City Hall, the principle being that of Innovation Office, used by most cities that stand out through digitalisation and innovation. The strategic actions directions:

- Improving public services
- Digital inclusion and competencies
- Citizen data protection and cybersecurity
- Universities, innovation and cooperation
- Interconnectivity and and data-driven decision-making
- Developing the municipal digital infrastructure
- Participation and transparency
- interconnected mobility

Oradea Smart City Strategy 2016-2025, addressing digitalisation of the public administration, as well as green and tourism components.

13. *Digital Transformation Strategy of Cluj-Napoca, 2021, Faculty of Political Sciences and Administration, Babes Bolyai University*

5.1.4. PROGRAMMES boosting research, development & innovation

Romania has entered its 3rd 7-year EU Cohesion Policy phase since its accession to the European Union in 2007. Each phase has provided large-scale EU funding support to the country, including for investment in R&I.
During the 2014-2020 phase, FESI have supported nearly half of Romania's public investment overall, and represented 25% of total national public financing for research in the country. Now Romania is entering the 2021-2027 phase of EU Cohesion Policy, for which it has the 3 rd highest financial allocation (equating to some €25.2bn), after Poland and Italy, to be co-financed and disbursed by the end of 2029. R&I has higher Cohesion Policy prominence at EU level for 2021-2027 than for the previous two phases.

Romania persistently directs remarkably low proportions of its EU Cohesion Policy allocations towards the promotion of R&I, compared to other EU13 countries. Indeed, Romania's Cohesion Policy allocations to R&I rank among the lowest in the EU. For 2021-2027, the overall indicative allocation Romania makes to R&I is €1.92bn (without JTF), approximately 6.1% of its total EU Cohesion Policy envelope. Whilst this is appreciably higher than the 2014-2020 allocation of €1.08bn, it is still very low.

2014-2020 Programmes supporting innovation

Out of the 7 operational programmes in Romania, 4 of them directly supported innovation. They are available for all the regions and are implemented at national level, some having Intermediate Bodies at regional level (such as ROP).

	Name of the program	Priority area Measure/ Call	Target beneficiaries	(N) National/ (R)Regional/ (E) European	(I) Individual application or (C) Collaborative
1	**OP Competitiveness (OPC) / ERDF**	PA1 - Research, development and innovation supporting economic competitiveness and the development of businesses	● Public institutions with legal personality, which are part of the national research and development system ● Partnerships between research and business	European / FEDR	Individual Collaborative
2	**OP Regional Development (ROP) / ERDF**	PA1 – Promotion of technology transfe	Innovation and technology transfer entities authorized/ accredited	European / FEDR	Individual
3	**OP Human Capital (OPHC -'POCU') / ESF**	PA6 – Education and Competencies (Only SO 6.13 - Increasing the number of university and non-university tertiary education graduates who find a job, including a research job)	SME, Central public authority, Chamber of Commerce, educational institutions, public-private partnership, Agricultural cooperative, Group of producers, Cooperative society, Composers, commons and others Professional associations Provider of guidance, Counseling, School mediation and alternative services	European / FEDRl	Individual
4	**National Rural Development Plan (NRDP) / EAFRD***	P1 - Knowledge transfer and innovation in agriculture, forestry and rural areas (Measure 16 - Cooperation, clusters and networks, EIP operational groups for agricultural productivity)	Farmers and foresters, SME in the food processing sector; researchers, research institutes and lab, universities, advisors; NGOs in the agriculture, forestry, environment and water conservation sectors; or municipalities and public entities.	European / FEADR	Collaborative

2021-2027 Forthcoming Programmes supporting innovation in North-West Romania

For the first time, the Regional Programmes are different for each of the 8 regions and are managed by the regional development agencies. In addition to the Cohesion policy programmes, the EU members states benefit from the National Recovery and Resilience Plans, following COVID-19 pandemic.

	Name of the program	Target beneficiaries	(N) National/ (R)Regional/ (E) European	(I) Individual application or (C) Collaborative
1	**North-West Regional Programme**	SME; Universities; NGOs, City Halls	European/ FEDR	(I) Individual application
2	**The National Recovery and Resilience Plan (NRRP)**	Authorities/institutions and central public services with attributions in field; Authorities/institutions and local public services with attributions in the field; Public or private providers of employment services/services of vocational education or training/ assessment and certification services skills/career information and counseling services; Educational units from the national education system; Higher education institutions; Research institutes; Youth associations; Chambers of commerce; Non- governmental organizations	European/ Next Generation Initiative	(I) Individual application
3	**POCIDIF**	Central Authority; Local authority; Regional authority; Authorities & Private Entities; Research centers and institutions; SMEs; Educational institutions	Europeanl/ FEDR	(C)Collaborative
4	**PNCDI IV**	Entities involved in research and innovation activity, both from the private and public environment, representatives of the business environment (SMEs, corporations, professional associations), public authorities and non-governmental organizations	National/ European FEDR	(I) Individual application (C)Collaborative
5	**Programs of the Romanian Academy**	Researchers	National	(I) Individual
6	**Operational Programme for Fair Transition**	Legal entities of public sector established as bodies under public law or as bodies governed by private law entrusted with a public service mandate, with which a grant agreement has been signed under the Facility	European	(C)Collaborative
7	**Education and Occupancy Operational Programme**	Central authorities	European/ FSI	(I) Individual
8	**The Sectoral Plans of the Ministries**	Entities involved in research and innovation activity; Universities; Central authorities	National	(C)Collaborative
9	**The programs of the People's Academy of Science of Romania**	Researchers	National	(I) Individual application
10	**Health Operational Program**	Authorities of the Central Public Administration; Local Public Administration Authorities; Territorial administrative units; Territorial administrative subdivisions of municipalities; Deliberative authorities at the level of administrative units Public Health Units, Public Medical Institutes; Directorates of Public Health National Institute of Public Health; The Authority for Digitization of Romania Ministry of Health National Health Insurance House	European/ FEDRl	C)Collaborative

5.2. BULGARIA - national & regional innovation framework

The Republic of Bulgaria is a parliamentary republic with local self-government and it is divided into municipalities and districts (provinces) in accordance with the Constitution. The municipality, where local self-government is practised, serves as the primary administrative territorial entity. The district's objectives include carrying out local government, fusing local and national interests, and implementing regional policy.[14]

There are three levels of government in Bulgaria: central, regional, and local. The three-level governance reflected in the public administration's structure makes a clear distinction between central and territorial governance, which includes both regional and local government structures. The Chief Inspectorate, Ministries, State Agencies, Executive Agencies, the administrations of State Commissions, and any administrative structures created by law or by means of a decision of the Council of Ministers comprise the central administration.

There are three levels of territorial administration: district/province (28) , regional (6) , and municipal (265). District administrations report to the Council of Ministers, and district governors are political appointees.[15]

The District governor is the only entity with executive authority in the district (province), carrying out local government operations and ensuring that regional policy is implemented while keeping in mind both local and national interests. The district governor:

- organises and maintains the development and implementation of district strategies and programs for regional development,
- interacts with local self-government bodies and local administration,
- ensures compliance between national and local interests.

The District administration and the District governor are the related institutions to the Ministry of regional development and public works for the means of management, implementation and integration of the national and regional development plans and strategies (incl. spatial planning systems and strategies).[16] The District governor is also responsible for the preservation and protection of state property on the territory of the district, ensures compliance with the law on the district's territory, and performs administrative control over the implementation of administrative policies.[17]

The area of the country is split into statistical regions with three hierarchical levels in accordance with the requirements of the Classification of Territorial Units for Statistics (NUTS), used by the European Union: NUTS1: 2 statistical zones; **NUTS 2: 6 statistical regions – Planning regions**; NUTS3: 28 administrative districts – Provinces;

14. Местно самоуправление | МРРБ (mrrb.bg)
15. https://data.europa.eu/doi/10.2767/969353
16. https://www.president.bg/docs/Bulgaria2020.pdf
17. https://varnaregion.egov.bg/wps/portal/district-varna/administration/structure/organisation-chart

Correspondence between the NUTS levels and the national administrative units[18]

	NUTS 1 #	NUTS 2 #	NUTS 3 #	LAU #
BG	Statistical zone - 2	Statistical region - 6	Administrative district / province 28	Municipality - 265

The country is split into six territorial regions, three in the north and three in the south, according to the European Classification of Territorial Units for Statistical Objectives (NUTS): Northwest Region, North Central Region, **Northeast Region (Severoiztochen),** South East Region, South Central Region, and South West Region.[19]



Figure no. 7. Common classification of territorial units for statistics in Bulgaria[20]

The European Semester Country Report 2022[21] for Bulgaria presents that the government of the country is prioritising scientific research as it is of strategic importance for the development of the country. The report presents indicators from the National Recovery and Resilience Plan (NRRP) - 58.9 % of funds support climate objectives and 25.8 % support digital objectives.
The innovation performance change over time of the country is presented in Fig… .

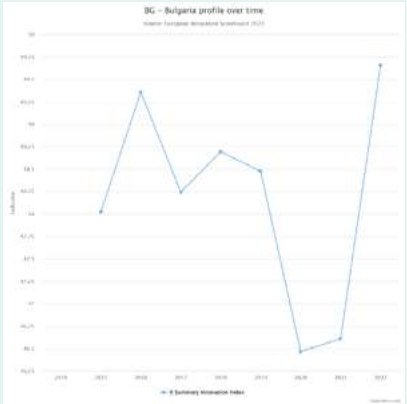


Figure no. 8. BG-Bulgaria Profile over time Source: European Innovation Scoreboard 2022

18. National structures - NUTS - Nomenclature of territorial units for statistics - Eurostat (europa.eu)
19. Classification of Territorial Units for Statistics in Bulgaria (NUTS) | National statistical institute (nsi.bg)
20. NUTS_v2016_EN.png (1100×850) (nsi.bg)
21. https://commission.europa.eu/publications/2022-european-semester-country-reports_en

Sofia area (part of Yugozapaden region and has only 18.8% of the population) produces nearly half of the nation's GDP, the other five of Bulgaria's six planning regions are among the 20 poorest in the EU. The country is creating a good environment with the potential to deliver breakthrough growth for businesses and innovation and it is currently ranking 35th among the 132 economies featured in the Global Innovation Index 2022[22].

5.2.1. Research, development & innovation GOVERNANCE

Management bodies

The ***"Activity Separation Model"*** is utilized by the Bulgarian government, much like it is in Germany, Norway, Finland and the Netherlands; in this model, the responsibilities of the Ministry of Economy are clearly defined for the industrial innovations and technologies (dealing with the private sector), and in the case of the Ministry of Education and science - for the development of human potential and research (oriented towards the public segment). According to the analysis and evaluation of the management system and monitoring the Bulgarian Innovation strategy for smart specialization 2014-2020 developed by the Ministry of Economy and Industry is presented that the institutional responsibility of several departments for the attitude of the strategy predetermines the limited possibility of innovation policies that are coherent and with a clear focus. [23]

Over the past years, governmental reforms that involved the formation of new entities or the transfer of tasks between already existing ones, regarding the governance structure for the Research, Development, and Innovation (RDI) System in the country has led to additional changes.

In 2021, the Ministry of Innovation and Growth (MIG) was established by the 47th National Assembly. Under its jurisdiction, there are structures such as the European Funds for Competitiveness, the Bulgarian Development Bank, the Bulgarian Investment Agency, and Sofia Tech Park. The above-mentioned are the main managing bodies but their work is actively supported by the Ministry of Agriculture and Food, Ministry of Transport and Information Technology and Communications, Ministry of Health, The Ministry of Internal Affairs and the National Fund under the Ministry of Finances. In the processes of implementation of the state policy in the field of scientific research and innovation, the work of the ministries is supported by the National Research Council and the National Innovation Council (consisting of representatives from universities, other scientific organisations, employer organisations, NGOs, other government bodies, and other interested parties in the field of science and innovations), further merged to National Research and Innovation Council.

» The National Innovation Council

The National Innovation Council[24] was established in 2004 with the aim of providing assistance to the Ministry of Economy and Energy in developing and putting through practice the country's innovation policy in accordance with the Republic of Bulgaria's Innovation Strategy. Until 2014, The Ministry of

22. https://www.wipo.int/edocs/pubdocs/en/wipo_pub_2000_2022/bg.pdf
23. https://www.mi.government.bg/files/useruploads/files/innovations/smartstrategyactivityreport%E2%84%963. pdf
24. Национален съвет по иновации | Консултативни съвети | Социален диалог | Българска стопанска камара (bia-bg.com)

Economy and Energy[25] defined and was responsible for the implementation of the public innovation policy. At the operational level, the process was coordinated by the Enterprise Policy Directorate. The National Innovation Council at the Ministry of Economy and Energy was an advisory body in which representatives of the state administration, business organisations, scientific circles, education, and non-governmental organisations participated.[26]

A *Council for Intelligent Growth* was established as an advisory body to the Council of Ministers in 2016 for the purposes of sustainable and effective management for the implementation of the "Innovation Strategy for Smart Specialization 2014-2020" (ISIS). The Council for Intelligent Growth (SIR) establishes the guidelines for the development of the thematic areas of the economy, vision, and strategic goals, coordinates, and monitors the implementation of ISIS. The establishment led to the termination of the operations of the National Innovation council.[27]

In addition to the National Innovation Strategy for Smart Specialization 2014-2020, during that period Bulgaria has several **regional and municipal S3s** (Severen – Tsentralen Region, Sofia, Plovdiv, Varna and Ruse). The strategic committee oversees the central management of the Bulgarian S3. An Administrative Partnership Network and an Interinstitutional Working Group assist this. The bottom-up body is made up of the nationally appointed Regional Partnership Network and other stakeholders, while a central technical body provides overall coordination of S3 governance in the country.[28]

The country's innovation policy is managed by the Ministry of Innovation and Growth in the context of:[29]

- National Development Program BULGARIA 2030
- The Innovation Strategy for Smart Specialization 2021-2027

Legislative framework

The Ministry of Innovation and Growth is working with the Ministry of Education and Science to create a new *Law on the Promotion of Scientific Research and Innovation* as part of the implementation of the innovation development policy. The Law will:

- update the current legal framework with elements of public-legal relations between the participants in the research and innovation ecosystem in the country in order to create conditions for realizing their full potential;
- specify the authorities and procedures for developing the national policy for promoting innovation and scientific research, as well as the roles of each institution involved in its creation, implementation, monitoring, and evaluation. It will also specify how the policy will be financed;
- outline the principles and regulations that will govern technology transfer finance as well as the roles of the organisations engaged in developing, implementing, monitoring, and evaluating technology transfer policy.

25. Министерство на икономиката и индустрията ● Официален сайт (government.bg)
26. Национален съвет по иновации | Консултативни съвети | Социален диалог | Българска стопанска камара (bia-bg.com)
27. https://www.strategy.bg/PublicConsultations/View.aspx?lang=bg-BG&Id=3502
28. https://s3platform.jrc.ec.europa.eu/bulgaria
29. https://www.mig.government.bg/politiki-i-strategii/inovaczii/

The Investment Promotion Act (IPA[30]), which established the principle of equality between Bulgarian and foreign citizens and businesses, was announced to require coding in primary schools in 2018. The Bulgarian government designated high-tech industries as preferential, which resulted in cheaper investment capital requirements. Businesses benefited from more government initiatives in the areas of social security, taxes, and vocational training. There are many IPA incentives for investments, including grants for R&D and affordable land prices. With a range of objectives, including:

- Ensuring digital skills
- Aligning business demands and education
- Supporting young Bulgarian talents both locally and globally

The *Digital National Alliance* (DNA) has spearheaded numerous initiatives to advance digitalization without cost, giving young people access to digital tools so they may engage and interact with individuals across Europe and support them in discovering new employment opportunities.[31]

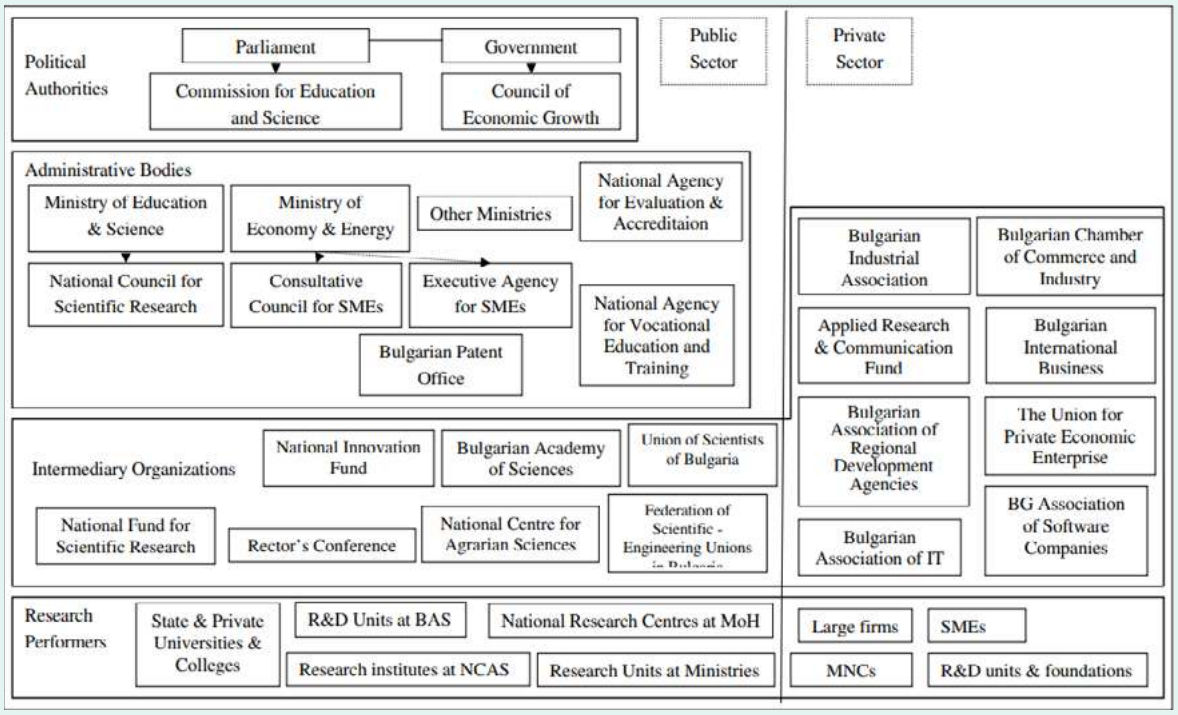


*Figure no. 9. Structure of the Bulgarian STI system prior to 2021[32](*Administrative bodies: In 2021 The Ministry of Innovation and Growth was established).*

30. https://investmentpolicy.unctad.org/investment-laws/laws/37/bulgaria-investment-promotion-act
31. https://digital-competitiveness.eu/wp-content/uploads/ESCP_Digital-Riser-Report_2020-1.pdf
32. PSI-CountryProfile-Bulgaria.doc (europa.eu)

5.2.2. Research, development & innovation SYSTEM

According to the Bulgarian Centres report[33] published by the European Commission in 2021, the public research system is composed by:

- the state-owned higher (tertiary) educational institutions performing research (HEIs)
- public research organisations - generally the two leading academies, Bulgarian Academy of Sciences (BAS) and the Agricultural Academy (AA)
- other public research institutes (centers/labs) operating under various sectoral ministries or agencies

The private RDI segment is composed of:

- private research organisations (including those listed as non-profit NGOs),
- privately held businesses engaged in R&D&I

A mapping of Bulgarian research infrastructures and research equipment performed in 2017 resulted in: 161 research infrastructures, facilities and equipment, divided between:

- 57 in Physical, Material Science and Engineering;
- 61 in Medical and Agro-biosciences field;
- 29 in Social Science and Humanities;
- 14 in e-Infrastructure for multidisciplinary research fields.

12 research infrastructures were considered having EU-level significance, 84 national and 65 having regional significance.

Academic institutions - universities, and university technological transfer centres (through the rating system of higher education institutions in Bulgaria the public can compare 52 higher education schools - from which 14 are with private funding status, hundreds of specialties, distributed in 52 professional fields[34]
According to the National Statistical Institute, there are 54 higher education institutions in total: in the school year 2021/2022 there are 21 Colleges and 17 Colleges in the structure of universities and specialised higher education schools that are not included in this number).[35]

Under the N*ational Roadmap for Research Infrastructure*, research infrastructure categories are defined as: Unique research infrastructure, Research centres, Research facilities, Pan-European infrastructures, Research complexes, E-infrastructure, European Open Science Cloud.

> **International research infrastructures**: European Organization for Nuclear Research , Joint Institute for Nuclear Research (JINR, Dubai), Research in the area of thermonuclear synthesis (ITER)

33. https://www.ipa.government.bg/sites/default/files/bulgarian_centres_report.pdf
34. https://rsvu.mon.bg/rsvu4/#/
35. https://www.nsi.bg/bg/content/3400/%D0%B2%D0%B8%D1%81%D1%88%D0%B8-%D1%83%D1%87%D0%B8%D0%BB%D0%B8%D1%89%D0%B0-%D0%BF%D0%BE-%D0%B2%D0%B8%D0%B4

> Unique research facilities: Regional Astronomical Centre for Research and Education (RACIO), Bulgarian polar base St. Kliment Ohridski, National Cyclotron Centre

> Bulgaria in Pan-European Research Infrastructures (ESFRI):

- E-infrastructure (CLaDA BG) for Resources and Technologies for the Bulgarian Language and Cultural Heritage, Member of the Pan-European Research Consortia CLARIN ERIC and DARIAH ERIC,
- European Social Survey for Bulgaria (ESS),
- Study on Health, Aging and Retirement in Europe (SHARE),
- National University Complex for Biomedical and Applied Research,
- Center for Contemporary Microscopy for Fundamental and Applied Research in Biology, Medicine and Biotechnology (EUROBIOIMAGING),
- Research Infrastructure for Cell Technologies in Biomedicine (INFRAACT),
- National Geoinformation Center,
- Infrastructure for Sustainable Development of Marine Research and Participation in the European Infrastructure (EURO ARGO) – MASRI,
- National Research Infrastructure for Observing Atmospheric Aerosols, Clouds and Gas Pollutants Integrated within the Pan-European Infrastructure ACTRIS,
- CTA-MAGIC International Cooperation in the Field of Particle Astrophysics,
- Electronic Infrastructure for Research of the Bulgarian Medieval Written Heritage (ELINIZB),
- "Extreme Light" ELI-ERIC Consortium (ELI-ERIC-BG),
- Bulgarian Observation Station of the Pan-European Radio Telescope "Low-frequency Array" (LOFAR) – LOFAR BG,
- Distributed System of Scientific Collections - Bulgaria (DISSCo BG),
- Distributed Research Infrastructure "Bulgarian Network for Long-Term Ecosystem Research" (LTER BG)

> National research and innovation complexes – projects of key importance for the development of the competitiveness of the Bulgarian economy and technological base, split on thematic areas as it follows:

» Information and Communication Technologies

1. Center of Competence "Quantum Communication, Intelligent Security Systems and Risk Management" – QUASAR
2. nstitute for Scientific Research in Computed Science and Artificial Intelligence (SCAI)

» Mechatronics and Clean Technologies

1. Energy Storage and Hydrogen Energetics (ESHER)
2. Eco and Energy-saving Technologies – Digitalization of Technological Processes
3. Digital Technology Systems for Clean and Secure Environment – 5D ALLIANCE
4. Laboratory of Aerospace Mechatronics (LAM)
5. Centre of Excellence "National Centre of Mechatronics and Clean Technologies"
6. Centre of Competence "Intelligent mechatronic, eco and energy-saving systems and technologies" – (IMEECT)
7. Centre of Competence "Clean Technologies for Sustainable Environment – Water, Waste,Energy for Circular Economy" (CLEAN&CIRCLE)
8. Centre of Competence "Technologies and Systems for Generating, Storing and

9. Consumption of Clean Energy", HITMOBIL
10. Center of Competence "Mechatronics and Clean Technologies MIRACLE"

» Healthy Lifestyle and Biotechnology Industries

1. Center for Plant Systems Biology and Biotechnology (CPSBB)
2. National Infrastructure for Research and Innovation in Agriculture and Food RINA
3. Research Infrastructure for Food, Nutrition and Health, Linked to Bulgaria's Participation in the Pan-European Infrastructure FNH-RI (FNH-RI BUL)
4. Center of Competence "Sustainable Utilization of Bio-resources and Waste of Medicinal and Aromatic Plants for Innovative Bioactive Products"
5. National Center for Biomedical Photonics (NCBP)
6. Extreme Coherent Light in the Mid-IR and X-Ray Area as a Laboratory Infrastructure (HEPHAESTUS)
7. Diagnostics and Technology Center for Plant Health - PLANTHEALTH
8. Research Infrastructure for Innovative Research of Biomolecules, Biomembranes and Biosignalling
9. Center of Competence "Fundamental, Translational and Clinical Studies in the Field of Infections and Infectious Immunology"
10. Center of Competence "Personalized Innovative Medicine" (PERIMED)
11. Center of Competence "Personalised Medicine, 3D and Telemedicine, Robot-Assisted and Minimally Invasive Surgery"

» New Technologies in the Creative and Recreational industries

1. Center of Excellence "Heritage BG"
2. Distributed Infrastructure from Centers for the Production and Research of New Materials and Their Applications, As Well As for the Preservation, Access and e-Storage of Artefacts (Archaeological and Folklore) – INFRAMAT
3. Laboratory complex in the science and technology park "Sofia Tech Park"

According to the Bulgarian Centres Report[36] , the majority of the organisations taking part in the Centres of excellence (CoE) and competence (CoC) are two different types of public institutions: 1. The Institutes of the Bulgarian Academy of Sciences (BAS) and 2. Higher Education Institutes (HEIs)

Bulgarian Academy of Sciences – is an independent national research organisation that operates under separate laws compared to higher education institutions' laws.[37] BAS is attracting funding from contracts for scientific, scientific and applied research and economic activity. Its allocation is accounting to 50% of its total budget. The other 50% of the total budget of the institution is in form of a subsidy from the state budget.[38] BAS consists of 42 scientific institutes, 8 academic specialised units, 9 specialised units, and is producing 48% of the total scientific research output in Bulgaria.[39]

The Institutes of the Bulgarian Academy of Sciences are independent parts of the BAS's organisational structure and function as separate legal organisations.

36. https://www.ipa.government.bg/sites/default/files/bulgarian_centres_report.pdf
37. https://www.ipa.government.bg/sites/default/files/bulgarian_centres_report.pdf
38. https://www.bas.bg/?page_id=29
39. https://www.bas.bg/?page_id=29

Agricultural Academy – AA c**onsists of 27 scientific institutes, 19 experienced stations and 2 experimental bases** and works closely with the Ministry of Agriculture and Food.[40]

Other organisations – Scientific organisations related to ministries and state structures.

Enterprises – According to the Bulgarian National Strategy for Development of Research 2020 a fewer research activities are carried out by the private sector, which is partially reflected in the small number of SMEs that apply for funds from the National Innovation Fund. A small number of significant high-tech firms have well-established R&D departments that focus mainly on technology transfer. 412 878 is the total number of non-financial enterprises in 2021, from which 40.36% are located in the capital region - Yugozapaden, another prerequisite for the centralization of resources.[41]

Strong NGOs sector[42] – incl. service providers, think tanks, professional organisations and others. A great example is the Bulgarian Innovation Forum with its main objective related to sustainable growth, and the establishment of connections between Bulgaria's many ecosystems of innovators, talents, businesses, universities, and financing sources. The forum aims to create a robust and long-lasting innovation environment in Bulgaria that will allow good ideas to spread globally.

5.2.3. POLICY & STRATEGIES boosting research, development & innovation

A. INNOVATION POLICY

In order to promote innovation, close the research-industry gap, and boost the competitiveness of the private sector, Bulgaria approved the National Innovation Strategy (NIS) in 2004. NIS included both financial and non-financial measures, including the National Innovation Fund (NIF), support for young professionals and entrepreneurs, the development of technology centers, the creation of clusters, incentives for foreign investment in R&D, and the establishment of university entrepreneurship centers.

After joining the EU in 2007, Bulgaria had access to several EU-level funding programs for R&D and innovation support, including the Competitiveness and Innovation Program and the Framework Program for Research, Technological Development and Demonstration. Additionally, Bulgarian businesses acquired access to the EU Patent Office and started taking advantage of the EU's innovation incentives.

By 2012, EU structural and cohesion funds had taken over as the primary source of public funding for Bulgaria's economy's development and modernization. All of the planning regions within Bulgaria have created Regional Innovation Strategies under the EC's "Innovating Regions in Europe" initiative and between 2001 and 2008, and developed their own unique frameworks for implementing R&D and innovation strategies within their territories. The recommendations from these regional strategies have generally not been implemented at the national level; instead, they have been only partially incorporated in Strategies for Regional Development and the National Strategy for Regional Development.

The development of a Smart Specialization Strategy was the missing tool for the improvement of the country's R&I capacity. The European Commission (EC) has therefore determined that the submission of a

40. https://www.agriacad.bg/bg/science-and-education/scientific-board
41. https://www.nsi.bg/en/content/8212/number-enterprises
42. https://bti-project.org/en/reports/country-report/BGR

Smart Specialization Strategy shall be an ex ante requirement for access to structural funds in the period from 2014 to 2020.[43]

Currently, the Ministry of Innovation and Growth coordinates innovation policy in the following sectors to promote sustained economic growth:

Green economy:

- Implementation of the green transition, which will boost the economy's growth, sustainability, and competitiveness;
- The Ministry of Innovation and Growth will oversee the creation and adoption of a National Road Map to improve the conditions for the deployment of the potential for the development of hydrogen technologies and the mechanisms for hydrogen production and supply - a crucial step in achieving the objectives of the Green Pact already identified in The National Recovery and Resilience Plan);

Digital economy:

- In order to achieve a quality digital transformation and a beneficial influence of technology on Bulgaria's industry and society, appropriate policies are being designed to aid in shaping a bright digital future for the country;
- A focused microelectronics policy is also essential for Bulgaria's development. Strategic components for important industrial value chains are integrated circuits. New markets for integrated circuits are developing as a result of the digital transformation, including highly automated vehicles, cloud computing, the Internet of Things, connectivity (5G/6G), aerospace/defence, computing power, and supercomputing.

Space policy:

- Bulgaria creates and engages in the high-tech strategy of the European Union for the peaceful exploration and use of space. Astronomy and astrophysics, Earth observation research and applications, telecommunications, micro-navigation research, space biology and medical, education and awareness, etc. are all areas of active space policy collaboration and development;
- An agreement was signed by the Ministry of Innovation and Growth between the Government of the Republic of Bulgaria and the European Space Agency (ESA), and the National Assembly ratified it on June 8, 2022. The agreement maintains the previous five-year collaboration allowing Bulgarian businesses and research institutions to actively participate in the European space industry. The development of new space technologies, applications, data utilisation, and space engineering courses will involve participation from universities, small and medium-sized businesses, and academic institutions around the nation.

Defense:

- NATO member states resolved to launch the Defense Innovation Accelerator and NATO Innovation Fund in the North Atlantic DIANA on June 14, 2021. Bulgaria supported the involvement of the Defense Institute "prof. Tsvetan Lazarov" and the Institute "Big data for the benefit of the intelligent society" GATE

43. https://www.mi.government.bg/files/useruploads/files/innovations/full_report_3s.pdf

at SU "St. Kliment Ohridski" as test centers under the DIANA initiative;
● The participation of Bulgaria in the NATO Innovation Fund, which will have a tenure of 15 years and a budget of 1 billion euros, was agreed by the Council of Ministers on June 8, 2022. The fund will assist start-ups and other high-tech businesses that are in line with the strategic objectives of NATO.
A major objective of the Ministry of Innovation and Growth is to create a competitive economy that will ensure the growth and development of Bulgarian regions, promotion, and acceleration of innovations and investments throughout the country.

Another key objective of the Ministry of Innovation and Growth is to make sure that the competitiveness funds of the EU and the National Recovery and Resilience Plan are being used effectively, efficiently, and in a results-oriented way, as well as to encourage cross-border projects, including those involving European funding.

The most important national R&I strategies and priorities are:

- **National Development Program BULGARIA 2030**
- **Innovation strategy for the smart specialization of the Republic of Bulgaria (2014-2020)**
- **Innovation strategy for the smart specialization of the Republic of Bulgaria (2021 - 2027)**
- **National Development Strategy of scientific research in the Republic of Bulgaria 2017 – 2030**
- **Better Science for a Better Bulgaria 2025 Vision for a research policy strategy in support of society and economy**
- **NNRP**

National Development Program "BULGARIA 2030"[44]

The Ministry of Innovation and Growth determines the conduct of innovation policy in the country in the context of the National Development Program "BULGARIA 2030". Bulgaria 2030 is the highest-level strategic document in the hierarchy of national program documents, setting out the vision and general goals of state development policies, including their territorial implications. As part of the document, three strategic goals (accelerated economic development, demographic upswing and reduction of inequalities) and 13 national priorities are defined, including "Smart Industry," a program aimed at developing and introducing innovative products, processes, and business models. In addition to improving resource efficiency, it also supports and implements innovations that address the economy's still high carbon intensity.

Currently, **The Innovation strategy for the smart specialization of the Republic of Bulgaria** (2014-2020)[45] is based on the principles of the innovation strategy (2004) and further integrated into the Innovation strategy for the smart specialisation of the Republic of Bulgaria (2021 - 2027) to guide investments by European funds to the most promising sectors and activities. The Council of Ministers adopted the Innovation Strategy for Smart Specialization 2021-2027 of the Ministry of Innovation and Growth. It is a condition for providing Bulgaria with access to the resources of the two European programs for Bulgaria-**Program "Competitiveness and Innovations in Enterprises" 2021-2027** and **Program "Scientific Research, Innovations and Digitization for intelligent transformation" 2021-2027** both with a budget accumulated to BGN 5 billion. The strategy's goal is for Bulgaria to become a hub for medium-and high-

44. https://www.mig.government.bg/politiki-i-strategii/inovaczii/
45. https://www.mi.government.bg/files/useruploads/files/innovations/ris3_26.10.2015_en.pdf

tech breakthroughs in key industries with established market positions and capacities. The objective is to foster and build an innovative, cutting-edge, and sustainable entrepreneurial ecosystem in the country. This also entails enhancing enterprise innovation and the system for scientific research.[46]
Smart Specialisation Strategy 2021-2027

In comparison to earlier, less comprehensive strategies, Bulgaria's S3 is observed as the country's first complete national innovation plan. The need to incorporate the bottom-up perspective presented the biggest obstacles for its governance. Due to the general detachment of the innovation systems and its components, as well as the internal geographical inequality in terms of capability and resource availability, this has been perceived as a new and difficult aspect. The need to further empower the S3 leadership structure and the operation of the technical body by defining particular duties and a coordinated activity among institutional entities posed a significant challenge in addition to the enhancement of the quadruple helix's role. An unbalanced development between regions has resulted from the place-based aspect, one of the most significant aspects of S3, not being sufficiently improved. This is particularly true in relation to local governance capacity to manage the implementation of the strategy and related processes and access to funds. S3 generally made it possible to acquire funds, but this also brought about new challenges in terms of deciding how to allocate these funds at the national and regional levels.[47]

National Strategy for Research and development[48]

It is one of the prerequisites for achieving the objectives outlined in the Partnership Agreement between the Republic of Bulgaria and the European Union for the 2014-2020 program period. It is defining the state's objectives and corresponding measures and actions for the advancement of scientific research from 2017 to 2030. The strategy is strongly related to the Innovation Strategy for Smart Specialization 2014-2020.

** **National Development Strategy of scientific research in the Republic of Bulgaria 2017 – 2030**

National Development Strategy of scientific research in the Republic of Bulgaria 2017 – 2030[49] is a continuation of the previous period of the strategy (2012-2020). The strategy is also consistent with key national documents (Innovation strategy for smart specialisation 2014–2020, National Development Program: Bulgaria 2020, National Reform Program 2016, National Research Development Strategy 2020, Strategy for the development of higher education in the Republic of Bulgaria for the period 2014-2020, Methodology for strategic planning in the Republic of Bulgaria) and other key European documents (Europe 2020: A Strategy for Smart, Sustainable and Inclusive Growth; EC Framework Program for Research and Innovation; European Research Area Roadmap; and others). During the period 2012-2020 the implementation of the strategy was unsatisfactory as the commitments made to the EU related to the national participation in the construction of the European Research Area were not fulfilled and official data showed decline in the field of scientific research due to lack of state policy support and appropriate reforms and long-term priorities in the field.

Better Science for a Better Bulgaria 2025 Vision for a research policy strategy in support of society and economy

46. https://www.investor.bg/a/536-finansi/366106-dve-programi-na-inovatsionnata-strategiya-shte-predostavyat-5 -mlrd-leva-na-biznesa
47. https://s3platform.jrc.ec.europa.eu/w/challenges-in-governance-of-smart-specialisation-in-south-east-europe
48. https://www.strategy.bg/StrategicDocuments/View.aspx?lang=bg-BG&Id=1231
49. https://www.strategy.bg/StrategicDocuments/View.aspx?lang=bg-BG&Id=1231

"Better Science for a Better Bulgaria 2025"[50] is the next step the Ministry of Education and Science is taking. The updated research plan seeks to have the biggest possible influence on the national level, affecting both society and the economy. **Founded on four fundamental principles: Partnerships in three dimensions** (Partnership amongst the research and innovation performing and dependent/demanding organisations – scientific organisations, universities and businesses, their confederations and civil society organisations;Partnerships amongst institutions developing and implementing (sectorial or generic) policies in science and innovation, basically aimed at inter-ministerial coordination;Partnerships amongst institutions developing and implementing (sectorial or generic) policies in science and innovations, and research and innovation performing and dependent/demanding organisations); **Complementarity and synergy** (complementarity and synergies with other strategies' objectives and results, such as the Innovation Strategy for Smart Specialisation, the National Reform Programme, the Strategy for development of research in the agrarian sector 2009-2018, Economic analysis of Bulgaria and others); **Equal involvement of stakeholders** (The entire community of research and innovation stakeholders is impacted by this principle. It is a matter of open discussion and ought to include all beneficial suggestions and actions that will significantly and favourably affect the results of its application. This plan, which is sponsored jointly by the Ministries of Economy and Finance, should protect both coherence and the availability of the resources required for its effective implementation); **Trust** (Systematic confidence in Bulgaria's R&D system has been eroded over the past years. Additionally, it has diminished the trust that firms and entrepreneurs have in Bulgaria's research system to give them access to knowledge and technology that will help them grow and expand their companies).

The strategy has 4 Pillars:

Pillar 1: Renewed commitment to raising public investment in research
Pillar2: Reforms in the R&D system
Pillar3: Strategic priorities, alignment with smart specialization and beyond
Pillar 4: Human resources

National strategy for small and medium-sized enterprises for 2021–2027

The "National strategy for small and medium-sized enterprises" 2021–2027[51] defines the framework of policies for SMEs based on a thorough examination of the SME system in Bulgaria. It was created for the Ministry of Economy (ME) and all other stakeholders in the state administration, who are in charge of developing and carrying out policies to promote the growth of small and medium-sized businesses in Bulgaria.

National strategic document "Digital transformation of Bulgaria for the period 2020-2030"[52]

The National Program "Digital Bulgaria 2025", the priorities of the "National Development Program BULGARIA 2030," and a number of other national strategic documents with a technological component are included in this document's definition of the vision and goals of the Republic of Bulgaria's policy on digital transformation for the years up to 2030. It considers the objectives of the UN 2030 Agenda for Sustainable Development and how new technologies can be used to accomplish them, as well as strategic documents of the European Commission such as "Building Europe's Digital Future," "Europe fit for the Digital Age," and "New Industrial Strategy for Europe."

50. https://era.gv.at/public/documents/2882/BG_Better_ScienceBetter-final_en.pdf
51. Портал за обществени консултации (strategy.bg)
52. Портал за обществени консултации (strategy.bg)

In 2020 the national strategic document "Digital Transformation of Bulgaria for the period 2020-2030"[53] was accepted. Measures to improve digital skills and increase consumer and business demand for internet-based services and support for high-speed connectivity are included. The strategy aims to incorporate technological subjects and digital skills into all educational and vocational training and retraining systems' curricula. The areas of impact include: Digital infrastructure, Cybersecurity, Research and innovation, Education and training, Adaptation of the labour market – education, training and social protection, Digital economy, Agriculture, Transport, Energy, Environment and Climate, Healthcare, Finances, Culture, Disinformation and media literacy, Territorial development, Digital governance, Security and participation of citizens in the democratic process.[54]

Strategy and action plan for the transition to a circular economy of the Republic of Bulgaria for the period 2021-2027

Aims to promote resource efficiency through implementation of the waste management hierarchy, reducing landfilling, promoting the reuse and recovery of waste and reducing the health and environmental impacts of waste. A green and competitive economy, less waste and more resources, and an economy that benefits the consumer have all been formulated as strategic goals.[55]

National Roadmap for Research Infrastructures 2020-2027

Under the Operational Program "Science and Education for Smart Growth", the Ministry of Education and Science has published a strategic document which is in accordance with the Bulgarian research organisations and higher education institutions and includes 51 infrastructures, including 15 Centers of Competence and Centers of Excellence.[56]

Bulgaria's National Recovery and Resilience Plan

The RRP's implementation helps Bulgaria's institutional framework and handle a variety of issues related to the business climate. The RRP also consists of improvements to the ecosystem for research and innovation.This relates to a new governance structure that includes the establishment of a new advisory body, the Innovation Board, as well as a new legal framework for the advancement of research and innovation (R&I) and research universities. The reform will be supported by additional features for funding research. A key deliverable related to supporting the innovation and growth of Bulgarian businesses is the launch of the Economic Transformation Programme. The plan consists of four main pillars : "Innovative Bulgaria", "Green Bulgaria", "Connected Bulgaria" and "Fair Bulgaria". The largest funding will be received by "Green Bulgaria" – almost half of the whole funding. Innovative Bulgaria is in second place, followed by "Connected Bulgaria" and "Fair Bulgaria".[57]

"Innovative Bulgaria" funding is **28% of the funds under the NRRP** (areas of funding - Education and skills, Scientific research and innovation, Smart industry). The financing will be provided from the

53. https://www.mtc.government.bg/en/category/283/national-strategic-document-digital-transformation-bulgaria-period-2020-2030-0
54. https://www.mtc.government.bg/sites/default/files/digital_transformation_of_bulgaria_for_the_period_2020- 2030_f.pdf
55. https://www.moew.government.bg/bg/strategiya-i-plan-za-dejstvie-za-prehod-kum-krugova-ikonomika-na-rep ublika-bulgariya-za-perioda-2021-2027-g-10910/
56. https://naukamon.eu/wp-content/uploads/2021/06/RoadMapBulgaria_2020-2027_EN-1.pdf
57. Bulgaria's National Recovery and Resilience Plan: Latest state of play | Think Tank | European Parliament (europa.eu)

following sources: 1) Recovery and Resilience Mechanism (RRM) - (69.4%), 2) Public financing -n (12.4%), 3) Private financing - (18.2%). **4 reforms** will be performed, ex.: "Reform of the educational system and learning through whole life", "Development of science", "Development of industrial parks". There are **8 projects** included in the Innovative Bulgaria piller. Most of them will address the following developments: "Modernization of the school infrastructure and building STEM centres", "Digital skills training, economic transformation". About 60% of the costs in the pillar are for economics, primarily a project called "Economic Program Transformation" and specifically contained in warranty tools and technology modernisation. Project costs that are intended to advance education make up 30% of the total.

"Green Bulgaria's" financing equals **42% of the funds under the NRRP** (areas of funding: Low carbon economy, Biodiversity, Sustainable agriculture. The financing will be provided by: 1) Recovery and Resilience Mechanism (RRM) - (65.5%), 2) Public financing - (5.8%), 3) Private financing - (28.7%). **14 reforms** will be performed, ex.: "Energy efficiency of buildings", "Liberalisation of the electricity market", " Stimulating the production of energy from RES", "Decarbonisation of the energy sector". **13 projects**, most of them aiming at: "Energy renovation of the building stock", "National infrastructure for storing electric energy from RES", "Construction of 1.4GW RES and batteries". More than 87% of expenses are for energy, approximately 12% - for agriculture and just over 1% - for ecology.

In the piller "Connected Bulgaria" will be invested **18% of the funds under the NRRP** (areas of funding: Digital connectivity, Transport connectivity, Local development).The financing of will be provided by: 1) Recovery and Resilience Mechanism (RRM) -(69.3%), 2) Public funding - (26.3%),3) Private financing - (4.4%). **14 reforms**, including: "Efficient use of radio frequency spectrum", "Updating the strategic framework", "Electric mobility", "Reform of the water sector". There are **12 projects**, most of which are aimed at: "Deployment of the digital infrastructure", "Purchase of new rolling stock for the railway transport", "Water supply and sewage systems". Over 60% of the costs are for transport, nearly 25% of the costs are for communication technologies in connection with digital connectivity and close 15% - for waters.

"Fair Bulgaria" is **12% of the funds under the NRRP** (areas of funding: " Business environment", "Social inclusion", "Health Care". The financing will be provided by: 1) Recovery and Resilience Mechanism (RRM) -(84.4%), 2) Public funding - (14.9%) 3) Private financing - (0.7%). **20 reforms**, including: "Combating corruption", " Development of electronic healthcare", "Reform in the field of social services", "Reform for accessible and effective justice". **25 projects**, most of them aiming at: "Digitization of information arrays in the administration", "Modernization of long-term care", "Modernization of medical facilities". 37% of the costs are for health care and 36% - for projects in the social sector. 7% will be allocated to the justice, information technologies and the culture sectors, the science sector will receive 6%, and 1 % is for the process of managing the implementation of the plan. All of the plan's funds for the sectors of healthcare, social services, justice and culture are distributed through this pillar.

Concept for digital transformation of Bulgarian industry (Industry 4.0)

The present Concept's objective is to lay the groundwork for the medium- to long-term modernization, automation, and competitive positioning of the Bulgarian economy (2017-2030). According to the Concept, Bulgaria will deploy Industry 4.0-related goods, technology, business models, and processes in order to become acknowledged as a regional hub of the digital economy by 2030. Adopting the Concept will enable the implementation of specific policies and measures for the digitization of the real economy and the production sector, as well as aid in the coordination of policies, tools, and mechanisms across the

various ministries and in line with the EU's policies in this area.

- Direction 1: Improving the country's science-industry partnerships and accelerated integration of Bulgaria in European and worldwide programs, projects, and networks pertaining to the creation and adoption of Industry 4.0.
- Direction 2: Technological renewal of the Bulgarian economy by implementing standards, building infrastructure, and creating specific mechanisms to encourage the creation and market adoption of technological innovations (new goods, services, and production methods) through Industry 4.0 technologies.
- Direction 3: Building institutional, organisational, and human capacity for Industry 4.0 development in Bulgaria.

B. NATIONAL AND REGIONAL POLICY FOR REGIONAL DEVELOPMENT

The main objectives of the state ***policy for regional development*** are defined in Art. 2 para. 2 of the Law on Regional Development. The two documents in which the foundations of regional and spatial development are laid for the previous program period and determine the guidelines of the strategic documents are the National Strategy for Regional Development of the Republic Bulgaria 2012-2022 and the National Spatial Development Concept for the period 2013–2025.[58]

A national concept for spatial development of Bulgaria determines the medium-term spatial framework for all development investments in the country. It outlines the fundamental framework for polycentric development, which integrates the city centers of different levels and development axes into a single spatial system, supports integrated strategy and promotes municipal collaboration to successfully address territorial concerns. The concept outlines many industries and subjects for which it is recommended the application of an integrated approach to investments:

1. provision of quality and accessible health, educational, cultural, social and administrative services in peripheral and low-urban areas regions;

2. joint implementation of key infrastructure projects, including improving transport accessibility, gasification and construction of industrial zones;

3. development of regional tourism products based on natural resources and the concentration of cultural heritage covering groups from municipalities.

The six regional concepts are meant to act as primary regional (NUTS level 2) documents that specify regional priorities and investment areas.[59]
National Regional Development Strategy of the Republic Bulgaria 2012-2022 is developed as a response to the requirements of the strategy "Europe 2020", "National Development Programme: BULGARIA 2020" serves as a long-term framework document that outlines the vision and overarching goals of the development policies for a ten-year period for all facets of the government, including their geographical manifestations. It contains examination of the territorial and socioeconomic development of the areas; regional development aims and objectives for the time period; evaluation of the resources needed to

58. https://www.eufunds.bg/sites/default/files/uploads/oprd/docs/2021-11/4_SIA_BG_Part_1%2008.2021-fin.pdf
59. https://documents1.worldbank.org/curated/en/632891617099840360/pdf/An-Analysis-of-the-Possibilities-toImplement-Territorial-Instruments-Program-for-Development-of-the-Regions-2021-2027.pdf

achieve the Strategy's goals; standards and measures for gaining the success of the strategy's execution; strategic recommendations for creating Regional Development Plans for the allotted time; essential activities for putting the partnership's guiding principles into practice, including the dissemination of information and publicity.

The National Center for Territorial Development (NCTR) was requested by the Ministry of Regional Development in 2019 to prepare **Integrated territorial development regional strategies** for the 6 regions at NUTS level 2 with the support and advice of the Regional Development Councils and the general public. They were developed to act as the primary regional (NUTS level 2) documents that specify regional priorities and investment areas.

The development of the regions program 2021-2027 accepts the important role of I**ntegrated territorial development regional strategies**, as they are recognized in it as the "territorial strategies" described in Article 23 of the EU proposal for the General Provisions Regulation 2021-2027, this implies that they will guide the planning of integrated interventions financed by EU funds during this period. Under the draft of the development of the regions program 2021-2027 is presented that all types of activities that will be supported under the Priority axis 2, with an emphasis on the territorial development of NUTS level 2 regions should be identified in the Integrated territorial development regional strategies.[60]

The Integrated Territorial Strategy of the North-East Region was approved by the Regional Development Council on September 21, 2022. It is a component of the system of planning documents for spatial development that is governed by the Law on Regional Development. The Regional Development Plan's vision for the North-East region's development aligns with level 2's vision (2014-2020).[61]

The Varna, Dobrich, Targovishte, and Shumen districts are included in the integrated territorial strategy for the development of the North-East region, which is a system of spatial development planning documents governed by the Law on Regional Development.

Strategic priorities of the region are outlined as follows in accordance with the BG 33 Integrated Territorial Development Strategy 2021-2027 and the Maritime Spatial Plan of the Republic of Bulgaria: increasing the region's dynamism on a global scale through the growth of intelligent industries with high growth potential — increasing specialisation in goods and industries with high levels of technological and R&D intensity; business and industrial development infrastructure; support for a marine economy; activation of rural areas through sustainable agriculture; diversification of the region's tourist product.

Strategic priority 1: Increasing the dynamism of the region on a global scale;

Specific objective: 1.1. "Creation of a smart industry with significant growth potential"

- 1.1.1 "Increasing specialisation in goods and sectors with high levels of technology and R&D intensity"
- 1.1.2. "Development of business and industrial infrastructure"

Specific objective: 1.2. "Sustainable utilisation of specific local development potential"

- 1.2.1. "Support for a marine economy"
- 1.2.2. "Sustainable agriculture and rural activation"

60. https://stateaid.minfin.bg/bg/page/432
61. https://www.namrb.org/bg/aktualno/regionalniyat-savet-za-razvitie-prie-integriranata-teritorialna-strategiyana-severoiztotchniya-rayon

Strategic priority 2: Achieving equal access to quality education, healthcare and social services. Social inclusion;

Specific objective: 2.1. "Investment in education and skills"
Specific objective 2.2. "Improving access to quality health and social services"
- 2.2.1. Access to quality health services: development of electronic healthcare;

Strategic priority 3: Territorial development and cohesion, and ensuring a sustainable environment.
Specific objective:3.1. "Fast and secure transport and digital connectivity"
Specific objective: 3.3. "Preservation and improvement of environmental quality"
Specific objective: 3.4. Cross-border and transnational cooperation:

Municipal Level:
Municipal Development Plan of Varna Municipality for the period 2014-2020

It is the primary strategy document that specifies the goals and priorities for Varna Municipality's sustainable and integrated socio-economic development and it is produced for a period of seven years in accordance with the provisions of the regional development legislation (Regional Development Act and Regulations for Application of the Regional Development Act). The Varna Municipality's Municipal Development Plan, a strategy plan, integrates comparative advantages and local development potential with a clear vision, objectives, and priorities with the goal of raising the standard of living for residents of the municipality through sustainable development.[62]

Plan for Integrated Development of the Municipality of Varna

The Integrated Plan for Urban Regeneration and Development of Varna is created as a tool for planning and managing the urbanised territory of the city's growth through the application of a unified approach for the spatial, temporal, and functional coordination and integration of political and managerial actions, as well as the mobilisation of resources and tools. This integrated plan is the key planning document for identifying all-encompassing and integrated solutions to urban environment challenges, making the most of the geographic advantages, and ensuring adequate and sustainable use of territorial resources that are now accessible. It incorporates the forecasts from various strategic planning documents relating to regional development and spatial planning - Regional Development Plan for the North-East Planning Region, the Development Strategy of the Varna District and the Municipal Development Plan of Varna Municipality. The plan was created in the form of a funded project under the OP "Regional Development" 2007-2013.[63] **The plan was further integrated into the next planning period and currently it is developed for the 2021-2027 period** with the following vision: a sustainable future for Varna includes an integrated green region with a developed ecosystem, economy, and services that are complex and focused on people.

Strategic objective 2. "Regional leader in integrated development of the region with knowledge and innovation. (Priority 1. Green city (including realisation of goals, priorities and projects included in The Varna-Green City initiative);

The public had the chance to submit new activities and project ideas proposals for updating the Program for the implementation of the Plan by filling out the "Project Idea Sheet" from 14.12.2022 to 13.01.2023,

62. https://varna.bg/en/15
63. https://varna.bg/en/15

as part of the implementation of the Communication Strategy, a key component of the Plan for Integrated Development of the Municipality of Varna for the period 2021–2027.

Varna Green City Action Plan (strategy document)

The Varna City Council approved the Green City Action Plan in August 2022. (GCAP). In accordance with the GCAP, the municipality aspires to create a "green, clean city that supports healthy and sustainable living through innovative and resilient solutions."

- Investing in a Greener Future
- Clean and Resilient Energy
- A Connected, Modern and Accessible City with a good quality of life
- Responsible and Sustainable Resource Use

The stakeholder engagement plan included 173 unique stakeholders representatives from municipal government agencies, research centres and universities, civil society groups, private companies (e.g. factories, construction, tourism, transport, energy, and water), national government agencies, national utility companies and international NGOs.

Examples of actions to be taken under the action plan:

"Set up a community energy efficiency programme", "Ensure that future Municipality Energy Strategies incorporate the findings and recommendations of GCAP", "Provide incentives to both developers and private homeowners, for the incorporation / installation of renewable electricity generation (e.g. tax exemptions, cost subsidisation), Integrate renewables at a large scale in the city", "The Municipality to establish a supplementary reporting programme for all existing and new industries to develop and share policy on the monitoring, reporting and publication of key environmental data (e.g. air, water, carbon emissions, noise pollution and waste disposal) to inform efforts for reducing pollution in-line with EU Limit Values.", "Work with ViK Varna to introduce "smart" technology, i.e. IoT smart metering, across the potable water network", "Develop and implement an integrated recycling program to promote the use of resourceful construction and demolition materials and create green jobs (i.e. inert construction and demolition waste as secondary aggregate).", "Introduce Low Emission Zone and time-based congestion charge zone within the city centre.", "Upgrade ITS (Intelligent Transport Systems) to enhance existing traffic management/control centre.", "Develop a 'Mobility Hub' Transport Strategy as part of the on-going SUMP to increase public or pedestrian modalities. Measure and track the network demand to inform the development of the strategy." and more actions missing from the above mentioned.

Varna "City of Knowledge"- an initiative of the Mayor of Varna Municipality

Mission: It is a cause that seeks to transform the economic profile of the city using digital, green, and innovative technologies and solutions in order to promote the long-term development of the maritime capital.

Vision: "Varna - City of Knowledge" combines the efforts of the city's local administration, industry, business, and scientific community to help the city reach its greatest potential. The 25 parties to the Memorandum of Cooperation and Partnership announce their willingness to cooperate in order to promote economic growth through knowledge and innovation-based investments that result in creating

jobs with high productivity and income.

WiFi4EU - Varna: Ten sites in the city offer free public wireless connections with high-speed Wi-Fi under the WiFi4EU initiative. In Dobrich municipality there are 12 sites, in Targovishte - 3 and in Shumen - 4 sites are providing the free public service under the WiFi4EU initiative.

The third level of Bulgaria's development planning system, municipal, consists of plans for integrated community development resulting from merging two previous types of documents—Municipal Development Plans and Integrated Urban Regeneration and Development Plans. The Ministry of Regional Development and Public Works' Methodological Guidelines are presented for the development and implementation of Plans for Integrated Development of a Municipality.[64]

5.1.4. PROGRAMMES boosting research, development & innovation

According to the Digital Riser Ranking Report[65] , Bulgaria was the top digital riser among countries in Europe and North America in 2020. Bulgaria's superior performance may be mostly attributed to its **"Digital Bulgaria 2025" lighthouse initiative**, which was introduced in 2018 as an extension of the national program **"Digital Bulgaria 2015".**

The **Executive Agency** "Programme Education is managing both The Operational Programme "Science and Education for Smart Growth" 2014-2020 and the Programme "Education" 2021–2027.

"The Operational Program "Science and Education for Smart Growth" 2014–2020 encourages reforms in higher education, pre-school and school education. The Executive Agency seeks to accomplish two key goals that are directly related to the European Union's strategy for smart, sustainable and inclusive growth and economic, social and territorial cohesion through execution of the measures of the program

- to serve as one of the primary tools for attaining the following goals set forth by the Republic of Bulgaria within the context of the Europe 2020 Strategy:"Increasing investment in science and research up to 1.5%;
- Reducing the rate of early school leavers to below 11%;
- Raising the rate of higher education graduates to 36% of people of the age 30 - 34;",
- to act as an effective tool to carry out cohesion policies in accordance with the agenda at the national and Community level.

In order to make important advancements in the national scientific and education systems, the resources of the program are concentrated in the thematic areas:

A. Building research and development (R&D) capacity in the Innovation Strategy for Smart Specialization's priority areas (IS3)
B. Supporting the system of higher education
C. Promoting education in schools, training, and lifelong learning

64. https://documents1.worldbank.org/curated/en/632891617099840360/pdf/An-Analysis-of-the-Possibilities-toImplement-Territorial-Instruments-Program-for-Development-of-the-Regions-2021-2027.pdf
65. https://digital-competitiveness.eu/digitalriser/

2014-2020

	Name of the program	Measure/ Call	Target beneficiaries	(N) National/ (R)Regional/ (E) European	(I) Individual application or (C) Collaborative
1.	**Competitiveness and innovation in enterprises**	"Voucher scheme for the provision of ICT services to SMEs"	1) to be legal entities or sole traders registered under the Commercial Act or the Cooperatives Act 2) to be micro, small or medium enterprises, in sectors: High-tech and medium-high-tech industries, Knowledge-intensive services, Low-tech and medium-low-tech industries	National	Individual application
2.	**Competitiveness and innovation in enterprises**	"Stimulating the implementation of innovations in enterprises"	micro, small, medium and large enterprises who develop their main economic activity in one of the sectors that are not ineligible for application with other plans and programs financed with EU funds.	National	Individual application
3.	**Competitiveness and innovation in enterprises**	Encouraging entrepreneurship	1) legal entities (owned limited liability company, Ltd., or sole traders, registered under the Commercial Law or the Law on Cooperatives; 2) registered after 31.12.2016; 3) applicants who, at the date of application, are independent enterprises according to the Law on Small and Medium Enterprises; 4) candidates where, on the date of the announcement of the procedure, more than 50% of the enterprise is owned by one natural person-entrepreneur.5) Projects of only applicants who develop their main economic activity and the activity they are applying for in the following sectors are admissible: Sectors of the National Strategy for the promotion of small and medium-sized enterprises, identified as priorities for the creation and development of new enterprises, Sectors related to overcoming European and regional challenges	National	Individual application

4.	**Competitiveness and innovation in enterprises**	Development of clusters in Bulgaria	Clusters registered as: - associations within the meaning of the Law on non-profit legal entities, carrying out activities for private benefit according to Chapter Two, Section I of the same law or - legal entities registered under the Commercial Law, (additional requirement upon application: Applicants must include a minimum number of members in dependence of their size - micro, small or medium enterprises , higher education institution or research organisation) in the following sectors of the economy: High-tech and medium-high-tech industries, Knowledge-intensive services, Low-tech and medium-low-tech industries	National	Individual application
5.	**Competitiveness and innovation in enterprises**	procedure "Increasing energy efficiency in large enterprises"	Large enterprises - develop their main activity in the following sectors B "Mining Industry"; C "Processing industry"; D "Production and distribution of electrical and thermal energy and gaseous fuels"; E "Water supply; Sewage Services, Waste Management and Remediation" F "Construction"		
6.	**Competitiveness and innovation in enterprises**	Development of product and production innovations	meaning of the Commercial Act or the Cooperatives Act or are an equivalent person within the meaning of the legislation of a Member State of the European Economic Area; Scientific organizations may (but not necessarily) be involved as project partners: a) Accredited Bulgarian higher education institutions, or b) Faculties of Bulgarian higher education institutions, according to Art. 26 of the Law on Higher Education or the service units operating at the faculties (within the meaning of Article 25, Paragraph 3 of the Law on Higher Education), or c) Institutes or academic specialized units of the Bulgarian Academy of Sciences, or d) Experimental laboratories and research institutes within the meaning of Art. 60 of the Administration Act, or e) Association for scientific research and development activity at "Sofia Tech Park" JSC.		

7.	**Competitiveness and innovation in enterprises**	Development of management capacity and growth of SMEs	micro, small or medium enterprises,with its main activity in the following sectors according to KID-2008:High-tech and medium-high-tech industrial productions, Knowledge-intensive services, Low-tech and medium-low-tech industrial productions		
8.	**Competitiveness and innovation in enterprises**	Support for pilot and demonstration initiatives for efficient use of resources	1) traders within the meaning of the Commercial Law or the Law on Cooperatives or are an equivalent person within the meaning of the legislation of a member state of the European Economic Area; 2) Applicants who are micro, small and medium enterprises; 3) Applicants who have a minimum of three completed financial years (2014, 2015 and 2016); 4) Operate in sector C “Processing industry”		
9.	**Competitiveness and innovation in enterprises**	Scheme Support for the development of innovations by start-ups	legal entities or sole traders registered under the Trade Act or the Cooperatives Act; candidates are not ineligible according to the demarcation line with other plans and programs financed with EU funds.		
10.	**Human Resources Development Program 2020-2027**	Procedure: Training for employed persons	Employers who can participate alone or in partnership with up to 2 other employers “Employer” is any natural person or legal entity that carries out economic activity, regardless of its ownership, legal and organisational form.		
11.	**Human Resources Development Program 2020-2027**	procedure : Specific trainings	Employers in knowledge-based sectors, high technology and ICT and manufacturing with higher labour value added, **Eligible partners**: Employers in knowledge-based sectors, high technology and ICT and manufacturing with higher labor value added		

12.	**Human Resources Development Program 2020-2027**	Flexible opportunities for employment and training in enterprises with variable activity intensity	Eligible candidates: employers developing their activity in the following economic sectors according to KID 2008: – Sector C "Processing industry", sections 10 to 33 inclusive; Sector F "Construction", sections 41 to 43 inclusive; Sector I "Hospitality and restaurant industry", sections 55 and 56 **Eligible Partners**: 1) employers developing their activities in the following economic sectors according to the 2008 Labor Code: Sector C "Processing industry", sections 10 to 33 inclusive; Sector F "Construction", sections 41 to 43 inclusive; Sector I "Hospitality and restaurant industry", sections 55 and 56 and/or 2) Vocational training centres (in cases where they are 100% owned by the applicant).		
13.	**operational programme "Education and Science for Smart Growth"**	Priority axis: 2. Education and lifelong learning	Ministry of Education and Science	European Social Fund (ESF)	
14.	**operational programme "Education and Science for Smart Growth"**	Priority axis 1 – Scientific research and technological development	Ministry of Education and Science	European Regional Developmen t Fund (ERDF)	
15.	**Rural Development Program**	Measure 4.1.2 Investments in agricultural holdings under Thematic sub-programme for the development of small holdings; Measure 4.2.2 Investments in processing/marketing of agricultural products under the Thematic sub-programme for the development of small farms	to be sole traders or legal entities registered under the Trade Act or cooperatives registered under the Cooperatives Act; to be registered as farmers in accordance with Ordinance No. 3 of 1999; have received from agricultural activity at least 33 percent of their total income/income for the previous calendar year;have an economic size of the farm, measured in standard production volume in the limits between the BGN equivalent of 6,000 euros and 7,999 euros inclusive, and more than 50 percent of the farm's SPO is from the "Livestock", "Fruits and vegetables" sectors and/or "Essential oil and medicinal crops"; e) to be micro-enterprises or small enterprises within the meaning of Art. 3, para. 2 and 3 of the Law on Small and Medium Enterprises		

Forthcoming 2021-2027

One of the main tools for carrying out Priority 1 "Education and Skills" of the **National Development Programme Bulgaria 2030**, as well as the strategic objectives set in the **Strategic Framework for Development of Education, Training, and Learning in the Republic of Bulgaria (2021-2030), and the Strategy for Development of Higher Education in the Republic of Bulgaria for the period 2021-2030, is the Programme "Education" (2021-2027)**. Complementarity and demarcation of the program with other programs and tools: NRRP, Regional Development Program 2021-2027, Program for Research, Innovation and digitalization for smart transformation 2021-2027, Human Resources Development Program 2021-2027, Technical Assistance Program 2021-2027.

During the program period 2021-2027, business representatives will be able to apply for European funds to finance their projects under the "Recovery and Resilience Plan", the "Competitiveness and Innovation in Enterprises" program, the "Human Development" operational program and the 'Rural Development Programme'.

	Name of the program	Measure/ Call	Target beneficiaries	(N) National/ (R)Regiona l/ (E) European	(I) Individual application or (C) Collaborative
1.	**The National Recovery and Resilience Plan (NRRP)**	procedure "Increasing energy efficiency in buildings in the sphere of production, trade and services"	micro, small, medium and large enterprises in the field of production, trade and services	E/ Next Generation EU	Individual application
2.	**The National Recovery and Resilience Plan (NRRP)**	procedure "Construction of new RES for own consumption in combination with local facilities for energy storage in enterprises"	SMEs, small mid-cap companies, mid-cap companies; from all sectors with the exception of enterprises from sector D "Production and distribution of electric and thermal energy and gaseous fuels", sector A "Agriculture, forestry and fisheries", sector K "Financial and insurance activities", micro-enterprises with headquarters and activity on the territory of a rural municipality, as well as enterprises whose main activity is primary processing of agricultural and forest products.	E/ Next Generation EU	Individual application

3	**The National Recovery and Resilience Plan (NRRP)**	"Transition to a circular economy"	SMEs and large enterprises from sector C "Processing industry", incl. partnership between them for the purpose of achieving industrial symbiosis	National	Individual application
4.	**The National Recovery and Resilience Plan (NRRP)**	procedure "Technological modernization"	Micro and SMEs	National	Individual application
5.	**The National Recovery and Resilience Plan (NRRP)**	"Solutions in the field of information and communication technologies and cyber security in small and medium-sized enterprises"	Micro and SMEs		
6.	**"Competitiveness and Innovations in Enterprises" program**	"Restoring SMEs by improving energy efficiency"	micro, small and medium-sized enterprises with main activity in the production sector of the economy (sector "C")		
7.	**Programme "Education" 2021 – 2027**	Priority: 1. INCLUSIVE EDUCATION AND EDUCATIONAL INTEGRATION/ Priority: 2. MODERNIZATION AND QUALITY OF EDUCATION Specific purpose: ESO4.6	Ministry of Education and Science Specific target: Children, students, parents, teachers, pedagogical specialists and non-pedagogical staff; incl. educational mediators; children and students with special educational needs, at risk, chronically ill and gifted; children and students from marginalised groups, such as the Roma, as well as those seeking or receiving international protection and from other vulnerable groups (including accommodated in Accommodation Centers from family type). Children and students with learning gaps, children and students at risk of dropping out of the education system, parents of children and students from vulnerable groups, incl. Roma, persons who left school prematurely, etc/ Participants in the educational process, the Ministry of Education and Culture and its secondary budget managers,, the institutions in the system of preschool and school education, including private kindergartens and schools, when applicable, public boards in educational institutions, municipalities, non-governmental organisations with proven experience and expertise in the field, universities and scientific organisations.	ESF	

8.	**Programme "Education" 2021 – 2027**	Priority: 1. INCLUSIVE EDUCATION Specific purpose: ESO4.7. Promoting lifelong learning, in particular flexible opportunities to enhance qualification and reskilling for all, taking into account entrepreneurial and digital skills, better anticipation of the changes and requirements for new skills depending on the needs of the market, the facilitation of transitions in professional development and the promotion of professional mobility	Ministry of Education and Science Specific target: Persons over 16 years of age with primary and lower education - youth, adults beyond compulsory school age, persons with special educational needs, youth and adults from marginalised groups such as the Roma, as well as those seeking or having received international protection from other vulnerable groups as well. The participants in the educational process, the Ministry of Education and Culture and its secondary budget managers, , the institutions in the system of school education, municipalities, non-governmental organisations with proven experience and expertise in the field, social partners, when applicable applicable, in their capacity as partners/associate partners	ESF	
9.	**Programme "Education" 2021 – 2027**	Priority: 3. RELATIONSHIP OF EDUCATION WITH THE LABOUR MARKET Specific purpose: ESO4.5. Improving the quality, inclusiveness, effectiveness and compliance of systems for education and training with the needs of the labour market, including by validating non-formal and informal learning, so that contribute to the acquisition of key competencies, including. entrepreneurial and digital skills, also by promoting the introduction of dual training and apprenticeship systems	Ministry of Education and Science Specific target: Students, pedagogical specialists, non-pedagogical staff, including educational mediators, vocational training teachers, mentors, parents, students, doctoral students, professors in higher education, representatives of marginalised groups, incl. people with disabled and Roma, children and students seeking or granted international protection and from other vulnerable groups;Higher schools, BAS, SSA, scientific organisations with accreditation for training in the educational and scientific degree "doctor", MES and its secondary administrators with budget, schools teaching in the high school stage of secondary education, including private schools when it is applicable; Employers, the nationally representative organisations of employers and employees, branch and professional organisations, National Agency for Vocational Education and Training, municipalities, NGOs.	ESF	

10.	**Programme "Education" 2021 – 2027**	Priority: 3. RELATIONSHIP OF EDUCATION WITH THE LABOUR MARKET Specific purpose: ESO4.7. Promoting lifelong learning, in particular flexible opportunities to enhance qualification and reskilling for all, taking into account entrepreneurial and digital skills, better anticipation of the changes and requirements for new skills depending on the needs of the market, the facilitation of transitions in professional development and the promotion of professional mobility	Ministry of Education and Science Specific target: Doctoral students, academic staff of higher schools and scientific organisations Higher schools, scientific organisations with accreditation for training in the educational and scientific degree "doctor", national representative organisations of employers and employees	ESF	
11.	**Programme "Education" 2021 – 2027**	Priorities for technical assistance	Ministry of Education and Science Specific target: managing authority employees performing planning, management, implementation, monitoring, evaluation, information provision and publicity and control of software; Other structures supporting the implementation of the Priority axis, in order to ensure and maintain high levels of competence, incl. members of the Committee for software monitoring; Beneficiaries under the Priority axis and their partners, as well as potential beneficiaries; Key beneficiaries and partners in system operations under Priority axis: incl. Regional administrations of education and its secondary budget administrators, schools (general education and vocational), kindergartens, universities.		

12.	**Rural development program**	Measure 6.4 “Investments in support of non-agricultural activities”	1. Existing or newly created micro-enterprises registered as sole traders or legal entities under the Trade Act and the Cooperatives Act. 2. Natural persons registered under the Trades Act. 3. Farmers registered as sole traders or legal entities under the Commercial Law, the Law on Cooperatives or the Law on Religions, whose farm has a standard production volume of more than 8,000 euros.		
13.	**Rural development program**	INVESTMENTS FOR NON-AGRICULTURAL ACTIVITIES IN RURAL AREAS (2023-2027)	1) micro-enterprises, 2) farmers and 3) natural persons.		

5.3. SPAIN - national & regional innovation framework

Territorially, Spain is one of the most decentralised countries in the world. It is organised into 8131 municipalities, 50 provinces, and 17 Autonomous Communities, plus the autonomous cities of Ceuta and Melilla.



Figure no. 10. Spanish Autonomous Communities

The Autonomous Communities are territorial entities that have political and financial autonomy. This implies the attribution of competence to legislate and execute in those areas in which their Statutes of Autonomy recognise it. Their main institutions of self-government are two: the Legislative Assembly and the Governing Council. In most of the Communities, this institutional framework is complemented by their own institutions (similar to those of the Central State).

In general, the Autonomous Communities have the following competences:

- Exclusive legislative and executive powers: for social services, agriculture and livestock, inland fishing, industry, trade, tourism, youth, and sports.
- Competences for the development and implementation of basic State legislation: in environmental aspects, economic policy, consumer protection, education, health care, and public health.
- Competences for the implementation of legislation adopted exclusively by the State. This is the case for employment and vocational training.

The Autonomous Communities have financial autonomy, although their revenues depend partly on the State and partly on their own resources, their own taxes or part of those obtained from State taxes in the Autonomous Community. This system is based on a “system of participation” in State revenues collected from the main taxes.

Spain has a population of 47,6 million inhabitants (2022), of which 15,95% live in rural areas.

5.3.1. Research, development & innovation GOVERNANCE

The Spanish national innovation framework is characterized as a "system of systems". The development of the competences of the Autonomous Communities in the field of scientific and technical research and innovation through their Statutes of Autonomy and the approval of their normative frameworks has resulted in autonomous systems of R&D&i with their own entity, that coexist with the system promoted by the General Administration of the State.

In this framework, the Spanish **Strategy for Science, Technology and Innovation** (EECTI) was born "*top-down*" through the governance established in Law 14/2011, of 1 June, on Science, Technology and Innovation (LCTI) but also "*bottom-up*" through the constitution of interest groups that respond to a quadruple helix model (Companies, Research and Public Administration, Civil Society and Innovation Users).

The EECTI 2021-2027, promoted by the Ministry of Science and Innovation, is the multiannual reference framework for achieving a set of general objectives, shared by all the Public Administrations with responsibilities in promoting scientific, technical and innovation research, and, together with the State Plans for Scientific, Technical Research and Innovation, is configured as the **State Smart *Specialisation Strategy S3***. This provides an instrument that will serve as a reference for drawing up the scientific and technical research plans of the different Public Administrations, and for their articulation with the research policies of the European Union and International Organisations.

Thus, the Strategy is an umbrella for both the State R&D&I Plans and the regional plans of the Autonomous Regions, meaning that it is necessary to develop the EECTI's governance and monitoring and evaluation system to facilitate sectoral and territorial coordination with the different ministries and the Autonomous Regions, respectively. Nevertheless, the EECTI Monitoring Committee must have the following composition:

Three representatives of the MCIN (Ministry of Science and Innovation) and one representative of MUNI (Ministry of Universities), excluding the chair and vice-chair.
Six representatives from the rest of the ministerial departments representing the six strategic lines of national R&D&I. To be determined by the Council of Ministers.
Four representatives of the Autonomous Regions. To be determined in the CPCTI (Council for Science, Technology and Innovation Policy)
Six scientists, technologists or innovators of recognised prestige representing the six strategic lines of national R&D&I. To be appointed by the General Secretariat for Research at the proposal of the CACTI (Science, Technology and Innovation Advisory Council)
Two representatives of society, two trade union representatives and two representatives of the business sphere, reflecting the demands of citizens, consumers and non-profit organisations. To be appointed by the General Secretariat for Research at the proposal of the CACTI.
A representative of the State Investigation Agency (AEI).
A representative of the Centre for the Development of Industrial Technology (CDTI).
A representative of the Instituto de Salud Carlos III (ISCIII).
A representative of the Spanish Foundation for Science and Technology (FECYT).

The EECTI is being implemented in two phases:

- In the first phase (2021-2023) efforts are being focused on guaranteeing the strengths of the system, reinforcing current programming, infrastructures and human resources.
- The second phase (2024-2027) will place R&D&I among the fundamental pillars of Spain and consolidate its value as a tool for the development of a knowledge-based economy.

The Strategy's main objectives are to strengthen public-private collaboration, promote knowledge transfer, improve the situation of research personnel and institutions, enhance Spain's capacity to attract, recover and retain talent and guarantee the application of the principle of real equality between women and men in R&D and innovation

In addition, at the national level, there are **sectoral strategies**, where R&D&I plays a fundamental role, such as the Spanish Strategy for R&D&I in Artificial Intelligence; the National Connected Industry Strategy; Defence Technology and Innovation Strategy; Digitisation Strategy for the Agri-Food and Forestry Sector and the Rural Environment; or strategic framework in SME policy, among others, which establish priorities to be developed in initiatives and activities defined and financed through the State Plans for Scientific and Technical Research and Innovation (PEICTI).

Finally, it has also been adopted the Pact for Science and Innovation, which is a document signed by organisations representing science, academia, business, and labour. This document includes a series of specific commitments regarding the sustainable increase of resources, the improvement of the conditions of scientific and technical personnel and the reinforcement of the autonomy and coordination of R&D&I funding entities.

5.3.2. Research, development & innovation SYSTEM

In Spain there are various institutions and public bodies responsible for supporting and promoting Spanish companies. These institutions belong to both the central State Administration and the Autonomous Communities

At the national level, business policies and strategies are planned and developed through the General Secretariat for Industry and Small and Medium-Sized Enterprises of the Ministry of Industry, Trade and Tourism, whose management body is the Directorate-General for Industry and Small and Medium-Sized Enterprises.

This body has adopted the **SME Strategic Framework**, which is an instrument at the service of SMEs that defines the political framework of action for Spanish public administrations in the field of small and medium-sized enterprises in the long term, comprising a set of recommendations organised into seven levers or areas of action that are considered strategic in any policy that has SMEs at its centre:

- entrepreneurship,
- business management and talent,
- regulatory framework,

- financing,
- innovation and digitalisation,
- sustainability and
- internationalisation.

All of this, in coordination with the different plans and strategies, whether sectoral or of a more cross-cutting nature, of both the General State Administration and the Autonomous Communities and Local Bodies.

In addition, there are advisory bodies, such as the State Council for SMEs (attached to the Ministry of Industry, Trade and Tourism, through the General Secretariat for Industry and Small and Medium-Sized Enterprises), whose function is to advise on issues that have an impact on SMEs, promoting their creation, growth, and development of competitive advantages.

At the Spanish level, we can find the Centre for the Development of Industrial Technology (CDTI), which is a Public Business Entity, answering to the Ministry of Science and Innovation, which fosters **the technological development and innovation of Spanish companies**. It is the entity that channels the funding and support applications for national and international R&D&i projects of Spanish companies.

The CDTI thus seeks to contribute to improving the technological level of the Spanish companies by means of implementing the following activities:

- Financial and economic-technical assessment of R&D projects implemented by companies.
- Managing and fostering Spanish participation in international technological cooperation programmes.
- Fostering international business technology transfer and support services for technological innovation.
- Supporting the setting up and consolidating technological companies.

Finally, other actors that play a crucial role at supporting SMEs and fostering their innovation strategies are the Chambers of Commerce. Concretely, the Spanish Chamber of Commerce -which is a public law corporation, with consultative and collaborative functions, whose purpose is to represent, promote and defend the general interests of Spanish companies- promoted the programme “Apoyo al emprendedor España” (Support for Entrepreneurship Spain) that, among others, aims at providing financial support for boosting innovation.

Supporting innovation through clusters in Spain

Clusters in Spain play a fundamental role in the development of business innovation, especially among SMEs. Aware of it, the Ministry of Industry, Trade and Tourism promoted in 2006 the “Agrupación Empresarial Innovadora” (Innovative Business Association- AEI), which is, on one hand, a distinctive to clusters that have a high innovative potential, and, on the other hand, grants SMEs members of theses clusters access to direct funding. Thus, the final objective of the AEI programme is to improve the competitiveness of SMEs through calls for proposals to support their innovative and business competitiveness strategies.

The Ministry of Industry has awarded the status of AEI to 99 Innovative clusters all over Spain, with Catalonia being the most represented with 24 clusters AEI:

CCAA	AEI	Entities	SMEs	Research centres	Employees
Andalucía	6	994	860	47	325.508
Aragón	12	797	578	51	334.274
Asturias, Principado de	6	436	361	29	156.243
Balears, Illes	1	60	45	2	445.414
Canarias	1	105	98	2	4.263
Cantabria	1	17	11	2	5.898
Castilla y León	6	426	326	61	205.008
Cataluña	24	3.050	2.516	224	967.326
Comunitat Valenciana	8	733	640	37	128.844
Galicia	6	615	492	29	240.941
Madrid, Comunidad de	9	887	679	69	482.231
Murcia, Región de	1	46	46	3	1.847
Navarra, Comunidad Foral de	6	467	387	39	96.838
País Vasco	8	1.219	1.018	68	332.343
Rioja, La	4	324	287	10	27.587
TOTAL	**99**	**10.176**	**8.344**	**673**	**3.754.565**

Table no. 2. Innovative cluster by Autonomous Communities (iPyme).

Those 99 clusters employ two million people and include 10.174 companies, 80% of which are SMEs.

The sectors represented by the AEIs are:

Sector	AEI	Sector	AEI
Aeronautics	3	Materials	8
Agri-food	12	Media	2
Automotive	7	Environment and Energy	14
Biotechnology and health	7	Naval	2
Sports	1	Textile and footwear	4
Railway	1	ICT	15
Habitat	6	Tourism	4
Childhood and toys	2	Machinery and Industrial Technology	8
Logistics	3		

Table no. 3. Clusters AEI by sector (iPyme)

5.3.3. POLICY & STRATEGIES boosting research, development & innovation

AT THE NATIONAL LEVEL, the Spanish **Strategy for Science, Technology and Innovation** (EECTI) was born "top-down" through the governance established in Law 14/2011, of 1 June, on Science, Technology and Innovation (LCTI) but also "bottom-up" through the constitution of interest groups that respond to a quadruple helix model (Companies, Research and Public Administration, Civil Society and Innovation Users).

The EECTI 2021-2027, promoted by the Ministry of Science and Innovation, is the multiannual reference framework for achieving a set of general objectives, shared by all the Public Administrations with responsibilities in promoting scientific, technical and innovation research, and, together with the State Plans for Scientific, Technical Research and Innovation, is configured as the **State Smart *Specialisation Strategy*** S3. This provides an instrument that will serve as a reference for drawing up the scientific and technical research plans of the different Public Administrations, and for their articulation with the research policies of the European Union and International Organisations.

The Strategy's main objectives are to strengthen public-private collaboration, promote knowledge transfer, improve the situation of research personnel and institutions, enhance Spain's capacity to attract, recover and retain talent and guarantee the application of the principle of real equality between women and men in R&D and innovation.

In addition, at the national level, there are **sectoral strategies**, where R&D&I plays a fundamental role, such as the Spanish Strategy for R&D&I in Artificial Intelligence; the National Connected Industry Strategy; Defence Technology and Innovation Strategy; Digitisation Strategy for the Agri-Food and Forestry Sector and the Rural Environment; or strategic framework in SME policy, among others, which establish priorities to be developed in initiatives and activities defined and financed through the State Plans for Scientific and Technical Research and Innovation (PEICTI).

Finally, it has also been adopted the **Pact for Science and Innovation,** which is a document signed by organisations representing science, academia, business, and labour. This document includes a series of specific commitments regarding the sustainable increase of resources, the improvement of the conditions of scientific and technical personnel and the reinforcement of the autonomy and coordination of R&D&I funding entities.

AT THE REGIONAL LEVEL, Catalonia bases its strategic programming on European strategies, i.e., it takes as a reference the 2030 Agenda, the European Pact, the Digital Strategy and the Industrial Strategy. Thus, in Catalonia we find the following Strategies and Agendas:

- Smart Catalonia strategy. Smart Catalonia is the strategy of the Government of Catalonia that, in line with the Europe 2020 strategy of the European Commission, extends the Smart City concept on a national level to undertake a programme that integrates and coordinates local and multi-region initiatives in support of businesses and ongoing Smart initiatives throughout the territory.

  Smart Catalonia aims to make Catalonia an international "Smart Country" of reference, using digital information and technology to bring innovation to public services, drive economic growth and promote a smarter, more sustainable and more inclusive society.

- Research and innovation strategy for smart specialization in Catalonia (RIS3CAT). Further information can be found below.

- Eco-design Strategy for a circular and eco-innovative economy. The Catalan Ecodesign Strategy is one of the main instruments of the Generalitat de Catalunya that, within the framework of other European and Catalan strategies, aims to promote the transition towards a circular economy. This strategy is formed by 43 actions.

- Rural agenda of Catalonia. The Rural Agenda is a key element for planning Catalonia's territorial balance and cohesion policies. The Rural Agenda of Catalonia has been drafted following the frame of the European Parliament's initiative to elaborate a European Rural Agenda that promotes socio-economic development, economic growth and diversification, social welfare, protection of nature and cooperation and interconnection with urban areas.

- Agenda of towns and cities of Catalonia 2050.Catalonia's urban agenda provides support to regions and municipalities with vulnerabilities towards climate crises. The agenda is based on the idea that the future of cities depends on economic, social, and environmental resilience. The plan includes a multilevel roadmap, with actions designed for different administrations and the economic and social stakeholders, in order to deal with the ecological transition and digitalization and generate opportunities across the country with the horizon of 2050.

Local authorities also have their own local development strategies. Barcelona includes the integrated Urban Development Strategy and Barcelona Metropolitan Strategic Plan.

The **RIS3CAT 2030**, approved by the government agreement on the 29 th of November 2022, is the document that contains the Catalan strategy for smart specialization, which focuses on shared agendas, research and innovation as the main drivers to guide Catalonia towards a greener, digital, resilient and fairer socio-economic model.

RIS3CAT 2030 prioritises **transformative and responsible research and innovation**, the development of enabling technologies, the **creation of new digital and technology-based industry** and the transformation of goods and services delivery systems through **shared agendas**. Social innovation in the broadest sense has, therefore, a key role.

In this framework, RIS3CAT 2030 promotes:

- A sustainable, fair, equitable and healthy food system.
- An emission-neutral and environmentally friendly energy and resource system
- A sustainable mobility and logistics system
- A universal, sustainable and resilient health and social care system
- A reflective, proactive, inclusive and responsive education and knowledge generation system
- A sustainable and competitive industrial system
- A cultural system that integrates people, territory and history

Focusing on the technologies, these have been redefined considering the cross-cutting enabling technologies of the Horizon Europe programme and the technological trends and developments of the last few years:

- Artificial intelligence]
- Cybersecurity, connectivity and blockchain
- Microelectronics and nanoelectronics, photonics and quantum technologies
- Advanced and sustainable materials
- Biotechnology
- Advanced digital manufacturing

The RIS3CAT 2030 also promotes instruments to support research and innovation and improve scientific and technological infrastructures that strengthen the business ecosystem and competitiveness, accelerate digital and green transitions in all areas of society and contribute to reducing social inequalities.

Governance system

The RIS3CAT 2030 governance system is coordinated by the Secretariat for Economic Affairs and European Funds of the Catalan Government's Department of Economy and Finance. The governance is organised through intermediaries:

- The Interdepartmental Commission for Economic Recovery and Governance of the NextGeneration EU Funds.
- The Directorate General for European Funds
- The Opportunity Discovery Mechanism

The Secretariat for Economic Affairs and European Funds, which plays a central role in all governance bodies, ensures the necessary coordination to prioritise the financing of strategic initiatives and actions, maximise the attraction of European funds in Catalonia and increase the participation of the actors of the Catalan research and innovation system in European and international networks and initiatives.

Interdepartmental Commission for Economic Recovery and Governance of the Next Generation EU Funds:

Created by government agreement on 13 July 2021, its main function is to plan, prioritise and monitor projects financed with Next Generation EU funds. The presidency of the Commission is held by the President of the Generalitat de Catalunya and the vice-presidency by the Minister of Economy and Finance.

Directorate General for European Funds:

The Directorate General for European Funds, attached to the Secretariat for Economic Affairs and European Funds, programmes, coordinates, and approves the actions of the Government of Catalonia financed with the FEDER Operational Programme for Catalonia 2021-2027 and promotes and coordinates the actions financed with the Recovery and Resilience Mechanism.

The Opportunity Discovery Mechanism:

The Opportunity Discovery Mechanism (MDO) is a response to the requirement, established by Regulation (EU) 2021/1060, that all RIS3s have a "business opportunity discovery process" that promotes cooperation between the parties involved in the strategy.

The MDO promotes that the relevant actors of the system (administrations, universities, research and technology centres, companies and civil society entities and associations) are actively involved in shared agendas and in the processes of opportunity detection, definition of priorities, implementation of initiatives and projects and monitoring.

5.3.4. PROGRMMES boosting research, development & innovation (including regioal level)

Support Program Science and Innovation Missions -CDTI

As it has been mentioned, CDTI is the main responsible for the State Program to Catalyse Innovation and Business Leadership, which includes the State Public-Private Collaboration Subprogram.

This subprogram includes, among other actions, Science and Innovation Missions, which are pre-competitive research projects led by companies that pursue relevant research that proposes solutions to cross-cutting and strategic challenges of Spanish society, improve the knowledge and technology base on which Spanish companies rely to compete, while stimulating public-private cooperation.

The Science and Innovation Missions program is fully aligned with the Spain 2050 initiative, which lays the foundations and proposals for a Long-Term National Strategy, anticipating the main challenges and problems that Spain must face in the next 30 years. The missions selected in this call address relevant aspects of two of the nine challenges set out in Spain 2050: the first “To be more productive in order to grow better” and the fourth “To become a carbon neutral, sustainable and climate change resilient society”.

Likewise, the call for Science and Innovation Missions 2022 is included among the actions foreseen in the National Plan for Recovery, Transformation and Resilience, which outlines the roadmap for the modernization of the Spanish economy, the recovery of economic growth and job creation, for the solid, inclusive and resilient economic reconstruction after the COVID crises, and to respond to the challenges of the next decade.

Support Program Agrupación Empresarial Innovadora (AEI)

At the national level, the support program for Innovative Business Groups (AEI) is aimed at improving the competitiveness of small and medium-sized enterprises by supporting, with publics funds, the companies’ innovation strategies and business competitiveness. As it was previously mentioned, there are 99 clusters in Spain with this distinctive.

Since the program’s release, an annual (ordinary) call for proposals has been launched. However, since the Government adopted the Transformation and Resilience Plan to channel the funds earmarked by Europe to repair the damage caused by the COVID-19 crisis, two annual calls have been issued: the ordinary and the extraordinary one

The ordinary call has a budget of 8M€, while the extraordinary call in 2021 had a budget of 23M€, in 2022 a budget of 50M€ and in 2023 will have a budget of 53M€. In 2021, under the extraordinary call, 221 projects were founded, while in 2022 319 projects were founded.
In 2021 extraordinary call, the sectors more benefited were from the ICT sector (26 projects) and environment and energy (27 projects), while in 2022 the sectors more benefited were from ICT (56 projects) and Agrifood (45 projects).

Support Program Catalonia Clusters

At the Catalan level, ACCIÓ launched in 2013 the programme "Catalonia Clusters" to achieve excellence of Catalan clusters. This programme was born with three main objectives:

· To boost the competitiveness of the Catalan economy through clusters.
· To systematise the actions of the Generalitat in the field of cluster policy.
· To contribute to the rationalisation of the existing map of clusters in Catalonia.

It is a voluntary programme open to all clusters that have a scope of action at least throughout Catalonia and that meet certain criteria. The participation in the programme basically allows access to certain specialised services offered by ACCIÓ, such as:

· Strategic orientation.
· Advice on governance.
· Networking.
· Specialised training.
· Promotion of inter-cluster dynamics.
· International benchmarking.
· Advice on European programmes for clusters.
· Access to specialised infrastructures, such as the Catalonia Clusters Space.

Currently, ACCIÓ has accredited 26 clusters that bring together more than 2,600 companies and associated agents, with a turnover of more than 70,000 million euros.
Every year, ACCIÓ evaluates its cluster policy. For 2021 it has been stated that every cluster has an average of 112 associates, of which 69% are SMEs. The average income is 378.260€ per cluster and the priority and strategic activities are focused on collaborative innovation, internationalization and new services.

Under this programme, ACCIÓ launches every year one call focused on boosting innovation for SMEs, named IRC-Grants for Competitive Reinforcement Initiatives.

2014-2020

	Name of the program	Measure/ Call	Target beneficiaries	(N) National/ (R)Regional/ (E) European	(I) Individual application or (C)Collaborative
1	**Support Program Science and Innovation Missions- CDTI**	Missions	Enterprises (Grouping constituted by between 3 and 8 partners, of which at least one must be an SME and led by a Large Company) & SMEs (Grouping constituted by between 3 and 6 partners, all of them SMEs, and led by a medium-sized company)	N	C
2	**CERVERA-CDTI**	Cervera	Research Centres and SMES	N	I
3	**CIEN program-CDTI**	CIEN-National Business Research Consortia	Large companies and SMES (required to subcontract Research centre)	N	C
4	**AEI**	AEI	SMEs	N	C
5	**Catalonia Clusters**	IRC- Grantsfor Competitive Reinforcement Initiatives	SMEs	R	C
6	**N/A**	ACCIÓ coupons for innovation	SMEs	R	I

Forthcoming 2021-2027

	Name of the program	Measure/ Call	Target beneficiaries	(N) National/ (R)Regional/ (E) European	(I) Individual application or (C)Collaborative
1	**Support Program Science and Innovation Missions- CDTI**	Missions	Enterprises & SMEs	N	C
2	**CERVERA-CDTI**	Cervera	Research Centres and SMES	N	I
3	**CIEN program-CDTI**	CIEN-National Business Research Consortia	Large companies and SMES (required to subcontract Research centre)	N	C
4	**State Program to Promote Scientific-Technical Research and its Transfer**	Technology and Innovation Platforms	Universities, public research centres and companies, Associations.	N	C
5	**AEI**	AEI	SMEs	N	C
6	**Catalonia Clusters**	IRC- Grantsfor Competitive Reinforcement Initiatives	SMEs	R	C
7	**N/A**	ACCIÓ coupons for innovation	SMEs	R	I
8	**Digital innovation hub support program (PADIH)**	February 2023	SMEs	N	I

5.4. ESTONIA - national innovation framework

5.4.1. Research, development & innovation GOVERNANCE/SYSTEM

The responsibility for implementation of the strategy is shared equally between the Ministry Economic Affairs and Communications and the Ministry of Education and Research.

The national research and innovation policy is guided by the Research and Development Council, comprising four ministers and eleven members appointed by the government. In addition to advising the Government on R&D related matters, the Council also submits an annual report on upcoming R&D objectives. The Research and Development Council has a say in the Government's draft state budget, relating to R&D financing.

The overall R&D sector is regulated by the Organisation of Research and Development Act. The Act outlines, details, regulates and enforces everything R&D related in the country. From organisation of R&D institutions and state involvement, to financing and staff requirements.

In January 2021, The Estonian Reform Party and the Estonian Centre Party formed a government and signed an agreement to maintain the progressive nature of Estonia, aiming to continually develop the state in all fields and regions. This included some of the following relevant RDI points:

- „We will allocate at least 1% of the GDP to research and development. We will prioritise investments made into research and development by the private sector."
- „We will create a financial facility of the future to accelerate the climate and digital transitions, resources from which will be directed into research, development, and establishing a knowledge-based economy."
- „We will support companies that can contribute to creating and implementing science-based and innovative technologies and need the support of the state in decreasing investment risks."
- „We will implement an applied research program to support enterprises in establishing and funding applied research and finding suitable partners."
- „We will implement a support measure for start-up companies and find a solution for the shortage of specialists, making Estonia an attractive country for creating and testing innovative solutions."

Startup Estonia is also a leading figure in supporting and uplifting startups and innovation. The head of Startup Estonia, Eve Peeterson spoke in an interview with Invest Estonia, that „Estonia is a flagship tax-competitive country in the whole OECD. It can boast of the simplest and most transparent taxation regime. We are also talking 0% income tax on retained and reinvested profits, clear stock options regulation, plus double taxation treaties on file with at least 60 countries."

5.4.2. POLICY & STRATEGIES boosting research, development & innovation

The priorities of Estonian RDI are set in the E**stonian Research and Development, Innovation and Entrepreneurship Strategy 2021-2035**, which connects science more closely with the society and economy and sets common goals and directions till 2035. There are four general indicators for measuring the success of the strategy:

Indicator	Unit	Baseline level	Reference year	Target level 2035
R&D funding as a share of GDP	%	0.75	2019	≥1
Private sector R&D expenditure as a share of GDP	%	0.86	2019	2
Nominal labour productivity compared to the EU 27 average	%	78.7	2019	110
Ranking in the European Innovation Scoreboard		Strong innovator	2020	Innovation leader

The strategy focuses on **three axes: knowledge transfer, research system and business environment.** Each of them having 2-3 key indicators with target values.

To promote knowledge transfer, Estonia will focus on the following lines of action:

- increasing the RDI intensity and knowledge transfer capacity of enterprises,
- increasing the knowledge transfer capacity of research institutions and higher education
- institutions,
- strengthening the societal and economic impact of R&D and innovation.

To ensure basic capabilities of the research system, Estonia will focus on the following lines of action:

- maintaining a high level of research excellence, enabling research institutions and the research community to increase their capabilities,
- ensuring the availability and quality of research infrastructures and supporting the shared use of infrastructures,
- providing opportunities for international research cooperation.

To create supportive business environment, Estonian will focus on the following lines of action:

- developing a competitive and smart business and consumer environment,
- increasing the capacity for higher added value and exports,
- fostering technology- and development-intensive investments.

5.4.3. PROGRMMES boosting research, development & innovation

2014-2020

	Name of the program	Measure/ Call	Target beneficiaries	(N) National/ (R)Regional/ (E) European	I) Individual application or (C)Collaborative
1	Applied research programme	Aims to support the development of innovative products and services through financial backing.	SMEs	National	Individual application
2	Innovation and development voucher grants	Aims to raise the competitiveness of Estonian SMEs through offering innovative products and services with higher additional value, as well as creating new technologies	SMEs	National	Individual application
3	Estonian Research Council grants	The grant is aimed at supporting high-quality R&D projects and the accompanying research activities.	SMEs	National	Individual application

Forthcoming 2021-2027

	Name of the program	Measure/ Call	Target beneficiaries	(N) National/ (R)Regional/ (E) European	I) Individual application or (C)Collaborative
1	Development cooperation consulting for product and service development	- Aid businesses in becoming leading innovators in their sector. -Aid businesses in broadening their scope, finding new networks and development partners. -Aid businesses in developing their product, service and/or project and finding funding.	SMEs	National	Individual application
2	Diagnostics of innovation capacitys	Improving business' innovation capacity by rating and mapping their strengths and weaknesses, with a thorough report on what to improve	SMEs	National	Individual application
3	Applied research programme	Aims to support the development of innovative products and services through financial backing.	SMEs	National	Individual application
4	Estonian Research Council grants	The grant is aimed at supporting high-quality R&D projects and the accompanying research activities	SMEs	National	Individual application

5.5. DENMARK - national & regional innovation framework

Denmark is divided into 5 regions at NUTS2 level, which have no legislative status and do not collect taxes. Danish Regions is run by a board of elected regional politicians from the five regions and reflects the political affinities of the 205 members of the five regional councils. The main task of the regions is to manage and administer the Danish healthcare system. And in addition, they are also for tasks in the areas of regional development, education and culture, nature and the environment and public transport[66].

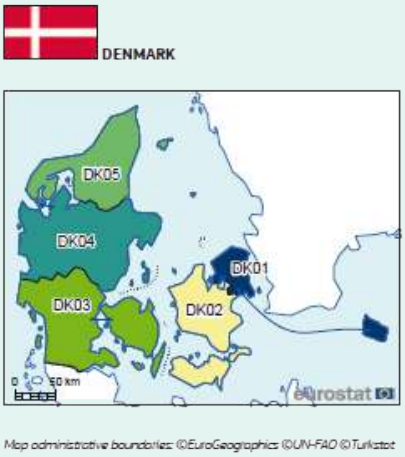


Figure no. 11. - Map of Nuts regions of Denmark

Denmark is an Innovation Leader with performance at 134.8% of the EU average according to the European Innovation Scoreboard 2022 (EIS). Since year 2015 the performance has increased (by 11.3%-points) at a rate higher than that of the EU (9.9%-points)[67] , with a flat development between 2015-2019 and with an increased performance starting from 2020.



From the 5 regions of Denmark, only the Capital Region (DK01) is an Innovation Leader+, and the 4th most innovative of all regions in the EU in 2021. Overall, almost all regions in Denmark are above average of the EIS[68].

66. Danish Regions
67. EIS Danish country profile
68. RIS 2021 report page 23

NUTS	Region	RII	Rank	Group	Change
DK01	**Hovedstaden**	149.0	4	Leader +	-4.0
DK02	Sjælland	99.1	107	Moderate +	-14.4
DK03	Syddanmark	109.0	78	Strong	-2.0
DK04	Midtjylland	132.2	24	Leader -	6.1
DK05	Nordjylland	116.9	56	Strong +	5.3

The total investments for R&D in Denmark in 2021 are calculated at DKK 73.3 billion, which corresponds to 2.9% of the GDP measured in current prices. Since 2015, the share of R&D expenditure in GDP has been close to 3%. The distribution between the share of the business community and the public sector was stable until 2017, after which the public sector's share has been slightly increasing until 2021.

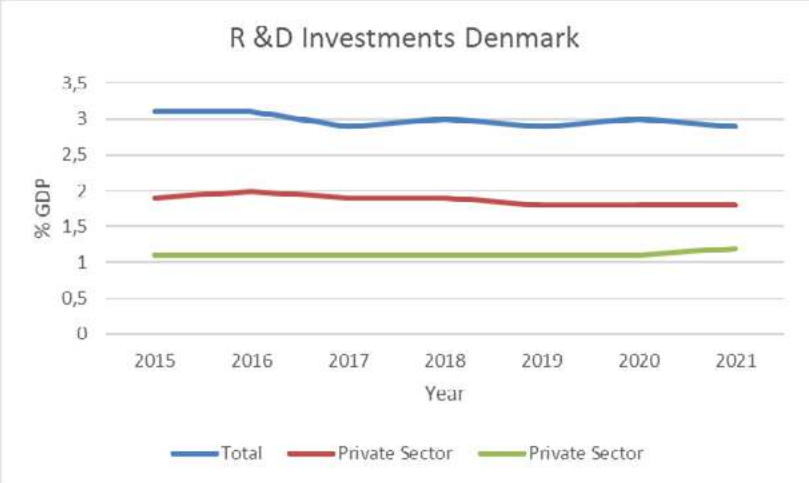


Figure no. 12. Statistic Denmark - table CFABNP

In 2021, the business community contributed DKK 44.6 billion and the public sector with DKK 28.7 billion. The total R&D expenses have increased by DKK 4.8 billion DKK compared to 2020.

In 2021, a total of 64,700 full-time equivalents were used for R&D in business and public institutions. With 46,300 man-years, researchers accounted for 72% of the total R&D man-years[69].

69. Statistic Denmark - Research and development 2021

5.5.1. Danish National Innovation Framework

The Danish National Innovation Framework is three fold:

A. Business development & support system – providing company support
B. The Ministry of Foreign Affairs - internationalization and foreign investment
C. Research & development support system – of Denmark

A. Business development & support system

Ministry of Industry, Business and Financial Affairs - The Ministry is responsible for several policy areas which are important for the general business environment, including business regulation, Intellectual Property Rights, competition and consumer policy, the financial sector and shipping.

The main mission of the Ministry of Industry, Business and Financial Affairs is to create competitive and innovative conditions for growth for business within several Danish positions of strength – life science, welfare technology, tourism, the creative industries, the defense industry and BioSolutions[70].

Danish Business Authority - The Danish Business Authority is the link between the highest political system for the business promotion system and companies in Denmark. They have a role which is split in two. One role is an authority task with supervision on rules and regulations in the business area. And the role second is to support the execution of Denmark's innovation strategies[71].

Danish Board of Business Development, established from 2019, is an initiative of the Danish government to unite the various efforts within the business promotion. It is subordinated to the Danish Business Authority and the Minister of industry, Business and Financial Affairs. Business policies and strategies are developed, planned, and executed through the ***Danish Board of Business Development***. The Danish Board of Business Development are The board members are represented by a wide range of representatives from the private business community, the trade union movement, municipalities, universities and the Ministry of industry, Business and Financial Affairs. The Board has the task of ensuring that the decentralized business initiatives are coherent across all Denmark in different sectors, regions and municipalities. The main goal in the efforts of business support services is to concentrate the needs of enterprises to increase business growth and innovation[72].

70. Ministry of Industry, Business and Financial Affairs
71. Danish Business Authority
72. Danish Board of Business Development

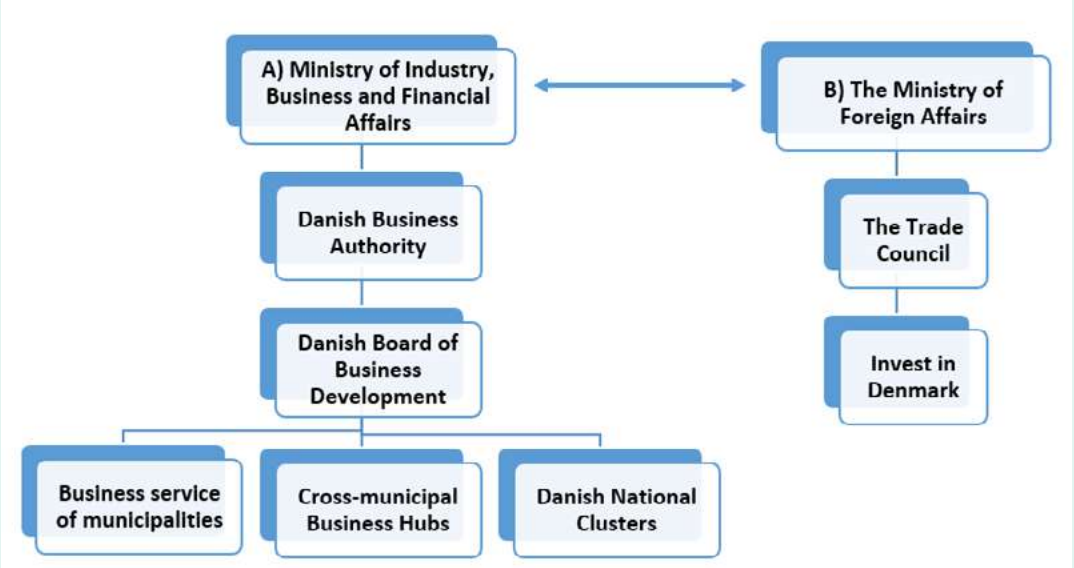


Figure no. 13. Structure of Danish National Innovation Framework

Business development support for companies is decentralized to **municipalities** and **Regional Business Development Business Hubs**. Together with national clusters, educational institutions, and GTS institutes, support the execution of Denmark's innovation strategies and companies in their development projects. The purpose is to support business development and innovation as close to the companies possible.[73] [74]

Business service of municipalities

All of Denmark's 96 municipalities have a business service, which helps companies with local, national, and internationally related questions and issues. The local business service in the municipalities has broad networks and many areas of cooperation in addition to an entire Danish business promotion system. Vejle Business Support facilitates e.g., local business networks, matchmaking companies and universities into projects.

The interest of Municipalities in national and EU relations are taken care of by the interest association Local Government Denmark (KL)[75] . All 96 Danish municipalities are members of KL. KL is the negotiator in the development and in national agreements on the municipality's tasks and influence on the Danish business promotion system.

Cross-municipal Business Hubs

Denmark has 6 **Cross-municipal Business Hubs** with one attached to each region. Region Southern Denmark has two business hubs, one located on Funen and another in the southern part of Jutland. The business houses' task is to support Danish entrepreneurs, startups and established companies with networks and advice. They offer specialized targeted 1:1 consulting and inspiration for growth and development for all types of companies and entrepreneurs. The business houses have competences

73. Danish Board of Business Development
74. Danish Board of Business Development, Strategy Denmark 2020-2023
75. Local Government Denmark (KL)

in the areas of business plans, strategies, HR, sales, capital, budgets and financing, export and internationalization as well as digitization, and green business development. The purpose is to inspire on identified growth and development potentials[76].

Denmark's national clusters

Denmark has 13 recognized national clusters[77] . The cluster initiative is rooted in private cluster organizations that works towards strengthening innovation via cooperation between companies and with knowledge, technology and education environments, authorities, customers and users, entrepreneur environments and investors. The work is based on the needs of the companies.

They play an important role in the national strategy for building bridges between companies, knowledge institutions, universities, and GTS institutes in the turnover of companies' good ideas for business. The national clusters are Denmark's most promising business and technology areas, which Denmark has strong competencies in companies, public business promotion institutions and R & D System. The areas are embedded the Danish Smart Specialization Strategies, S3 strategies 2014-2020[78] , that have been reconfirmed in 2022 with a refinancing for the years 2023 and 2024[79] .

The 13 national clusters are nationally funded by the Danish Board of Business Development and Ministry of Higher Education and Science and by private funded contributions from the cluster members.

76. Cross-municipal Business Hubs in Danish Regions
77. Denmark's 13 national clusters
78. S3 Priorities 2014-2020
79. Danish Board of Business Development

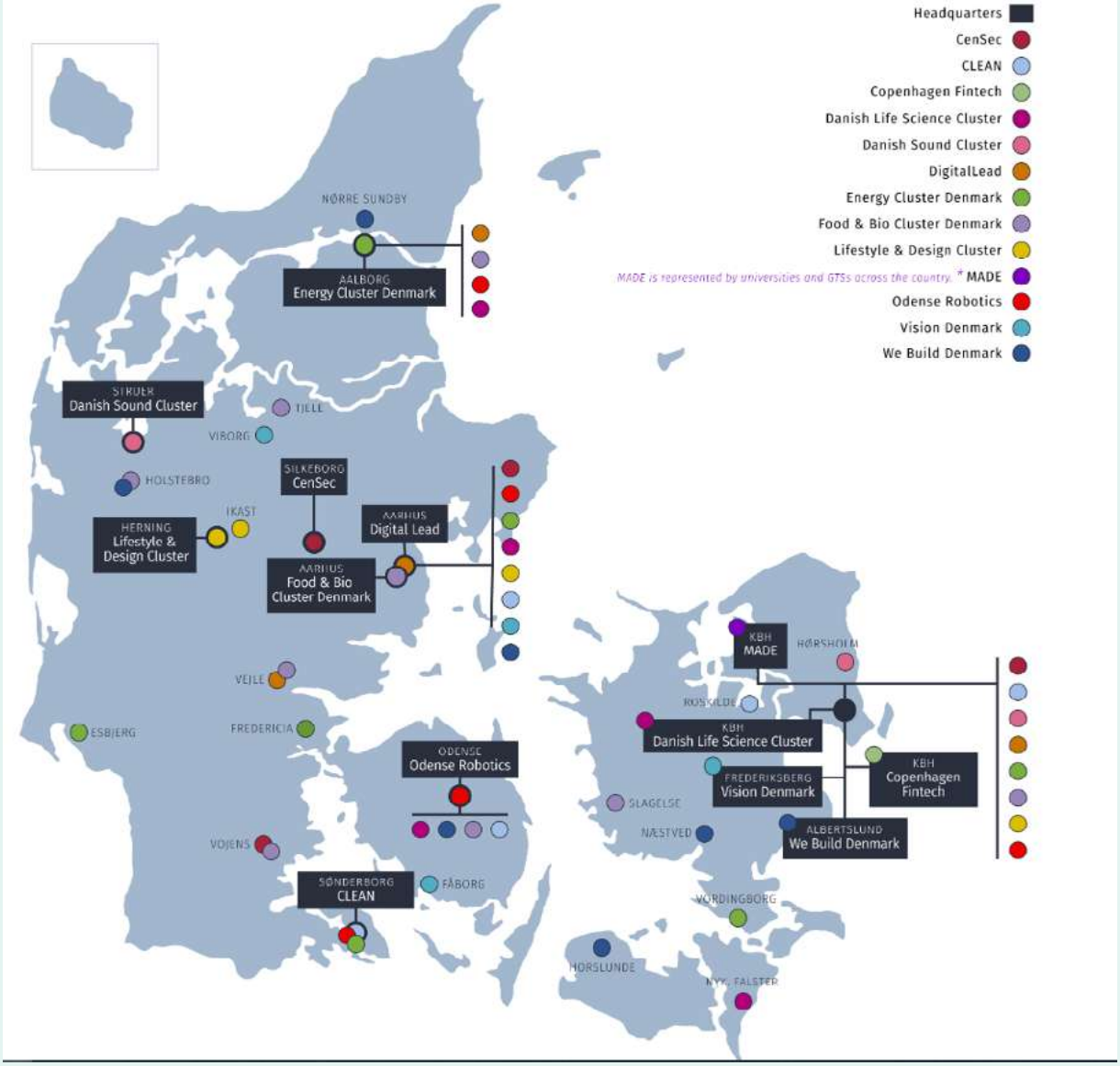


Figure no. 14. Map of Danish national clusters

Cluster Excellence Denmark[80] functions as a support and service organization for Denmark's national clusters. In the foundation and further development of the clusters has the organization a facilitator role between the Agency for Higher Education and Natural Sciences, the Agency for Business Development, which co-finances the national clusters and the work of Cluster Excellence Denmark.

Cluster Excellence Denmark supports the national clusters with consultant help, guides and facilitates knowledge sharing groups across the Danish cluster organizations. As well as the organization supporting the clusters with cluster matchmaking with international partners.

Denmark has various clusters that cover and support the BOOST project's four main areas: ICT & Digitalization, Health & Wellbeing and Cleantech.

80. Cluster Excellence Denmark

Industry 4.0	Cleantech
● Odense Robotics ● MADE (Advanced Production)	● Clean (Environmental technology) ● Energy Cluster Denmark
Health & Wellbeing	**ICT and Digitalization**
● Danish Life Science Cluster	● Digital Lead

In addition, Denmark has other clusters, which have complementary strengths and synergies between the different clusters for boosting innovation. For instance, the cluster for textile and in succeeding in a green transition of clothing developing and production. Or construction and building for bringing down waste from building materials and energy consumption in buildings.

Textile, Furniture and Design	Construction & Building
● Danish Lifestyle And Design Cluster	● We Build Denmark
Defense, space and security	**Games, movies, animation and XR**
● CenSec	● Vision Denmark
Sound Industry	**Finance**
● Danish Sound Cluster	● Copenhagen Fintech
Food Industry	
● Food & Bio Cluster Denmark	

Public & Private support framework statistic

In Denmark, there are various networks, NGOs and also some private clusters besides the national clusters in the sectors ICT, green transition, Industry 4.0 and healthcare. Some of them are Dansk AM Hub, which is a network in the manufacturing industry, Con Tech Lab a network in the Building & Construction Business and CORO Lab is a network for companies in the environmental technology industry. In addition to the national clusters, there is Medicon Valley , which is a private cluster within medicine. The organizations collaborate in the Danish business support system and R & D innovation system in private-private public.

In total, there are 198 organizations in Denmark included in the business support framework, as split in the table below.

Business support framework Denmark	
Type of association	**No of organisations**
Local entry points municipality	96
Regional Entry Points	5
National Clusters	13
Private Hubs	19
Student Entrepreneurship	28
Universities	8
GTS Institutes	7
Science, technology & Development Parks	26
Co-working spaces & hubs	34
Incubators & Accelerators	35
Later Stage Capital	28
Crowd Funding	14
Soft Funding	17
Total	**198**

B. The Ministry of Foreign Affairs

The Ministry of Foreign Affairs'[81] network is for many Danish companies the first entry into export markets. And for foreign companies, an entrance to starting a business in Denmark and access to the Danish business support system and players in innovation R & D.

One of the tasks of the Danish Ministry of Foreign Affairs is the attraction of new companies that want to invest and start new businesses in Denmark . They advise foreign companies on general and sector-specific framework conditions in Denmark. And provides Guidance on setting up a company in Denmark.

The Trade Council is the part of the Ministry of Foreign Affairs that solves tasks for private companies within export, innovation, internationalization and investment promotion. Under The Trade Council, the organization **Invest in Denmark** is Denmark's national investment promotion organization, which works to attract foreign investments and companies to Denmark[82].

81. The Ministry of Foreign Affairs
82. Invest in Denmark

C. Research & Development support system

Denmark's national R & D Framework has the following structure, where all the universities, technology transfer offices, public research foundations and GTS institutes play a significant role in the research and innovation system:

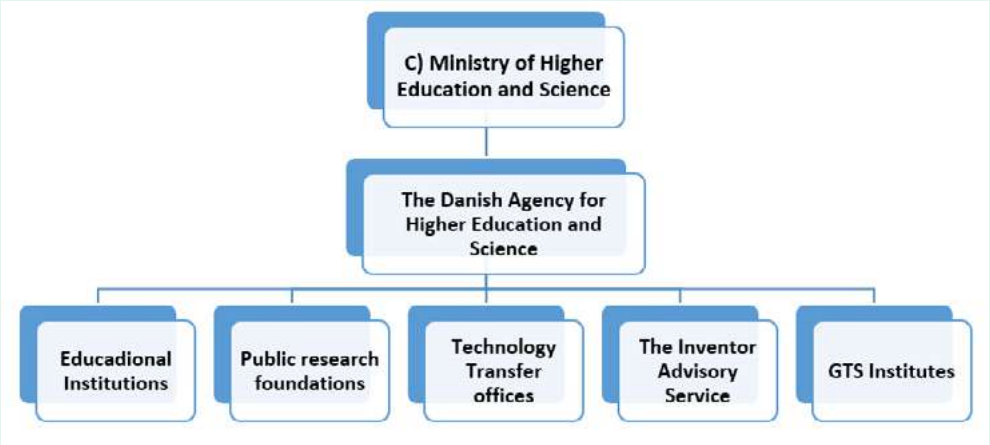


Figure no. 15. : Structure of Danish National R&D Framework, source own development

The Ministry of Higher Education and Science is the highest authority in the Danish educational and research innovation system. It is an important driver as policy maker in development of the education system, aligning strategic research and innovation priorities in funding programs and supporting educational institutions[83]. The ministry serves as a bridge-builder in innovation policy making in cooperation with the Danish government, politicians, public and private organizations.

The Danish Agency for Higher Education and Science[84] is an agency in the Ministry of Higher Education and Science and handles tasks within preparation academic and administrative tasks that support the further development of Danish research, research-based innovation and ongoing quality development in higher education, also drawing on excellent international connections both in research and education.

The Agency holds the main responsibility for institutions within the remit of the Ministry of Higher Education and Science. This responsibility is grounded in an ongoing dialogue and covers the administration and implementation of grants and subsidies to the institutions, as well as other matters. The Agency is responsible as well for the State Educational Grant and Loan Scheme, including the general educational grant and the state adult educational grant. Finally, the Agency is responsible for the Coordinated Admission System and is the Danish Space Authority.

In the Danish Agency for Higher Education and Science, the following staff units support the development of the Danish business support system and innovation and development at national and EU level:

Staffunits in the Danish Agency for Higher Education and Science are:

83. Ministry of Higher Education and Science
84. The Danish Agency for Higher Education and Science

a). Center for Knowledge-based Innovation

The Center for Knowledge-based Innovation[85] is a staff unit in the ministry. The center is responsible for developing and setting the direction for the agency's work with a coherent knowledge-based innovation system.

- Support research and higher education institutions' knowledge transfer and entrepreneurship
- Create synergy between research and the business promotion system with initiatives that connect the innovation actors, which are e.g. national clusters, GTS Institutes, Innovation Centres, universities.
- Cooperation, dialogue and supervision with the approved technological service institutes (GTS) and the new business and innovation clusters
- Cooperation, dialogue and supervision with the Innovation Fund Denmark[86] (IFD)

b). The EuroCenter

The EuroCenter[87] is another staff unit in the agency. The unit handles professional coordination, ministerial service, and policy formulation regarding European research collaboration. For Denmark, the unit is a national office for Horizon 2020 and Horizon Europe. The office has a unit DANRO[88] in Brussels, which contributes with advice and takes care of strategic research policy interests in Brussels on behalf of the Danish Agency for Education and Research.

Tasks:

- The EU's programs on research and innovation, including implementation of the programmes, negotiation of work programmes, contributions to the preparation of future research programmes, etc.
- Information, communication and advisory activities in connection with Danish participation in Horizon 2020 and Horizon Europe, including courses, workshops, webinars and individual advice.
- Further development of the European Research Area and implementation of ERA priorities, including the ERA roadmap.
- Coordination of the EU-DK Support network, which supports Danish participation in EU programmes, and contributes to companies, researchers and relevant public organizations making use of the opportunities for EU funding within research, innovation, business development and entrepreneurship
- Handle relations with and collaborate with the international innovation players, including EUREKA[89] and EIC

85. The Center for Knowledge-based Innovation
86. Innovation Fund Denmark
87. The EuroCenter
88. DANRO
89. EUREKA

Higher education institutions

The Higher education institutions[90] in Denmark are: universities, university colleges, business academies, higher education institutions within the Fine Arts and maritime educational institutions. The different institutions offer educations at several levels: academy short higher educations, bachelor, master and PhD Educations in universities and schools with university level[91] . There are 8 public universities with 149,000 students and 33,396 employees[92] and 3 higher education institutions with a university level in the fields of architecture, design, music, and fine and performing arts.

Technology Transfer Offices (TTO) within universities

There are 5 TTO offices in Denmark; Copenhagen University (KU), Aarhus University (AU), Aalborg University (AAU), Technical University of Denmark (DTU), Southern University of Denmark (SDU).

Since the year 2000 patent-active universities have worked with technology transfer[93] by establishing techtrans units in their organizations. They assist the university's employees with paternalization and commercialization and look after the university's interests when entering into cooperation and rights agreements with external parties. The techtrans units solve similar tasks for affiliated university hospitals[94].

Ownership of university inventions is governed by the Danish Act on Inventions at Public Research Institutions[95] . The law allows the universities to acquire, protect and exploit intellectual property created by their employees in line of duty. There is, to a large extent, freedom of agreement regarding the conclusion of cooperation and rights agreements.

Commercialization statistics of Danish Universities year 2019 -2021[96]:

Measure	2019	2020	2021
Notified inventions	374	339	294
Priority patent application	113	122	104
Patents issued	39	42	37
Licenses, sales & options	180	146	135
Spinout companies	27	27	23
University research agreements private companies	2.019	2.029	1.576
University research agreements public companies	733	1.091	929

90. Study in Denmark
91. Ministry of Higher Education and Science
92. Danish Universities
93. Ministry of Higher Education and Science – Danish report about TTO
94. Ministry of Higher Education and Science – TTO Knowledge Transfer
95. Ministry of Higher Education and Science – Acts Inventions and technology transfer
96. Danish Universities: own production with information from Danish Universities' statistics

Since year 2019 the development in the measures of efforts in the exploiting technologies have had decreases up to 25 % in agreements with private companies, Licenses, sales & options

Public research foundations

Under the ministry there are 3 public research foundations, which support the R & D system with funding.

1. Independent Research Fund Denmark - the main aim is to support and promote researchers' own initiatives and most original ideas and initiatives within Danish research, participating also in several research networks at Nordic, European and global level[97] . The Fund provides advice in all scientific areas for the Danish Minister for Higher Education and Science, the Danish Parliament, and the Government. On annual basis, it awards 400 grants to research projects, in a total amount to over DKK 1 billion[98] . Themes which are funded are; Green research, Green transition, digital technology, clinical and independent research[99].

2. Denmark Innovation Fund[100] was established in 2014 to fund the development of knowledge and high technology, which leads to the strengthening of research and innovative solutions for the benefit of growth and employment in Denmark. The foundation particularly supports solutions to concrete social challenges and increases research and innovation efforts in companies, including SMEs. The fund is looking for projects within mission – driven green research and innovation partnerships, research collaborations at national and international level.

It includes special funding programs focus on supporting the contribution of SMEs to future solutions to the green transition[101] and in investment in knowledge-based development projects in SMEs[102] .

3. Danish National Research Foundation (DNRF)[103] is an independent foundation, established to promote Danish basic research in all subject areas. The foundation distributes DKK 470 million annually. This corresponds to approximately two percent of total public research funds[104] . The primary activities of the foundation are to establish and support research centers of the highest international level. Its flagship program is "The Centers of Excellence program" used to cover all types of research expenses for one centre for up to 10 years. Also, the foundation has launched special programs to promote the internationalization of Danish research[105]: the "Chair Grant", aiming to help Danish universities attract and recruit outstanding researchers from abroad, a program of Pioneer Centers as a strategic basic research initiative, where the centers will operate within the scientific fields of energy/climate and artificial intelligence and will be co-funded by four private Danish foundations[106] .

97. Independent Research Fund Denmark
98. Ministry of Higher Education and Science
99. Independent Research Fund Denmark
100. Innovation Fund Denmark
101. Innovation Fund Denmark - Missionbooster
102. Innovation Fund Denmark-Innobooster
103. Danish National Research Foundation
104. Ministry of Higher Education and Science
105. Objectives of Danish National Research Foundation
106. Pioneer Centre of Danish National Research Foundation

GTS institutes

Denmark has 7 government-approved Research and Technology non-profit Technological Service Institutes, called GTS institutes[107] . Each GTS institute has its own specialty, which is approved by the Ministry of Research. The GTS institutes have specialist knowledge at a university level in their areas of work.

In the innovation ecosystem, the purpose of the Technological Service Institutes is to support Danish business with the development, testing and demonstration of new environmental and energy technology solutions through research and development collaborations and access to test, demonstration, and development facilities on market terms.

The Ministry of Research co-finances specific research and development activities that will lead to the building and development of new technological competences and services, which are expected to be of great importance to Danish companies.

The seven GTS institutes are:

Industry 4.0	Cleantech
● FORCE Technology: technological consulting company specializing in testing technologies within digitization, green transition, health. ● Technological Institute: Research institute with highly specialized Test, demonstration, and development facilities within, Agriculture and bioresources, Energy, Construction and Facilities, Environmental technology and resources, Products and Materials, Food, Agile Production, Big Science.	● DHI – Institute for Water and Environment: Fund-owned, international consultancy and research organization. The aim is to promote knowledge, technological development, and competence-building in the field of water, environment, and health all over the world.
Health & Wellbeing	**ICT and Digitalization**
● Bioneer A/S: research and development partner for biotech and pharmaceutical companies.	● Alexandra Institute A/S: Specialties are IT research, software development, IOT
Fire and Security	**Wetter and Metrology**
● Danish Fire and Security Institute: research company, specialized in fire and security.	● Dansk Fundamental Metrology A/S: Construction and maintenance of the Danish metrological infrastructure and research projects within metrology

107. Danish Association of Research and Technology Organization (GTS Association)

The Inventor Advisory Service

It is a consultancy services for inventors, providing advice for inventors to achieve successful commercialization of inventions, research and other commercially promising ideas to existing companies. The Inventor Advisory Service is a free advisory service based on a very practical 'help-to-self-help' method. The goal is to coach and emp ower the citizen-inventor to become the lead driver of his idea and the commercialization process.

The target group of the consultancy is researchers, students, craftsmen, specialists and others who have made an innovation, have the rights themselves and wish to commercialize via license agreements with existing companies. The consultant can help clarify the potential for an innovation with a view to whether can be carried out technically and an assessment of the commercial value. Helping do design a prototype or other illustrations and evaluating the possibilities for protecting the invention with a patent, design protection, selling the invention in a license agreement[108] .

Regional EU Offices

Denmark has 4 regional EU offices, known as DACOB (Danish Local, Regional and Research Co-Op Brussels)[109] , founded as associations started by the local municipalities, companies, and business organizations from the region they originate. The South Denmark European Office is the partner in the region. The other EU offices are:

- Nord Denmarks EU-Office
- Central Denmark EU Office
- Greater Copenhagen EU Office

The EU offices are a gateway for companies, business organizations, universities to EU collaborations and projects. Their function is to guide organizations on applications, funding, and matchmaking partners for EU projects.

108. The Inventor Advisory Service
109. DACOB

5.5.2. POLICY & STRATEGIES boosting research, development & innovation

Innovation strategic focus

Innovation, entrepreneurship and training of qualified labor are the keys to synergy effects between the areas. SME companies in Denmark often use their network of suppliers, customers, and other collaboration partners in innovation projects, while they collaborate to a lesser extent with knowledge institutions on innovation. For the areas, the following initiatives are generally important driving forces for development and innovation in the areas:

- Access to collaboration on test and demonstration projects
- Access to co-financing for SME companies for hiring private consultant help
- Establish partnerships across value chains in both regional, national, and internal innovation projects in triple or quadruple helix collaborations.
- Building bridges between companies, the business promotion system, knowledge- and educational institutions.
- Support innovation with offers of co-financing from innovation programs

Based on analyzes and dialogues with Danish businesses, knowledge institutions and other players in the business promotion system, the Danish Business Promotion Board has identified the following areas as driving forces for innovation and development across the whole of Denmark[110]:

A. Green transition and circular economy
B. Digitization and automation
C. Internationalization & export

A. Green transition and circular economy

Denmark has strong capabilities, capacities, products in green energy technology and environmental technology. The global demand for existing and new green and circular solutions will grow over the next several years. In 2019, Denmark exported DKK 91 billion in products or services with an environmental or resource-saving purpose. The share corresponds to 7% of the total Danish exports of goods and services in 2019.

Circular economy must be strengthened in all industries and among companies throughout Denmark. In the circular economy, the potential is great in solutions that push the efficiency of resource consumption in new business models. Denmark and other EU countries could benefit from inspiring each other to innovate in the field. With 24,5 % circularity of materials, the Netherlands is a good example of how the circular economy in the EU can succeed[111].

110. Danish Board of Business Development - Strategy 2020-2023
111. The Circularity Gap Report – Netherlands

The keys to innovation and growth in the area are:

- Strengthen competences in the circular economy with competence development courses for companies, e.g., knowledge of new circular business models.
- Strengthen the export of cleantech technologies and environmental technologies in SME companies with access to private consultants in developing export strategies
- Match companies to innovation projects within green transition through national clusters and the regional and local business support.
- Promote digitalization, green transition, and circular economy in innovation projects.

B. Digitization and automation

A continued development of digital solutions and automation of processes are important for strengthening productivity and competitiveness. From an international perspective, Danish companies are far advanced in the use of digital opportunities. Especially on relatively basic digital technologies, e.g., accounting, administration, sales, operation and use of industrial robots. These are untapped potentials in Danish SME companies in the digitization of operations and in innovation collaborations in the business promotion system.

The Danish Business Promotion Board supports the development with initiatives that promote the readiness of SME companies to invest in digitization and automation with:

- Strengthening SMEs use of digital solutions, automation, and new technology
- Innovation with automated solutions within production and service
- Innovation on advanced digital technologies; artificial intelligence and robot technology and new business models.
- Support companies' access to the latest research and innovation projects within digitization and automation

C. Internationalization & export

Denmark is a small domestic market, and therefore increased internationalization in Danish companies and international trade play a decisive role in the companies' competitiveness, productivity and growth.

Danish companies have a strength in the green area and are well positioned to simultaneously contribute to solving global challenges with climate, sustainability and green energy, responsible consumption and production as well as water purification technology and efficient water supply.

The Danish Board of Business Development will improve SMEs' opportunities to increase collaborative relationships within research and development with foreign companies, knowledge and educational institutions or other collaboration partners and thereby give the companies access to international value chains or new knowledge.

Denmark's Business Promotion Board will support a coherent business promotion effort by coordinating with other actors within export promotion:

- Strengthen Danish companies' cooperation with the 13 danish national clusters
- Strengthen Danish companies' cooperation with the local business support in the municipalities and regional business support
- The Trade Council under the Ministry of Foreign Affairs, which is present in more than 70 markets and provides sector-specialized advice on and grants for Danish companies'.
- Denmark's Export Credit Agency (EKF), which helps Danish exporters with internationalization and exports by providing security for their own financing and obtaining financing for their foreign customers[112].
- Private actors who provide subsidies for internationalization activities and provide advice that improves the competitiveness of business life, including Industriens Fond, The Danish Export Community, private advisers etc.[113]

Healthcare innovation in Danish Regions

As healthcare is the main task for the regions, Danish hospitals play an important role in public healthcare innovation. Every region has healthcare innovation centers. The purpose for the 5 regional healthcare innovation centers is to drive healthcare innovation in public-private projects at national and at European level. The innovation is driven by close interaction with citizens, private companies, actors from the Danish R & D system and business support system. The organizations are located close to the largest hospital of the region. In Region of Southern Denmark, the central division of The Health Innovation Centre of Southern Denmark is placed in Odense.[114]

The following strategies are defining Denmarks' innovation policy:

No	Strategy	Policy level
I.	Denmark Smart Specialisation Strategy	National
II.	Business Lighthouse Strategies	National/Local
III.	National Strategy for Digitization	National
IV	The Danish National Strategy for Cyber and Information Security	National
V.	The Danish National Strategy for Artificial Intelligence	National
VI.	Climate Strategies: ● Climate Act 2020 ● Strategy: 'A Green and Sustainable World (2020) ● "The green solutions of the future" Strategy (2020) ● Action Plan for Circular Economy	National / some replicated Local

112. Denmark´s Export Credit Agency (EKF)
113. Danish Export Association
114. The Health Innovation Center of Southern Denmark

I. Smart Specialisation Strategy

Denmark's smart specialization strategy (S3) is based on 13 priorities. The S3 priorities are the same business areas as the 13 national clusters. These areas are strongholds in companies, public institutions in the business promotion and in the R&D. The S3 priorities are the strategic foundation for the direction of Denmark's innovation development 13 national clusters[115][116][117].

S3 priorities for Denmark in the period of 2014 – 2020 are the underlying.

Environmental technology	Energy technology	Food and bioresources
Maritime business and logistics	Life science and welfare technology	Building and Construction
Design, fashion and furniture	Robot and drone technology	Finance and fintech
Digital technologies	Advanced production	Animation, games and film - emerging industry
Tourism		

Strategic paths Region South of Denmark. Green transition and efforts against climate change play a central role in Region Southern Denmark's development strategy. The goal of Region Southern Denmark contributing to the development of a sustainable society is a pervasive element in the strategy. Region Southern Denmark's development strategy has 6 strategic paths with three guiding objectives which are as follows [118]:

1. Green transition, climate, and resources

- Reduce emissions of CO2 and other greenhouse gasses in Region Southern Denmark.
- Transition to a more circular economy with more efficient use of resources, including raw materials.
- Reduce negative consequences of elevated water levels and extreme weather.

2. Clean water and soil

- Clean groundwater.
- Holistically oriented projects on clean drinking water and health for citizens.
- Innovation projects in co-creation and partnerships with citizens

3. Capabilities for the future

- Access to educational opportunities throughout the region.
- Capabilities for life, the labor market and a sustainable society.
- Educational environments that promote young people's well-being and health.

4. Healthy living conditions

115. EC Smart Specialisation Platform
116. Cluster Excellence Denmark
117. Business promotion in Denmark 2020-2023
118. Region of Southern Denmark

- Promote the citizens' mental and physical well-being.
- Strengthen healthy living conditions through knowledge of local and socio-economic differences.
- Promote new solutions through public-private innovation.

5. Attractive experiences and cultural life

- Increase attractiveness and settlement through experiences.
- Strengthen citizens' well-being and active life.
- Further develop and use southern Denmark's strengths within culture, nature and creativity, for example southern Denmark's world heritage and the special history and uniqueness of the border area of Denmark to Germany.

6. Mobility for everyone

- Green, climate-neutral transport on public and private transport.
- High availability of transport and connection with digital development in the field of transport.
- Easy accessibility, which reduces congestion in and between cities in Southern Denmark.

Partnerships and cooperation across the state, regions, municipalities, educational and research institutions, cultural institutions, companies, citizens and other regional partners are crucial to being able to realize the goals of the development strategy.

II. Business Lighthouses - Specialization Strategies

The Danish government decided in 2021 to initiate the development of local business lighthouses, each with a specialist area which is spread across all regions in Denmark.

The purpose of the initiative is to increase growth and create new jobs across the whole of Denmark. The government set up regional work teams consisting of private and public companies from local players in business, the trade union movement, municipalities, and knowledge institutions.

For a successful development and execution of the specialization strategies, a strong local anchoring is important. Therefore, it has been a requirement that actors join in consortia with ownership and anchoring in each region. The consortia must have the capacity to carry out business-oriented activities with an international outlook and a high technological level[119].

The program for Business Lighthouses runs from 2021-2027. It is financed by the REACT EU program; EU's Regional Fund, the EU's Social Fund, and the decentralized business promotion funds[120]. The work teams formulated a vision for their region based on the local strengths and potentials. The work has resulted in 8 Business Lighthouses for areas and regions across Denmark. And each with its own specialization strategy. The Business Lighthouse - specialization strategies are[121]:

119. Danish Board of Business Development - Development of Business Lighthouses
120. Danish Board of Business Development - allocates DKK 290 million. DKK for local business lighthouses
121. Danish Business Authority - The local business lighthouses

Part of Denmark	Business Lighthouse Specialisation strategy
The capital region of Denmark	Life science - Welfare technology - Global health capital
Zealand and the islands - Biosolutions	Solving climate and environmental challenges - Innovation collaboration
Zealand and the islands - Fehmarn	Showcase - Green infrastructure construction
Bornholm	Green energy island - Green and maritime transport hub
Funnen	**Industry of the future - Robotics - Automation**
South Jutland	**Green energy - Green technologies - Sector coupling**
Northern Jutland	Green industries Capture, storage and use of CO2 - Power-to-X
Central Jutland	Water technology solutions - Innovation collaboration

Business Lighthouse of Southern Jutland - Green energy - Green technologies - Sector coupling

The goal of the Business Lighthouse of South Jutland[122] is to make South Jutland an international green energy metropolis. The Danish Board of Business Development has granted DKK 105 million from REACT-EU funds for the establishment of a national center for energy, which will develop, test and demonstrate future green technologies and sector coupling solutions, including Power-to-X.

In the project, facilities are to be built for testing and demonstration of integrated and digitized energy systems, where tests and demonstration projects are to be carried out with the participation of companies and knowledge institutions. And efforts are being made to ensure companies have access to qualified labour. The center will establish cooperation with knowledge and educational institutions by mid-2023. Towards 2025, however, the aim is to improve the regulatory and infrastructural framework for the production and distribution of PtX products. This means that existing value chains for renewable energy must be strengthened.

The consortium behind the project is a public-private partnership with 13 municipalities from South Jutland, Energy Cluster Denmark, private companies, and knowledge institutions.

122. Business Lighthouse of Southern Jutland - partnership deal

Business Lighthouse of Funen - NextGen Robotics

The vision is Funen to be an international epicenter for the development of the industry of the future, which creates, tests and produces new digital, robotic and autonomous solutions for use on land, water and in the air. The Danish Board of Business Development has granted DKK 108.5 million from REACT-EU funds to Business Lighthouse of Funen - NextGen Robotics[123] .

Behind the consortium for Business Lighthouse of Funen - NextGen Robotics are 26 partners: 13 private companies, 4 municipal players, 4 knowledge institutions, 3 business clusters and 2 GTS institutes. And a further 25 companies outside the consortium are backing the lighthouse.

The consortium is the first to establish a new test and development center at the port of Odense for large constructions, LSP (Large Structure Production). More information about the project can be found on NextGen Robotics[124] and LSP's[125] websites.

III. National Strategy for Digitisation

In October 2021, the Danish Government Digitisation Partnership[126] presented 46 recommendations for how to harness the possibilities of digital technologies in Danish society. Based on these contributions, the Danish government presented the National Strategy for Digitalisation in May 2022[127] .

The strategy calls for broad collaboration between public, private and civil society actors. The strategy contains nine visions for the next steps in Denmark's digital development. Some of the vision are increased growth and digital SMEs, digital healthcare of the future, acceleration of the green transition through digital solutions.

The current Joint Government Digital Strategy runs from 2022 until 2025. The strategy includes initiatives which will accommodate some of the greatest challenges that Danish society is facing, including labor shortage, climate change mitigation, and digital inclusion.

The digital society must be inclusive for all, and the public sector has an obligation to ensure that the greatest number of people possible have the opportunity and the skills to participate.

Accordingly, the Joint Government Digital Strategy 2022-2025 will - among its 28 initiatives - introduce two new solutions. First, a new infrastructure component will allow users to grant and rescind permissions for authorities to use their personalized data. Second, digital powers of attorney will pave the way for allowing people to let their relatives manage their digital contact with the public sector.

123. Danish Business Authority- Business Lighthouse of Funen
124. NexGenRobotics Funen
125. LSP - Large Structure Production
126. Agency for Digital Government - Digitisation-partnerships
127. Agency for Digital Government - National-strategy-for-digitalisation

IV. The Danish National Strategy for Cyber and Information Security

The Danish Government's National Strategy for Cyber and Information Security 2022-2024[128] has been adopted to help enhance technological resilience; secure the protection of critical government ICT systems; and improve the knowledge and skills of residents, businesses, and authorities.

In the strategy, Danish Government defined four strategic objectives which set the framework for the development of stronger and more secure digital Denmark:

1. Robust protection of vital societal functions
2. Improving and prioritizing levels of skills and management
3. Strengthening the cooperation between the public and private sectors
4. Active participation in the international fight against cyber threats

V. The Danish National Strategy for Artificial Intelligence

The National Strategy for Artificial Intelligence[129] sets the roadmap for how Denmark can be a front-runner in responsible development and use of AI – benefiting individuals, businesses, and society as a whole.

AI offers great opportunities for creating growth, prosperity, and world-class public services in the public sector. Therefore, the Danish National Strategy for Artificial Intelligence seeks to create a framework for businesses, researchers, and public authorities to enable them to better exploit the potential of AI with a high level of responsibility.

The strategy puts forth four objectives for the Danish development and use of AI:

1. Denmark should have a common ethical and human-centered basis for AI
2. Danish researchers should research and develop AI
3. Danish businesses should achieve growth through developing and using AI
4. The public sector should use AI to offer world-class public services

VI. Denmark and Climate strategies

The Climate Act 2020

In 2020, the Danish government entered into an agreement with all parties in the Danish parliament on an ambitious and binding climate act[130] . The Climate Act makes the climate target of 70 percent in 2030 a Danish law and ensures that Denmark takes the lead in the green transition, raises ambitions for the climate and inspires the whole world to climate action.

128. Agency for Digital Government - National Cyber Strategy
129. Agency for Digital Government - National Artificial Intelligence Strategy
130. Clima Act 2020 - Danish Ministry of Climate, Energy and Utilities

With the new climate act, the current and future government will be obliged to ensure the realization of the 70 percent target by 2030. At the beginning of each year, the Danish Climate Council must give a professional assessment of whether the government is on the right track towards the climate act's goals.

At the end of the year the Danish parliament assesses whether the government lives up to the climate act, or whether it must be required to act further. The Danish Parliament is the final judge of whether the initiatives are sufficient.

The Climate Act is more than a signal to the world. It is a strategic direction for Denmark, which affects all levels; State, region and in municipalities. Green transition is of great importance in the design of national and local strategies for Danish business policy, digitization policy and investments in innovation R&D in Denmark. Danish municipalities have also incorporated the climate targets of 70% CO2 reduction in 2030 and CO2 neutrality in 2050 in local strategies.

In many years, Danish municipalities have taken local climate leadership by working purposefully to promote the green transition and reduce the CO2 footprint. After the adoption of the Danish Climate Act in 2020, all 96 municipalities in Denmark have committed to developing a local climate action plan[131].

The climate action plan must both show how the municipality as a geographical area will achieve net zero emissions of CO2 by 2050 at the latest and what measures the municipality will take to adapt to climate change, which will make the individual municipality resilient to climate change. As examples of climate action plans, ***Vejle Municipality's climate action*** plan and Project Zero from Sonderborg Municipality are presented.

> Climate action plan Vejle Municipality

In its climate action plan, Vejle Municipality follows the national objectives of a 70% reduction in CO2 emissions and becoming CO2 neutral by 2050[132] . It builds upon the experiences of the municipality's previous strategy "Vejle's Resilience Strategy" from 2016[133] . As a baseline the development of Vejle's Municipality climate action plan began with an account of all CO2 emissions sector by sector in the municipality.

Vejle Municipality's climate report shows that the large emissions are distributed almost equally between the sectors Stationary Energy (32%), Transport (28%) and Agriculture (36%). In addition, there are smaller emissions from Industry (1%) and Waste (2%). The total emission of greenhouse gases in Vejle Municipality is 1,155,000 tonnes of CO2 e per year, or approx. 10 tons per person.

In the climate action plan, Vejle Municipality works to reduce CO2 in the aforementioned sectors and with the following efforts:

131. Local Government Denmark
132. Vejle's Climate Action Plan
133. Vejle's Resilience Strategy

- **Energy supply**: Working with strategic energy planning in relation to future energy supply and identifying new areas in the energy infrastructure such as solar cells and wind turbines.
- **Oil and natural gas**: Oil and natural gas must be phased out at small district heating plants, at private homes, in industry and in the district heating system. Phasing out oil and natural gas can reduce our CO2 emissions by 69,200 tonnes/year.
- **Biogas**: Biogas from agriculture can displace natural gas. Vejle Municipality is in active dialogue with farmers, biogas companies and local communities about opportunities and locations. Utilization of biogas can reduce our CO2 emissions by 57,000 tonnes/year.
- **Agricultural land**: Afforestation on municipal land is an opportunity to sequester more CO2. The municipality is working with possibilities for financing, purchase of suitable land and planting of areas.
- **Transport**: Green supplement to the mobility plan with a major focus on everyday cycling. More charging stations in the city of Vejle and a strategy for more charging stations in the rest of the municipality. Requirement for electric buses in the next supply of city buses.. 30% conversion to electric cars in 2030 can reduce our CO2 emissions by 40,900 tonnes/year.
- **Local plans**: The development of local plans and the incorporation of climate prevention and climate adaptation are incorporated into new local plans.
- **Sustainable construction**: Invent best practice for sustainable construction that reduces the climate footprint from materials and building operations, etc.
- **Green procurement policy**: Vejle Municipality formulates a Green procurement policy that focuses on climate, in line with economy. The purchasing policy must ensure that consideration is given to the products' long-term climate impact. In 2021, the focus is expected on the purchase of 100% green electricity, driving and passenger transport on electricity, more ecology and a plant-based diet, and the purchase of sustainable/eco-labelled furniture.

> ProjectZero Sonderborg case example

ProjectZero[134] is Sønderborg Municipality's climate action plan. The ProjectZero started back in 2007. During 2008 and 2009 more than 75 leading Danish energy specialists analyzed the areas opportunities and challenges and created the ProjectZero 2029 Masterplan, concluding that Sonderborg can achieve ZEROcarbon by 2029 and at the same time create new skills and green jobs.

ProjectZero includes all energy-related CO2 emissions linked to energy production and energy consumption. The ProjectZero vision does not include imported goods and transport outside the Sønderborg area. The starting point was almost 700,000 tonnes of CO2 emissions in 2007, corresponding to approx. 9.2 tonnes of CO2 per inhabitant. Since 2007, the CO2 footprint has been reduced by 55.4%.

134. ProjectZero Sonderborg

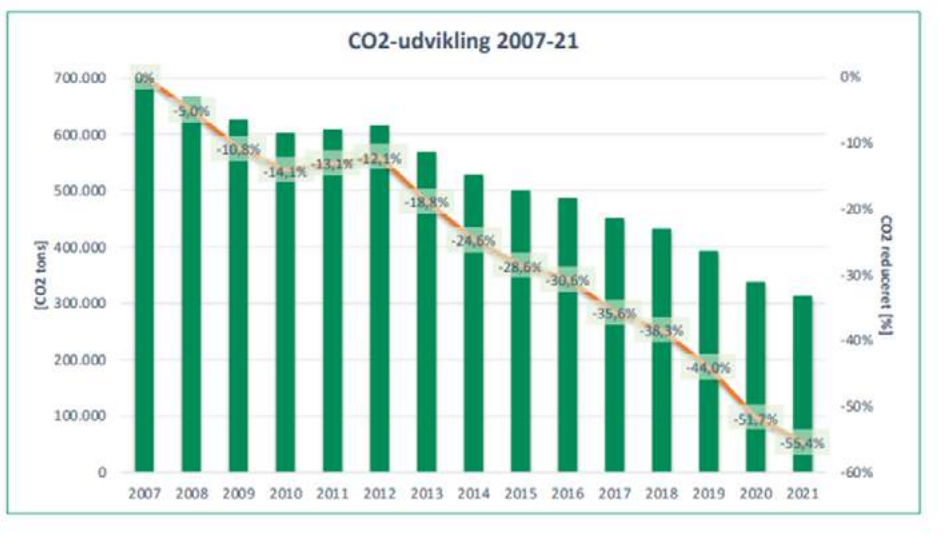


Figure no. 16. Carbon footprint development Project Zero, source: Project Zero report 2021

Through learning, attitude processing, urban development, energy renovation of homes and business development, the Sønderborg area focuses on efficient energy use and renewable energy supply based on the area's own resources.

Making energy use more efficient is linked to i.a. buildings, lighting, appliances/process equipment, transport etc. The renewable energy sources include wind, sun, biomass, geothermal energy, geothermal energy. The solutions must be smart, build on citizen involvement, data/management and support efficient resource use.

In ProjectZero, several subprograms have been created under the brand "ZERO". Eg. ZEROfamilies – Ambassadors to the community. The program ZEROfamily offers training and education in low carbon and sustainable lifestyle for Sonderborg citizens. The location of the Municipality of Sonderborg is located at the Danish-German border in the southern part of Region Southern Denmark.

Strategy: 'A Green and Sustainable World'

In October 2020, the Danish Government launched a new long-term strategy on global climate action 'A Green and Sustainable World'[135] , which sets the direction for Denmark's international climate efforts. Denmark has the experience and the green solutions, and that is why Denmark has a unique opportunity to contribute solutions to global climate challenges.

Denmark wishes to inspire and encourage the rest of the world to in global climate action. Denmarks goal is 70 percent emission reductions by 2030 and climate neutrality by 2050, which is also included in the Danish Climate Act from 2020. Denmark are one of the green frontrunners. With 551 green patents in 2021, Denmark is cementing a solid first place on green patents. This corresponds to 93 green patents per million inhabitants, well above number two and three Switzerland (51 patents) and Sweden (37 patents)[136].

135. Global Climate Action Strategy
136. Invest in Denmark - Global leader in green patents

The Danish Government's new long-term strategy on global climate action sets the direction for Denmark's international climate efforts. Denmark's aim is to:

- Increase global climate ambition
- Reduce global greenhouse gas emissions
- Strengthen focus on adaptation and sustainable development
- Shift financial flows to green
- Cooperate with the private sector on green solutions

As part of the work on the strategy, the Danish government has published "State of Green Denmark Solutions". It is a booklet with a presentation of Denmark's strengths and solutions for the green transition. In the booklet it highlights the following strengths of Denmark in the work with the green transition[137]:

- Wind energy:
- Solar Power & Biogas energy
- Recycling, waste and district energy
- Water Management
- Food & Agriculture
- Architecture & Urban Planning
- Smart and livable cities
- Urban mobility

"The green solutions of the future"

"The green solutions of the future"[138] is the Danish government's strategy from 2020 for investments in green research, technology and innovation. The strategy contains four research missions. With a mission-driven effort, the Danish government wants to accelerate the development of ground-breaking green solutions. The strategy must be executed in close private-public collaboration. The interaction and coordination between universities, companies, authorities and other relevant actors is important to accelerate the development of green solutions and technologies. The strategy identifies four green missions:

- Capture and storage or use of CO_2 climate-neutral solutions.
- Green fuels for transport and industry (Power-to-X etc.)
- Climate- and environment-friendly agriculture and food production
- Recycling and reduction of plastic waste

137. Invest in Denmark -Publication: The-State-of-Green-Solution
138. The Ministry of Higher Education and Science - "The green solutions of the future"

Action Plan for Circular Economy

Like other EU countries, Denmark must meet the EU's binding recycling targets that the EU has adopted. For household waste and similar waste from other sources, binding EU targets for recycling of 55 per cent have been adopted. in 2025, 60 per cent in 2030 and 65 per cent in 2035[139].

The Danish Government's Action Plan for Circular Economy constitutes the national plan for the prevention and management of waste for 2020-2032. In a circular economy products and materials stay in use and their value is maintained for as long as possible.

The Action Plan for Circular Economy describes the Danish targets, indicators, policies and initiatives in the entire circular value chain, which ranges from design and consumption to waste management, from which natural resources are recycled into new products and materials. In addition to several initiatives along the value chain in general, the Action Plan for Circular Economy focuses on three areas with significant environmental and climate impact: biomass, construction and plastics[140].

139. The Ministry of Environment - Action plan for circular economy (danish)
140. The Ministry of Environment - focal points

5.5.3. PROGRAMMES boosting research, development & innovation

2014-2020

	Name of the program	Measure/ Call	Target beneficiaries	(N) National/ (R)Regional/ (E) European
1	National Programme for the European Regional Fund – 2014-2020	● Increase the number of innovative SMEs ● Increase the number of high-growth enterprises ● Improve the efficient use of energy and resources by SMEs ● Reduce energy consumption and increase the number of innovative SMEs in urban areas with a population of more than 30,000	SME's Clusters Knowledge institutions	E (ERDF)
2	National Programme for the the European Social Fund programme 2014-2020	● Increase the number of self-employed, survival rates and employment in ESF-funded companies ● Increase labour mobility across national borders ● Increase employment for people on the edge of the labour market ● Increase the number of people in vocational training or further education	SMEs NGOs Public authorities	E (ESF)
3	Innovation Fund Denmark **Grand Solutions**	● Digitization, technology and innovation ● Life science, health and welfare technology ● Green Research, Technology Development and Innovation ● The Construction and Building Sector's Transition to Circular Resource Economy	Enterprises, research institutions or public institutions in or outside Denmark, directly involved in the project activities	N
4	Innovation Fund Denmark **Innomissions**	● Mission-driven green research and innovation partnerships ● Roadmaps for mission-driven green research and innovation partnerships	Knowledge institutions, Research and Technology Organizations (GTS institutes), companies (start-up, SME, large companies), investors, municipalities, cluster organizations.	N

5	Innovation Fund Denmark **Missionbooster**	Missionbooster is a special program in the autumn of 2022 with a focus on supporting the contribution of small and medium-sized enterprises (SMEs) to future solutions to the green challenges.	Small and medium-sized businesses, including startups. You must have a Danish CVR number and EITHER have attracted 100,000 DKK in capital within the last 3 years OR have a gross profit in the last published financial year of min. 250,000 DKK.	N
6	Innovation Fund Denmark **Innobooster**	Grants for companies and entrepreneurs who want to initiate an innovative, knowledge-based development project. The purpose is to increase the company's competitiveness and create growth for Danish society	Entrepreneurs, start-ups and small and medium-sized businesses. You must have a cvr number and EITHER have attracted 100,000 in capital within the last 3 years OR have a gross profit in the last financial year of min. DKK 250,000.	N
7	Innovation Fund Denmark **Industrial Reseacher**	Industrial Postdoc projects develop research talents, contribute to business-oriented research, development and innovation in Denmark and strengthen the collaboration between organizations in Denmark and research institutions at home and abroad.	Co-financing of the company's expenses for the student's salary and travel activity as well as the university's expenses for projects	N
8	Innovation Fund Denmark **Innoexplorer**	Innoexplorer is the Innovation Fund Denmark´s program that aims to mature entrepreneurship based on knowledge and research results from the public Danish research and education institutions and hospitals.	Innoexplorer is targeted at employees at public research and educational institutions and hospitals	N
9	Innovation Fund Denmark **Innofounder**	Entrepreneurs with an innovative idea who have completed a higher education.	Salary for 12 months + tuition, mentoring and feedback from other entrepreneurs, so you can mature your idea and develop as an entrepreneur.	N

Forthcoming 2021-2027

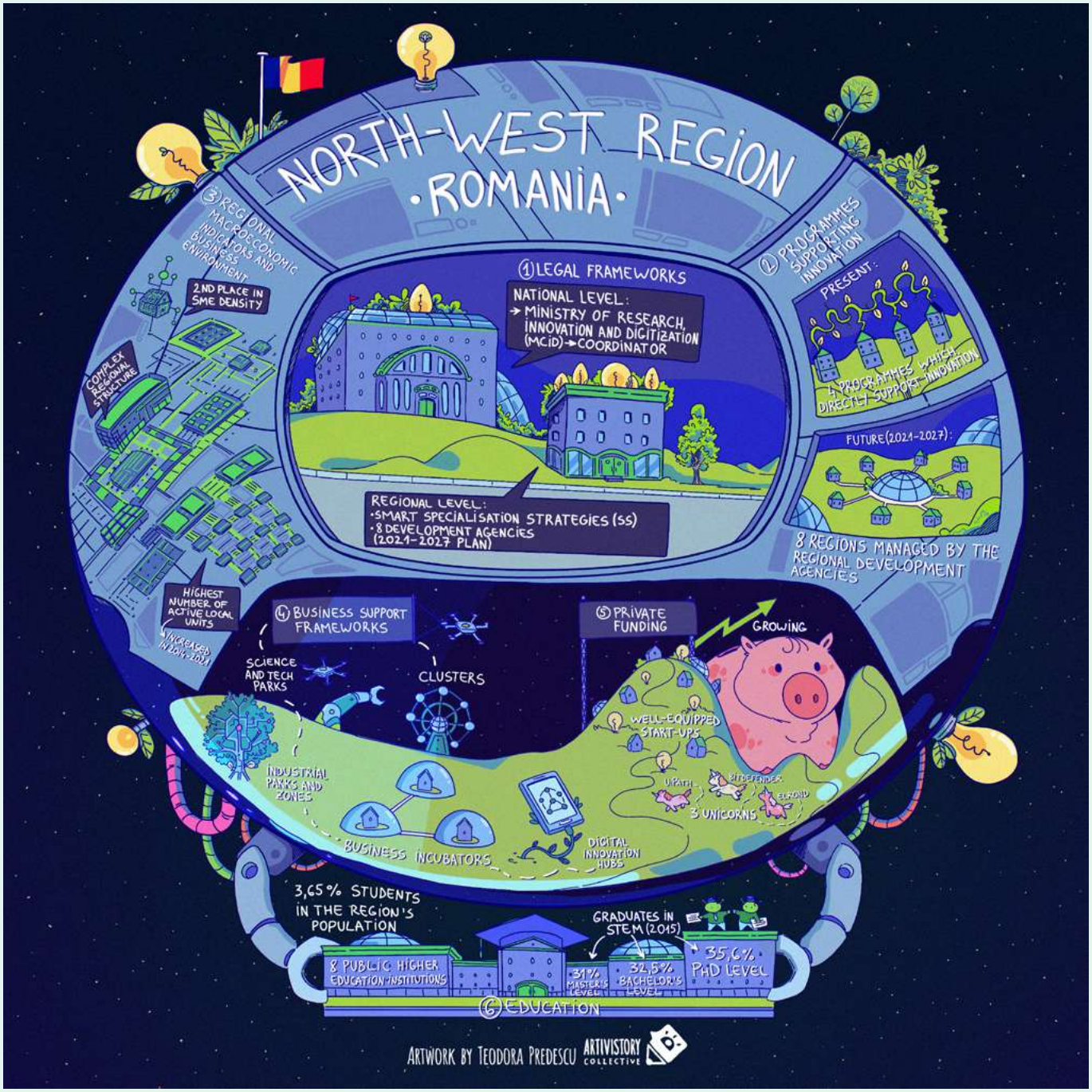
	Name of the program	Measure/ Call	Target beneficiaries	(N) National/ (R)Regional/ (E) European
1	European Regional Development Fund (ERDF) Main program	● Promote circular economy ● Strengthen the enterprises' innovation capacity and development of new solutions ● Strengthen enterprises' competitiveness ● Develop a welfare technology position of strength ● Promote sustainable development of living city centres in small and medium-sized cities ● Attract private investments through tourism infrastructure development ● Drive the digital transformation of the enterprises	SME's Clusters Knowledge institutions	E
2	(ERDF) Local Business Light Houses II	Development of methods within capture, transport, use and storage of CO2, biosolutions, water technology, development, testing and demonstration of green energy technology and sector coupling	SME's Clusters Knowledge institutions	E
3	(ERDF) Entrepreneurship program 2023-2026	Aim to increase the establishment and survival rate among entrepreneurs and a specialized effort targeting entrepreneurs with great growth potential	SME's	E
4	(ERDF) Welfare technology	The effort must address procurement and implementation challenges as well as challenges in creating the prerequisites for successful exports, including competence development, entrepreneurship/innovation , testing and development.	SME's Clusters Knowledge institutions	E
5	(ERDF) Green transition with a circular focus	Develop and scale circular initiatives in Danish SMEs and improve the opportunities to increase security of supply by incorporating circularity into the business. And reduce resource consumption and waste volume, which supports future sustainability reporting requirements.	SME's	E

6	(ERDF) Digital tools for SMEs	The focus is on the development of new digital tools that can support SMEs' work with e.g. internationalization and sustainability with a view to increasing export readiness	SME's	E
7	The European Social Fund programme (ESF)	● Get more people to take vocational training or higher education ● Raise the competences of the workforce through targeted and flexible continuing education ● Promote entrepreneurship ● Retain and include citizens in the labour market ● Ensure that young people have skills that prepare them for the future ● Support equal access to education ● Promote the social integration of citizens who are homeless or at risk of homelessness		E
8	Just Transition Fund (JTF)	● Create a coherent Denmark with strong local business lighthouses ● Ensure better conditions for a green transition in Danish SMEs ● Support the development of brown biorefining such as pyrolysis ● Ensure the development of CO2 capture, storage, and hydrogen-related technologies ● Promote green and circular technologies	SME's	E
9	(DFF) Independent Research Fund Denmark	DFF supports independent research based on the researchers' own ideas within and across all the main fields of science. ● Humanities ● Natural Sciences ● Social Sciences ● Medical Sciences ● Technology andProduction Sciences	Knowledge institutions	N
10	(EUDP) The Energy Technology Development and Demonstration Program	Supports with funding the work of companies and universities with the demonstration of new, green energy technologies. Every year from 2018 until 2024, a minimum of DKK 500 million is set aside.	Companies Knowledge institutions	N

11	(MUDP) Environmental Technology Development and Demonstration Program	Provides grants for projects that promote new, innovative ideas and business cases within environmental and energy technology.	Companies Knowledge institutions	N
12	(GUDP) Green Development and Demonstration Program	GUDP under the Danish Agency for Agriculture, which supports projects that promote green and sustainable economic development in the food sector.	Companies Knowledge institutions	N
13	Innovation Fund Denmark	Programs in the Innovation Fund Denmark do not have fixed time periods. ● Grand Solutions ● Innomissions ● Missionbooster ● Innobooster ● Industrial Researcher ● Innoexplorer ● Innofounder ● International collaborations	● Companies ● Researchers ● Entrepreneurs ● Public institutions ● GTS-institutes	N
14	Denmark's Green Investment Fund	The Danish Green Investment Fund is an independent state loan fund with the purpose of co-financing economically viable projects that facilitate and support the sustainable development of our society in sectors: Energy and supply Food and agriculture Buildings and infrastructure Materials and resources Transport and mobility	Privately held companies, non-profit housing associations and public sector companies and institutions can apply for a loan from the fund.	N
15	Denmark's Export and Investment Fund.	The fund collaborates with Danish banks and financial institutions on the provision of loans and financial guarantees to Danish companies in all industries and at all stages of their development. There are special loans for start-ups in the early stages of their development.	Danish Companies	N

6. BOOST REGIONS - Regional analysis of the Innovation Status

6.1. North-West ROMANIA Regional analysis of the innovation status



6.1.1. Introductory data about the region

North-West Region has a favorable geographic positioning at the Western border of Romania, its features being heavily influenced by the close interactions with Western and Central Europe. The region borders Hungary in the West and the Ukraine in the North.



Figure no. 17. – Map of North-West Region

The **North-West Region**, also known as **Northern Transylvania**, is composed of 6 counties (Bihor, Bistrița-Năsăud, Cluj, Maramureș, Satu-Mare, and Sălaj) comprising 15 cities, 28 towns, 403 communes and 1,800 villages. It has a surface area of 34,160 km² (14.3% of the country) and in 2022 had a population of 2,523,143 inhabitants. The region is one of the most ethnically-diverse in Romania. The regional ethnic structure consists of Romanians (75%), Hungarians (18.3%), Roma (4.6%), Ukrainians (1.3%) and Germans (0.3%).



Figure no. 18. – Map of the Counties of the North-West Region

According to a recent study published by the World Bank taking into account two indices designed to assess the city performance (competitiveness index focused on current performance and attractiveness index focused on potential performance), Cluj-Napoca is the 2 nd city in Romania after Bucharest the capital and Oradea is listed 9 th in the national rank, especially due to the proximity of the Western border closer to European markets.

The rural environment of the North-West Region consists of 403 municipalities and it represents a percentage of 45% of the total population. Out of a total of 1800 villages, 48 villages belong administratively to municipalities and cities (making part of the urban environment, they are not eligible for rural development funds). Territory covered by rural settlements in the region is 29,285.93 km² representing 85.73% of total area. The municipalities in the region vary in size, with an average population of 3,060 inhabitants. The largest commune is Florești (Cluj County) with 41.503 inhabitants, (year 2020), due to close proximity to Cluj-Napoca. The second largest commune is Apahida (Cluj County) with 14.467 inhabitants, followed by Baciu (Cluj County) with 12.282 inhabitants[141]

6.1.2. Macroeconomic indicators and business environment

The North-West Development Region is one of the least developed regions in the European Union, with GDP per capita (PPS) which was equal to 74% of the EU27 average in 2021, placing the North-West Region in the category of poorly developed regions (GDP/capita <75% of the EU27 average) In 2014, the value of the GDP per capita (PPS) for the North-West Region was equal to 56% of the EU27 average, between 2014-2021 this indicator increased by 18%.

According to the latest data provided by INSSE, in 2020 the value of GDP at the level of the North-West region was 132,190.5 million lei (26.438,1 Euros), representing a percentage of approximately 12.4% of GDP at the national level.

In 2020, Cluj county (42%) contributed the most to regional GDP formation, followed by Bihor (19%), Maramureș (14%) and Satu-Mare (10%) counties. Cluj County ranked second nationally in 2020, after Bucharest City with a value of PIB of 55.771,9 million lei (11.154,38 Euros).

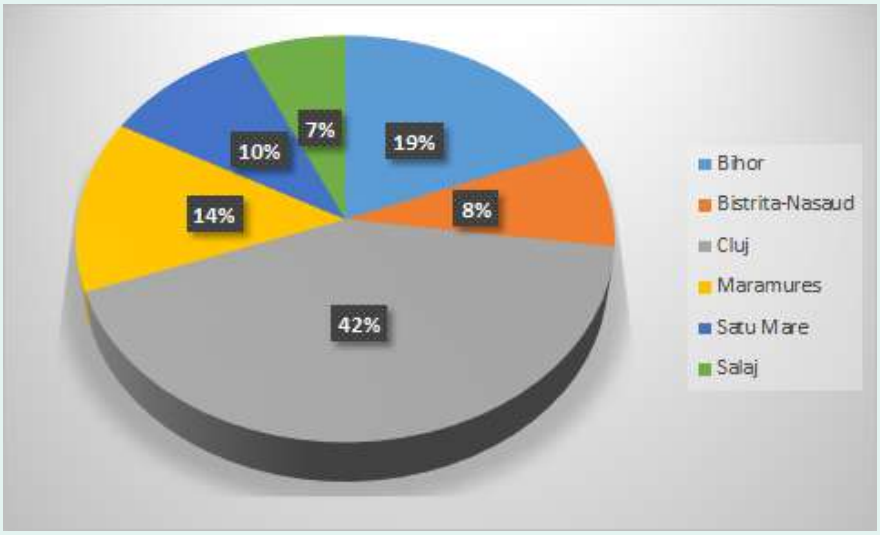


Figure no.19. GDP by counties of the North-West Region in 2020 Source: INSSE

141. NSSE, 1st of January 2020, https://insse.ro/.

According to the latest Regional Competitiveness Index for 2019, the North-West Region has ranked 246 th out of 268 European regions, but being in the same time the 3 rd most competitive region out of the 8 regions in Romania.

According to the latest available data, in 2020, the **region's economy** was based on services and industry, the predominant sector being represented by extractive industry, this sector represented approximately 23% of the regional GDP. According to INSSE available data, in 2020, the distribution of GDP per sectors of activity, in the North-West region is: extractive industry (23%); retail trade (20%); administrative activities (17%); real estate transactions (9%); ICT (8%); construction (7%); professional, scientific and technical activities; agriculture, forestry and fishing (5%); cultural and recreational activities; financial insurance (3%).

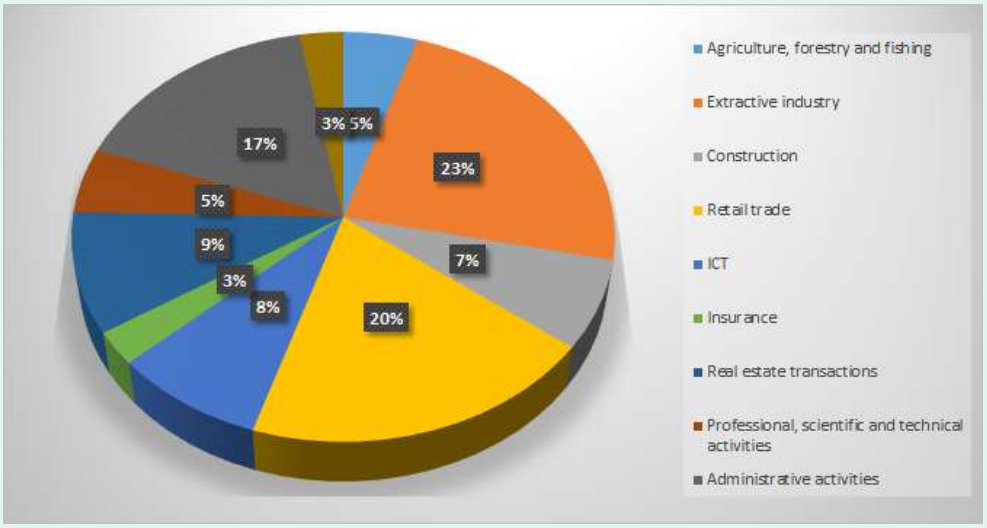


Figure no. 20. GDP by counties of the North-West Region in 2020
Source: INSSE

The structure of the regional economy is complex, with different weights at the county level. If Cluj has a strong tendency towards development, having a less developed primary sector, the economy of Satu Mare county is an industrial-agrarian one, with a more developed agricultural sector. Overall, the tertiary sector represents an important pillar of the regional economic structure, respecting the European economic structure.

No. of active companies / local units - The North-West Region has the highest number of active local units in the country after Bucharest-Ilfov, with 156.567 active local units in 2021, representing 14.95% of the national number. Cluj county ranks 2nd in the national hierarchy, after Bucharest. At the regional level, Cluj County has the highest share of active local units (38.695), followed by Bihor (21.762). The fewest local units were active in Bistrița-Năsăud (8.913), Satu Mare (8.976) and Sălaj (6.188) counties. Most of the enterprises are in the micro and small category (SMEs) and over 98,6% of the companies in the region have less than 50 employees. Only 11% of them are active in the industry, especially in the food industry, metal, wood processing and furniture manufacturing.

SME density - Related to the density of SMEs, in 2018, the North-West Region ranks second in the national hierarchy, with 33.44 SMEs/1000 inhabitants, above the national average of 29.43 SMEs /1000 inhabitants. According to the EU Annual Report on SMEs 2018/2019, the value of this indicator places Romania in last place at the EU-28 level, well below the average value of 58 SMEs/1000 inhabitants, the first place being occupied by the Czech Republic with 115 SMEs hours/1000 inhabitants.

Evolution of no of companies per sectors - In the period 2014-2021, the number of active local units at the level of the North-West Region increased by 34,91%. The sectors that had the greatest growth in 2021 compared to 2014 are: Health (+141%), Performing, cultural and recreational activities (+107%), Education (+146%), IT (+98%) and Real estate (+78%). At the same time, one sector registered a decrease in the analyzed period: Production and supply of electricity and thermal energy, gas, hot water and air conditioning (-29,88%).

The business structure in the North-West Region is dominated by real estate (24%), construction (14%), transport and storage (12%), professional, scientific and technical activities (11%) and manufacturing (10%). Manufacturing is concentrated on lowskill, low-tech sectors including food, textiles and wood, leather and rubber, plastic and metal products. For services, high-skill/ high-tech sectors are telecommunications and computer programming and related activities, while other dominant high-skill sub sectors include real estate, architectural and engineering activities and management consultancy.

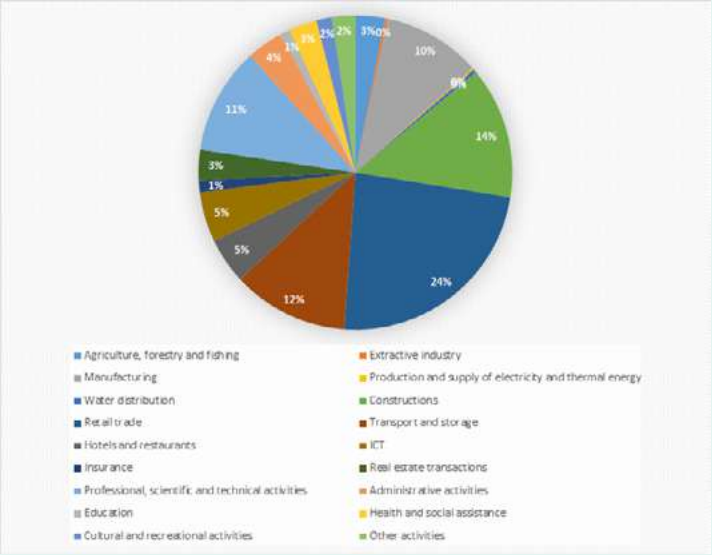


Figure no. 21. The structure of active local units, on activities of the national economy at the level of the North-West Region; Source: INSSE

The figure below presents the evolution of active units at the level of the North-West Region during the period 2014-2022 for the three sectors relevant for BOOS analysis: Manufactury, ICT and Health and social assistance. The manufacturing sector encountered an increase of 22.5% compared to 2014. The percent of active local units in the ICT sector raised with 49.6% compared to 2014 and the sector of health with 58.5%

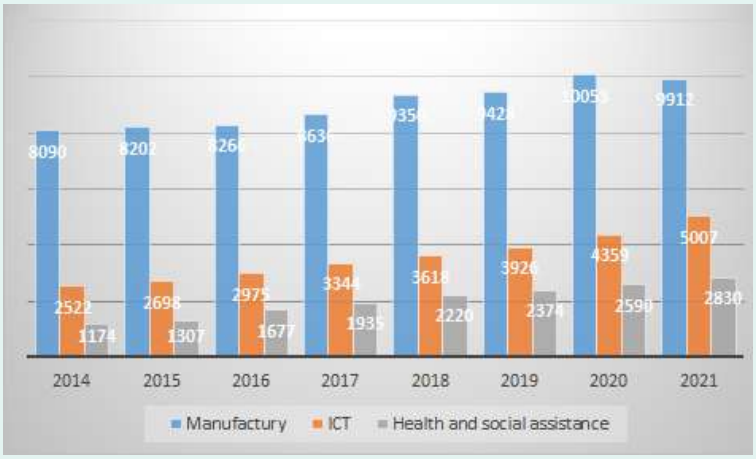


Figure no. 22. The evolution of active local units, on activities of the national economy at the level of the North-West Region Source: INSSE

Comparative advantages - Comparative advantages can be identified in industrial sectors with low technological intensity (leather and footwear, woodworking, furniture) and in several sectors with medium to high or even high technological intensity (ICT, machinery and equipment, electrical equipment). After the Bucharest-Ilfov Region, in 2018 the North-West Region has the highest concentration of ICT companies, the business infrastructure being relatively well developed.

Innovative companies

In the last year for which data are available on INSSE (2020), the percent of innovative companies in the North-West Region was 13.31% of the total number of innovative firms registered in Romania (2.900), with most of them located in the Bucharest-Ilfov Region. In 2020, from the total number of active companies in the North West region, only a percent 9.8% of the companies are considered innovative. The figure below shows that the number of innovative firms in the North-West region has grown from 2014 to 2018, from 401 innovative firms to 940 innovative firms, following that in 2020 the number of innovative companies has decreased dramatically to 386 companies

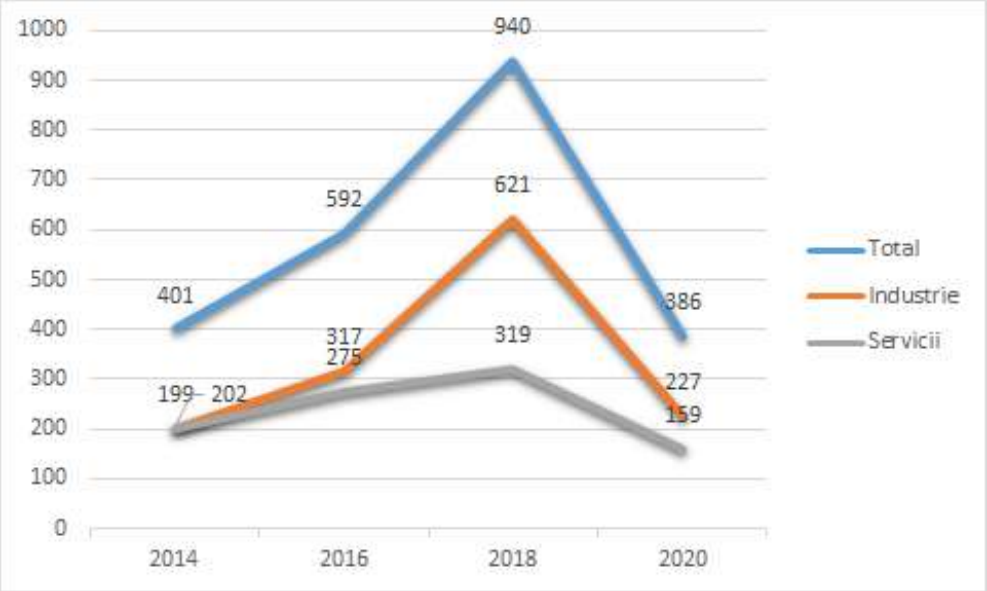


Figure no. 23. The evolution of number of innovative firms, by sectors of activity at the level of the North-West Region; Source: INSSE

6.1.3. Business support framework

Industrial parks - The most visible business support structures are the industrial parks, which can be the result of public, private or even public-private initiatives. According to MDRAP data from 2022, from 106 such existing structures at national level that acquired the title of industrial park, a number of 25 are located in the North-West Development Region. The title of industrial park is the administrative document issued by the specialized body of the central public administration that gives to the industrial park the legal regime provided by Law no. 186/2013 on the establishment and function of an industrial park, with subsequent amendments and additions.

The industrial parks are located in the following localities: Bistrița, Carei, Câmpia Turzii, Cluj-Napoca, Dej, Feleacu, Jibou, Jucu, Oradea, Petrești, Săcuieni, Tileagd, Moldovenești and Turda. The biggest ones are in Cluj County - Tetarom 3 Industrial Park.

According to MDRAP, at the end of 2022 there were 25 industrial parks, which covered a total area of approximately 750 hectares. Of the 25 mentioned industrial parks, 6 are located in rural areas, the rest being located in urban areas. In the period 2007-2013, 5 parks benefited from non-refundable financial aid (four through the ROP and one through the Hungary-Romania Transfrontier Cooperation OP). Three of these projects (TETAROM 1 Cluj, ARC Parc Industrial Dej and Eurobusiness Parc Oradea) were projects to expand the existing infrastructure and two aimed at the creation of new industrial parks (Bistrița and Satu Mare).

Industrial zones - Along with the accredited industrial parks, a number of industrial zones or similar structures operate, such as the REIF Industrial Zone - Câmpia Turzii, the Nervia Park - Apahida, the Sud Satu-Mare Industrial Park, etc. which generally have the same characteristics and perform the same functions.

Science and Technology Parks (STP) are physical spaces that provide a space for collaboration between universities, research organizations and companies whose basic objective is to favor the generation of knowledge in distinct sectors, starting from the integration of scientific, technological and industrial interests but also the transfer of technology.

Although there have been some initiatives in this sense, at the moment there are no such functional structures in the North-West Region. Tetapolis, a STP established 10 years ago by the association of Cluj local administration and few universities, has remained at an incipient level to the date.

The construction of Bihor Scientific and Technological Park, an initiative of the Bihor County Council together with Bihor Industrial Park and the University of Oradea, is to be financed, the total value of the project amounting to approximately 7 million euros. This science and technology park is under construction and it benefited from non-refundable financial aid by Regional Operational Programme 2014-2020.

Business incubators - Business incubators are, according to the provisions of Law no. 102/2016, structures to support businesses that constantly aim to create a favorable and sustainable environment for newly established SMEs. In this way, businesses will have boosted their potential for growth and viability, helping them to develop in the early stages by providing shared facilities and the necessary managerial support. The founders of such structures can be legal entities under private law, as well as local public authorities, institutions/consortia of higher education institutions, institutes, research-development centers and stations, and chambers of commerce.

One of the oldest incubators in the North-West operates within the TETAROM 1 industrial park in Cluj. The business incubator is intended to support start-up companies. The main objective is to attract students interested in promoting valuable business ideas and young people who want to develop an innovative business. TETAROM SA concluded a collaboration protocol with the academic environment in Cluj-Napoca with the aim of: capitalize on the important human resources generated by Cluj universities and support through scientific research, innovation and technological transfer.

Also, in the 2014-2020 programming period through the Regional Operational Program, Investment Priority 2.1, Call for projects 2.1B - "Business Incubators" 8 new similar structures are currently funded for construction (with a total project value of over 28 million euros, of which 76 million non-refundable funding): 4 in Cluj county, , 3 in Bihor countryland one in Maramureș. Three of these projects are to be implemented by public authorities, the rest being private initiatives.

In October 2019, the Romanian Government approved a new law on supporting newly established companies through business incubators and accelerators, which aims to replace the Law no. 102/2016. The draft law clarifies some methodological and interaction aspects with the authority of the central public administration with attributions in the field of SMEs and simplifies the procedure for granting the title of business incubator by eliminating the feasibility study, as well as other regulations that made this procedure more difficult. Also, the project extends the validity period of the title of business incubator from 10 years to an indefinite period and, at the same time, the possibility of financing business incubators by using any legally identified source is extended. The law clearly mentions the tax facilities that the founder of the business incubator can benefit from, all of which are measures aimed at contributing to the long-term sustainability of these business support structures.

In recent years, in terms of business support structures, one can see the exponential increase in the number of new generation structures, such as ***co-working offices***, various ***business hubs, accelerators,*** etc. This trend indicates a growing interest in collaboration by young entrepreneurs, especially in high-tech sectors, thus contributing to the acceleration of spill-over effects and the exchange of information between innovative start-ups. Most of them are private initiatives, supporting the collaboration between new companies and start-ups and - even if they are not addressed to a specific sector - they have an important IT component. However, recently, structures with an emphasis on specific fields have also begun to appear. Without pretending to give an exhaustive list, among the initiatives of this kind we can mention: Cluj Hub (Cluj), Cluj Cowork (Cluj), Chaos Cowork (Cluj), Zain Studio (Cluj), Coworking Oradea (Bihor), Oradea Tech Hub (Bihor), Work Baia Mare (Maramureș) or Creative Minds Hub Zalău (Sălaj).

The list of coworking locations is completed by ***business accelerators***, whose mission is to improve the ecosystem of startups, helping them to develop quickly on the international branch. Since they are private, it is a challenge for them to last in time as a business, without public funding; the few examples were in Cluj-Napoca: Spherik Accelerator, Techcelerator, Risky Business, Hubcelerator.

Clusters - Romania does not have a dedicated cluster policy. The clusters which were established around 10 years ago followed Western associative models and some were also supported by two dedicated open calls in 2012 and 2013. The establishment of clusters at regional level was initiated and supported by the North-West RDA, including by attracting European funds, as part of the implementation of the Regional Innovation Strategy of the North-West Region 2007-2013. At the initiative of the North-West RDA, first clusters were generated in the fields of ICT, furniture and renewable energies starting from 2011. Currently there are 15 clusters operating in the region, most of them in- or around Cluj-Napoca, in fields such as: ITC, wood and furniture, agro-food, energy, thermal waters, space-technologies, life style, creative industries, tourism. Most of the clusters in the region have been created on the classic triple-helix model, the core being represented by the association of companies joined by research and education bodies, as well as public authorities that come to support these structures and bring additional visibility and lobbying. In recent years, in line with international trends, the scope of the types of actors has been broadened in most of these structures, gradually moving towards a quadruple helix format with

the increasing involvement of civil society.

Some of the clusters in the region are among the most mature in the country, with a relatively large number of members, with well-structured development and innovation strategies, recognized at European level by the European Secretariat for Cluster Analysis (ESCA).

Six of the clusters from the North-West Region formed in 2016 the Northern Transylvania Clusters Consortium, which in 2022 become a legal organisation under the name of SMART Transylvania, being active in organisation of dedicated events and responsible for facilitating collaboration within and out of the regional ecosystem.

Digital Innovation Hubs (DIHs) - After the launch in April 2016 of the first initiative of the European Commission regarding the Digitization of the Single Market (Digital Single Market), an important decision was taken to establish the Digital Innovation Hubs (DIH). Digital Innovation Centers are one of the key elements of the DEI strategy (Digitizing European Industry), formed by structures which offer assistance to companies, especially SMEs, towards digitalisation and new technologies.

There are two such Digital Innovation Hubs in the North-West Region), recognised also as European DIHs, following the European open call during 2021-2022. The DIHs will capitalize on the potential of IT&C companies and start-ups to offer digitization solutions for industry and public administration, and on the other hand, they will contribute to the digitization of areas of regional strategic importance. Public administration will have a particularly important role in Digital Innovation Hubs, as a partner in the Hubs' ecosystem and beneficiary of the digital tools developed and tested in the DIH infrastructure. Public administration will also benefit from digital skills training programs for employees and citizens to adopt the digital tools and innovations on a larger scale, which will contribute to the faster digitalization of the public administration. To achieve these objectives, the Digital Innovation Hubs will organize innovation experiments whose results will be technologies and innovations tested and validated by the public administration and beneficiary industries.

6.1.4. Private funding

Private funding scenery in Romania. Evolution of private investments in Romania 2017-2022 and current status (2022)

Transaction volume in Romanian startups has continued to grow despite challenges in the global tech scene in 2022. The Romanian-born and Eastern European startups are considered well-equipped to handle future challenges. The Central and Eastern European region is one of the fastest-growing regions for VC funding in Europe, with a 7.6x growth since 2017.



Figure no. 24. Romanian enterprise value growth
Source: Startups & Venture Capital in South Eastern Europe 2022, dealroom.co

The country is home to one of the most well-known IPOs in the region (UiPath), three successful unicorns (UiPath, Bitdefender, Elrond), and a wave of new startups awaiting to take off (Fintech OS, Soleadify, eMag, Tokinomo, Flowx AI.). Its particular strength lies in enterprise software, process automation, developer and collaboration tools, software development, cybersecurity, fintech, marketing & sales and creating value.

The success of tech companies is attributed to perseverance, founder's character, taking risks, promoting innovation, and unconventional approaches. The growth in the Romanian venture industry is seen as the successful continuation of an industry on the rise. The Romanian angel investors networks are well organized, with clear processes and very active in the pre-seed and seed rounds. Communication among Romanian angel networks is good and co-investments are the norm.

According to the International Monetary Fund, International Financial Statistics and Balance of Payments databases, World Bank, International Debt Statistics and OECD Romania's net flow of Foreign direct investment was 3,7% of GDP in 2021 - an increasing trend compared to 2020.

The Private equity investments was 0,035% of GDP in 2021, also an increased Annual investment value compared to 2020 (Invest Europe, Central and Eastern Europe Private Equity Statistics 2021).

For 2022, the Key figures of the deals in Romania are:

- In 2022, the volume of deals in Romania was €101.7 million, a 54.3% increase from 2021 after adjusting for outliers.
- The number of transactions increased by 3.5% from 71 in 2021 to 73 in 2022.
- The volume of series A transactions nearly tripled from €15.3 million in 2021 to €42.6 million in 2022 and the number of transactions doubled from 3 to 6.
- The total volume of seed transactions increased by 29% to €56.4 million in 2022, with an average deal size of €1.175.5 million.
- The pre-seed volume declined by 15.9% to €2.7 million with a decreased average deal size of €144.3K.

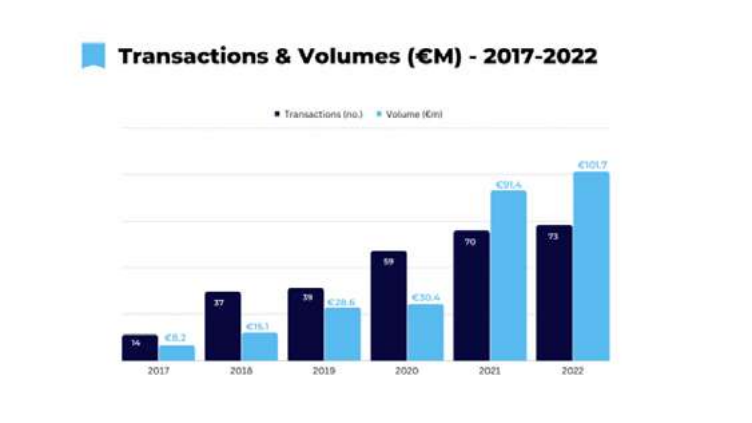


Figure no. 25. Evolution of Transactions and Volumes of venture deals
Source: ROMANIAN VENTURE REPORT 2022

Cluj-Napoca and Oradea - the main regional innovation hubs in North-West Romania

Cluj-Napoca has emerged as a key tech and innovation hub in Romania over the past decade. It is nicknamed as the "Silicon Valley of Romania" due to the development of the first IT clusters in the country. The city has witnessed a tremendous growth in the IT sector with 9% of the workforce employed in IT in 2020 as compared to 2% in 2008.

In 2020, Cluj-Napoca received recognition as a project leader in healthcare innovation and AI in Europe at the Global StartUp Summit. This growth has been supported by a well-developed network of startup community builders, tech events, accelerators, and local investors, leading to the birth of numerous startups and tech startups in the city.

Cluj-Napoca was named the leader in the "smart city development" category by Emerging Europe in 2021, based on its policies aimed at improving urban life. The city is participating in the European Commission's Cities Mission to become climate-neutral by 2030, alongside 111 other cities across the EU, with the potential to access the Horizon Europe fund programme.

Finally, Cluj-Napoca is also an R&D hub, attracting multinational companies in industries such as automotive and consumer electronics to set up R&D centers in the city, including Porsche Engineering and Bosch Engineering.

In **Oradea**, the second largest city in the North West region of Romania, both in terms of population and economic development, in 2020, small businesses made up the majority of companies in the city and were primarily involved in the services and commerce sectors, generating a revenue of €1.54 billion. Oradea had 22 startups with a local focus operating across 21 industries, present in 19 countries and employing over 300 people. Investments totaling over $9 million have been made in these startups. The local government has played a key role in the technological advancement of Oradea and the growth of its startup ecosystem. In 2020, a partnership between the private and public sectors was established with the aim of enhancing the local technology sector, supporting startups, and retaining IT and entrepreneurial talent.

Business incubators, accelerators and start-up support programmes

Innovation Labs[142] is a national pre-incubation and mentorship program for young technology entrepreneurs, reaching its 11th edition in 2023. Teams who will sign up for hackathons and participate in the Innovation Labs program can be, depending on the experience of their members, in one of three categories: teams made up exclusively of students, spin-off teams from university research projects, and teams made up of students and experienced entrepreneurs.

Based in Bucharest and Cluj-Napoca, **Techcelerator**[143] is an accelerator and investment partner for pre seed and seed-level hi-tech start-ups in acceleration and post-acceleration. Innovative young companies with high potential for development and international expansion in growing industries such as Fintech, B2B SaaS, eHealth, PropTech, cybersecurity, AI, digital transformation, etc., are targeted for acceleration and investment.

Techcelerator benefits from the strategic support of the GapMinder investment fund, Google for Startups and collaborates with a few other local and European investors to support the tech ecosystem in Romania and Southeast Europe. Techcelerator has supported over 240 start-ups through previous acceleration rounds and through various support programs, organized by itself or in partnership with other entities in the ecosystem.

InnovX-BCR[144] is an accelerator dedicated to technology businesses developing solutions for domains such as cyber-security, fintech, AI, machine learning, robotics, cloud, automation, or microservices. Businesses can sign up for the program in the following categories: Startups - companies with turnover or funding raised between €500,000 and €1 million, Scaleups - businesses with turnover or funding raised between €1 million and €5 million, developing innovative technology solutions and products. At the end of last year, the InnovX-BCR technology business accelerator completed its first program dedicated to venture capital investment funds in the Central and Eastern European region. Of the 14 teams participating in the program, 6 of them became alumni and are set to open venture capital funds with the aim of investing €155 million in technology start-ups in Central and Eastern Europe in the coming years, with a focus on the Romanian market.

The regional innovation ecosystem in the North-West region of Romania, is supported by a network of organizations and initiatives aimed at helping startups grow and succeed including technology companies, non-profit organizations, business intelligence companies, startup communities, angel networks, funds, accelerators, and co-working spaces.

Transilvania IT Cluster[145] is a network of IT companies that provides training and support for employees, while the **Romanian Tech Startups Association**[146] connects tech startups with key players in the ecosystem. **INNO**[147] , a department of the North-West Regional Development Agency, has launched in August StartUp LevelUP, an educational program that aims to initiate those who wish to enter the world of entrepreneurship. The program is organized in levels, with different themes and activities, which help the participants to develop, regardless of their stage. Business intelligence firm Activize.Tech[148] scouts, advises

142. https://www.innovationlabs.ro/
143. https://techcelerator.co/
144. https://innovx.eu/
145. https://www.transilvaniait.ro/
146. http://rotsa.ro/
147. https://inno.ro/en/home
148. https://activize.tech/

and matches startups with potential partners, and the community-focused Cluj Startups[149] , Fortech Investments[150] and Robin Good[151] help startups with their first steps. **The Transylvania Angel Network** [152] facilitates communication between startups and angel investors, and the pre-seed and seed fund **Risky Business Ventures**[153] invests in young tech founders. The **Spherik Accelerator**[154] offers startup programs at various stages, while RebelVentures operates as a corporate venture capital fund, reinvesting its parent company's revenue into startups. Cluj Hub[155] is a co-working space for entrepreneurs and freelancers.

As a conclusion Romania's venture investment scene is characterized by an increase in the value of initial private rounds, with fewer rounds being made below €200K compared to previous years. This indicates that startups are seeking more significant capital investments to support their growth. Although some small rounds may go unannounced, startups have access to grant programs that can help cover their initial capital needs, though they may not fully address the overall demand. Pre-seed investments are often made through convertible notes, and the raise period can last anywhere from 6-10 months, with some investors joining later with a lower level of risk. Angel investors are also a significant part of the investment landscape in Romania, with well-organized networks that are highly active in pre-seed and seed rounds. These networks have clear processes and strong communication, leading to a culture of co-investment among Romanian angel investors.

6.1.5. Foreign direct investments

According to the National Trade Register Office, the North-West development Region ranked 3rd in Romania in 2019 in terms of the value of subscribed share capital and 3rd in terms of the number of companies with foreign equity participation registered.

According to the study conducted by the National Bank of Romania, the value of foreign direct investment (FDI) in the region was 4,610 million Euros in 2018, representing a share of 5.7% of the total FDI balance. Compared to the reference year, 2014, the region's investments increased by approximately 36.23%, a dynamic above the national growth rate (34.76%).

Of the total FDI in greenfield enterprises (investments made from scratch by foreign investors) registered at national level, in 2018 the region attracted 6.1% of the total investments of 51,150 million Euro, ranking fourth after Bucharest-Ilfov, Centre and West.

In terms of share in total FDI in the country, the position held by the North-West Region is constant (5th place nationally between 2008-2018), attracting, by the end of 2018, 5.7% of the total value of FDI in Romania. The top regions are Bucharest Ilfov (60.7%), Centre Region (9.0%), West Region (8.6%), South Muntenia (6.3%). The least attractive for foreign investors is the North-East Region (2.4%).

In the period 2014-2019, the registrations of companies with foreign shareholding registered a negative trend, their number decreasing by 11%.

149. https://clujstartups.com/
150. https://www.fortechinvestments.ro/
151. https://robingood.ro/
152. https://taninvest.ro/
153. https://riskybusiness.ro/
154. http://spherikaccelerator.com/
155. http://www.clujhub.ro/

Most companies with foreign capital in the North-West Region are concentrated in Cluj county, which for 2019 attracted 43% of investments (353 companies), respectively Bihor county - 32% (263 companies). The majority of foreign direct investments are concentrated in the municipalities of the county capital on the main road transport arteries. Their distribution is uneven, but their concentration in Oradea, Cluj-Napoca, Baia Mare and Satu Mare is mainly justified by their proximity to the Hungarian motorway network and air transport infrastructure.

At the national level, Cluj county ranks 3rd according to the number of companies with foreign contribution registered in the period 1991-2019, with a total of 10.340 companies (after Bucharest and Timis county). In terms of the value of subscribed share capital, Bihor county ranks 4th in the national ranking.

6.1.6. Education environment

The development of the region can be based on qualified human resources, considering that in 2017 the percentage of students in the region's population was 3.65%, above the national average, the number of graduates in science, engineering and technology being 30.08%, percentage which places the region in third place after the Bucharest-Ilfov and North-East regions.

There are 8 **public higher education institutions** (HEIs) in the region, out of the 48 public HEIs on the national level. These also perform research and development activities. Their number is completed by 7 private universities with headquarters in the region that have accreditation, as well as subsidiaries of other 2 private accredited universities. Public universities lead in both student enrolments and research production, and are the only ones to enjoy institutional public funding. However, universities are comparatively new players in RDI and have been struggling to adapt to this new section of their mission after 1990. Their ties to industry, although gradually increasing in some aspects, remain weak overall. R&D activities in academia are rather irregular, depending only on project-based funding and on faculty's publishing efforts. Only 'teaching duties' are clearly defined for individual faculties in virtually all Romanian academia, so 'research duties' are more informally set at 25% of the former. For this reason, in official statistics the number of researchers in universities is estimated simply as the equivalent of 25% of all academic staff. The number of academic staff decreased by 11% between 2010 and 2015. One Romanian university has ever been included in the Shanghai top 500. Universities receive public institutional funding for teaching activities, but not for R&I. They finance their research via projects based on competitive funding, which is open to all R&I actors. Nevertheless, the research performance is a key factor in evaluating the universities and to some extent in quantifying their institutional funding. Also in terms of the share of people with tertiary education and/or working in the field of sciences and technologies in the total active population, the North-West Region has the lowest value for the entire period 2014-2019 compared to the reference regions.

New graduates provide opportunities for knowledge spillovers. Regarding the fields of education undertaken by the graduates, there was a trend during the last decade for obtaining social sciences and humanities degrees, which was reinforced by private higher education programmes [1, p. 60]. The most recent data for **tertiary education graduates** in North West Romania suggest that 51% of the graduates with a bachelor's degree, 38% of the graduates with a master's degree and 55% of the new PhDs in 2015 studied Natural Sciences, ICT, Engineering, Agricultural/Veterinary Sciences and Medical Sciences. In stricter terms, the percentage of the 2015 cohort of graduates with a STEM degree was 32.5% at the bachelor's level, 31% at the master's level, and 35.6% at the PhD level.

The percentage of **persons with tertiary education in the active population** at 20.2% is slightly above the national average of 19.6%, but still at 66% of the EU28 average. In practical terms, this means that the stock of human resources with qualifications that can potentially support innovative activity is low when compared to the EU average.

Regarding **students enrolled in higher education**, according to the INS, 95,046 students were registered in 2019 at the level of the North-West region. At the undergraduate level, their number increased almost constantly between 2014 (68,346 students) and 2019 (72,922 students), although at the national level their number decreased by approx. 1% in the same period.

In terms of the **number of students enrolled at bachelor's level**, the North-West Region ranks second nationally (national total of 407,373 students in 2019) after Bucharest-Ilfov, with a significant proportion of foreign students. The region ranks second (after Bucharest-Ilfov) also in terms of the number of **students enrolled in master's and doctoral or post-doctoral programs**, with 18,086 master's students out of 113,950 in 2019, respectively with 4,038 doctoral and post-doctoral students from total 21,976 at the national level.

According to the INS, in 2017 the **share of graduates in higher education** at the level of the North-West Region was 15.82% of the total of 124,759 graduates at the national level. This share places the region in second place in the national ranking.

The **share of technical graduates**, which include: engineering, manufacturing, construction, information and communication technologies, agriculture, forestry, fish farming and veterinary sciences, places the region in second place at national level, with 16.17%, after Bucharest-Ilfov (30 .78% of all graduates at the national level), increasing compared to 2014, when there was a weight of 15.61%.

A very important indicator in the context of intelligent specialization is the **population that graduated from tertiary education in the fields of science and technology (STEM)**. In absolute terms, the North-West Region registered, in 2019, 364 thousand people who graduated from tertiary education and/or work in the field of science and technology (signaling an increase of 18.5% compared to 2014). Compared to the active population, 26.4% have completed tertiary studies and/or work in the field of science and technology, placing the region above the national average (26.4%), but well below the values of the Bucharest-Ilfov region (53.7%).

6.1.7. Research & Innovation

RDI % GDP - From the point of view of expenditure on research and development activity as a percentage of GDP, the region recorded decreases in the period 2014-2017, arriving in 2017 to hold the last place compared to the analyzed regions with only 0.24%. At the level of the North-West Region, the total expenses for CD activity increased in the period 2014-2018 by 18%, reaching a value of 54.4 million euros. At the same time, the region decreased from this point of view in the national ranking, in 2018 occupying only the 5th position in front of the Regions: North-East, South-West Oltenia and South-East, while in 2015 it was placed on 2nd place, after the Bucharest-Ilfov Region.

The value of R&D expenses per inhabitant recorded in the North-West Region has fluctuated in recent years, the maximum value being 29.3 euros/inhabitant in 2015, in 2013 being 19.8 euros/inhabitant and in 2017 21.1 euros /resident. This indicator places the region below the national average of 48.1 euros/ inhabitant in 2017 and well below the European average of 624.2 euros/inhabitant. At country level, the North-West Region ranks 3rd, after the Bucharest-Ilfov Region (268.6 euros/inhabitant) and the West (38.9 euros/inhabitant).

R&D Units - Economic development through innovation can be supported by R&D units - the region presenting the highest concentration of them after the Bucharest-Ilfov Region - and those of higher education in the region, including Babeș-Bolyai University in Cluj, the best-rated university in Romania internationally.

In the North-West Region there are 34 public research and development units, out of the total of 263 at the national level, respectively:

- 1 national research and development institute under the coordination of the Ministry of Research and Innovation
- 5 branches (of which 2 with legal personality) to which are added 2 research workshops of national research and development institutes based in the capital
- 5 institutes (of which 3 with legal personality) and 1 research center of the Romanian Academy
- 15 research stations with legal personality of the Academy of Agricultural and Forestry Sciences (ASA)
- 7 public universities, which bring together 15 prestigious institutes, 5 experimental research teaching stations, over 200 research centers and over 65 research laboratories
- 6 public health units located in Cluj-Napoca, with secondary R&D activities
- 2 branches without legal personality of the Academy of Medical and Technical Sciences respectively

The region stands out both at the national level and in comparison with other regions in Central and Eastern Europe, in terms of the number of higher education institutions (especially public) and the specializations offered. According to INS statistical data from 2019, the region ranks second in the national context, after Bucharest-Ilfov, in terms of the number of universities (13). There are 7 public universities in the North-West Region, out of 55 at the national level, and 6 private universities, out of 35 existing at the country level.

According to INS data, in 2019, there were 90 faculties in the region out of 546 at national level, the first place being the Bucharest-Ilfov Region with 157. The faculties in the region can be found in every county, most being in Cluj counties (49) and Bihor (22). Out of 407 faculties - public property existing at the national level, there are 70 in the North-West Region, compared to 95 in the Bucharest-Ilfov region. At the regional level, Cluj County ranks first, with 42 public faculties, followed by Bihor with 16.

The region hosts 7 top-performing advanced research public HEIs and around 15 public research organisations, ranking the region second after Bucharest-Ilfov in terms of number of HEIs, specializations and research institutes. Three non-public universities, with regional headquarters operate in Cluj-Napoca, 3 in Oradea, as well as one in Cluj-Napoca and Baia Mare.

The private research organisations represent a small minority. The SME sector typically does not perform R&I activities, as they are considered to be too risky, while several large multinational corporations have limited R&I activities in the region. Few high-tech sectors emerged recently, such as the ICT sector. According to data available through the ERRIS portal (erris.gov.ro), most of the region's research facilities and infrastructure is located in or around Cluj-Napoca (214), with Oradea (25) and Baia Mare (9) being the second and third poles, respectively.

The share of personnel involved in research and development in the total active population in the period 2014-2017 also decreased by 0.02 pp., reaching in 2017 the value of 0.266%, thus placing the region in 11th place out of 11 analyzed regions.

R&D employees - According to INS data, in 2018, in the North-West Region, 3,484 employees were active in units with CDI activity (of which 67% were researchers), representing 7.79% of the total number of employees in Romania in this sector. The North-West region ranks 5th in the national hierarchy in terms of this indicator.

In the same year, there were 29.5 employees from the CD activity compared to 10,000 civilian employed persons, the region occupying the 3rd place in the national hierarchy. At the NUTS 3 level, Cluj County ranks 6th in the national hierarchy (with 90.5 CDI employees/10,000 civilian employed persons), an aspect that can be correlated with the presence of the Cluj-Napoca University Center in the county.

The number of employees in the CDI activity in full-time equivalent in the region was 1,964 employees in 2018 (representing only 6.1% of the national total). The overwhelming majority is found in Cluj County (92%), followed by Bistrița-Năsăud County (4%).

Researchers - In 2018, the number of researchers in the North-West Region was 2,334, representing 8.5% of the number of researchers in Romania (a total of 27,471 researchers), the region ranking 4th in the national hierarchy after Bucharest-Ilfov (50.44% from Romanian researchers), North-East and West. In the period 2014-2018, there was an 18.96% increase in the number of researchers in the region, while the number of technicians and related personnel remained practically constant. Cumulatively, 77% of researchers in the region come from the public sector (government and public higher education) and 23% from the private sector (business and the civil sphere).

Innovation and Technology Transfer entities - At the national level, there are 37 innovation and technological transfer accredited entities and 10 entities provisionally accredited, according to the data provided on January 1, 2021.

The North–West region hosts 7 accredited ITT entities: CTT-CENTI IIT, CTT IPA CIFATT Cluj, CIT TEHNOINF BM, Industry Liaison Office CIVITTA OLI@ Cluj, Baia Mare Technological Information Center CIT-UTCN-CUNBM, Technological Transfer Center Oradea CNCG-CTT and Technical University of Cluj-Napoca and 2 provisionally accredited entities: Cluj-Napoca Municipal Hospital and INCDTIM Cluj-Napoca.

Patents - Regarding patent applications to OSIM, in 2018, 129 applications were submitted at the level of the North-West Region, representing 11.25% of the 1,147 applications submitted by Romanian applicants at the national level. Of the total number of applications submitted to OSIM, 31.65% were finalized by the issuance of patents, registering a slight decrease compared to 2014.

In the period 2014-2019, 213 patents were issued at the level of the region, Cluj County holding the largest share (over 70%), an aspect explained by the concentration of universities and research institutes in the region in Cluj-Napoca.

6.1.8. Public authorities - innovation and digitalisation

In the public sector, digital technologies enable governments to operate more efficiently and to provide more citizen-oriented services. However, the increased pace of evolution technology, budget constraints, combined with the change in the demographic structure generate new challenges to which public authorities must find solutions. Use of technology of information and communications (ICT) and e-government strategies is now reaching new levels of maturity (eg: digital government), where technologies and user preferences are integrated into production and service delivery and are part of wider sector reforms public.

Public authorities must adopt measures to modernize the infrastructure to offer citizens an easy interaction with public platforms, both from the point of view of communication, as well as the use of the filling and uploading functions of the forms. In 2020, 12.4% of people between the ages of 16 and 74 interacted with public authorities via the Internet, at the level of the North-West Region.

Ghiseul.ro

The National Electronic Payment System (SNEP), also known as www.ghiseul.ro, is the system through which Romanians can pay their taxes online. The Ghiseul.ro system is administered and operated by the Agency for the Digital Agenda of Romania (AADR), an institution subordinate to the MCID. The online payment platform was made available free of charge by the Association for Electronic Payments in Romania (APERO). This is an association that promotes electronic payments and is made up of 14 major banks, international card schemes (VISA and MasterCard), processors and technology providers.

Since 2021, Cluj-Napoca has a **Digital Transformation Strategy** focusing on Smart living - integrating digital technologies in the community's life; Digital skills and digital inclusion, Interconnected digitalisation.

Since 2018, **Oradea municipality and metropolitan area has a Smart City Strategy**, addressing digitalisation of the public administration, as well as green and tourism components.

E-primariacluj

Cluj-Napoca City Hall uses new technologies to make Cluj-Napoca a more "intelligent" city in terms of solutions for the multiple problems that arise in an urban agglomeration, but also to give citizens the opportunity to express themselves and to offer effective solutions in the relationship with the local public administration.

Cluj-Napoca City Hall expands digital communication with citizens through the e-primariaclujnapoca.ro platform. The citizens of Cluj can thus create an account for digital communication of documents in relation to the City Hall on www.primariaclujnapoca.ro. The user account allows the communication and viewing – in digital format – of tax administrative documents, submission of applications, registration, online payment of fees and taxes, parking service, civil status documents and document issuance appointments.

Best practices for urban regeneration and social innovation

1. Participatory budgeting - is a process initially launched by Cluj-Napoca City Hall and now adopted by Oradea and other cities in the country, through which the ideas and initiatives of the Cluj community are manifested and transformed into reality, using a platform for proposing and voting community project ideas to be financed and implemented by the city hall. It is an open, inclusive and transparent process through which community members are directly involved in formulating decisions regarding the priorities for spending money from the local budget.

2. Com'ON Cluj-Napoca - participatory budgeting for youth process, launched in the context of the Cluj-Napoca 2015 European Youth Capital program. The purpose of Com'ON Cluj-Napoca is to carry out a process facilitated by the generation, development, collection of community initiatives proposed and implemented by informal groups of young people in Cluj-Napoca and supported by public funds. The process is based on the principles of participatory budgeting. The strategic objective is to create a portfolio of at least 45 initiatives proposed by young people and addressed to the local community, initiatives that will contribute to the active participation of residents in community life, take place in public and community spaces and ensure free access without a financial barrier (ticket).

Com'ON Cluj-Napoca aims to involve young people from the local community in the development of the local community through a mechanism based on the principles of participatory budgeting. The mission of the Program is to strengthen the role and support given to young people and informal groups, formed by them in their active participation, in changing society through a process of sustainable, responsible and inclusive urban development.

The participatory process Com'ON Cluj-Napoca is implemented by the PONT Group and is primarily supported by the City Hall and the Cluj-Napoca Local Council. The Romanian Commercial Bank joins the participatory process by supporting the co-financing of the project.

3. Cluj-Napoca Civic Innovation and Imagination Center - The City Hall of Cluj-Napoca inaugurated the Civic Innovation and Imagination Center (CIIC) in October 2017, with a debate on the theme of the Railway Park - Competition for solutions for the rehabilitation of the park. Under the slogan "We imagine the future of the city!", the Center for Innovation and Civic Imagination has become a permanent laboratory in which to develop the various forms of collaboration between actors in the city.

Some of the main activities of CIIC are:

- Public consultations and participatory governance mechanisms. Since 2017, CIIC has been organizing public debates on various projects related to the development of the city of Cluj-Napoca. Starting in September 2022, with the support of the new CIIC Board, these public consultations will include new, interactive methods of debate.
- Cooperation with the university and private environment. CIIC aims to gather, in the future, all the positive energies of the city in an organized framework where these ideas can be analyzed and debated together with experts from the university and private sector.
- International cooperations. With the support of the Board, the CIIC team will develop clear international cooperation mechanisms with cities and networks of cities at European and global level, for exchange of experiences, best practices and collaboration.
- International competitions of solutions for city projects. The City Hall of Cluj-Napoca continues

its partnership with the Romanian Order of Architects for the running of solution contests and the identification of the best projects for Cluj's public space, through a validated procedure and based on selection criteria at European standards.

- Cluj-Napoca Innovation and Experiment Fund (FIX Cluj) is the result of a co-design process of the Cluj innovation ecosystem and is one of the projects aimed at encouraging and developing the city's human resources in the field of innovative entrepreneurship. It is a unique project in Romania, which helps young people from Cluj-Napoca to create innovative entrepreneurship initiatives, has entered a new stage. The first innovation fund dedicated to financing the entrepreneurial initiatives of young people from Cluj was launched at the end of 2021 by Cluj-Napoca City Hall, the C-EDU Education Cluster and the Botnar Foundation, being the result of a co-design process of the Cluj innovation ecosystem.
    - Currently, from 145 innovative proposals, received following the publication of a dedicated call in this regard during October 2022, 40 ideas have been selected to participate in the next stage of the project. The ideas were awarded by Cluj-Napoca City Hall with a first prize worth 3,000 euros. The teams are made up of young people aged between 16-26 who live, study or work in Cluj-Napoca.
    - The young people presented their ideas to their colleagues from the opposing teams during the first FIX Cluj event this year, FIX Kick-Off 2022, held online on January 26. By March 2022, the selected teams will undergo a training and mentoring program where they can improve their ideas, before presenting them again to the jury for a possible second round of funding of €12,000 under the program of social innovation. The program helps teams with grants of up to 50,000 euros to experiment, test and develop their innovative projects.

- Support actions for the implementation of the European Commission Mission "100 smart and climate-neutral cities by 2030". The CIIC Board will initiate and propose projects aimed at achieving climate neutrality objectives by 2030.
- Local level translation of the Sustainable Development Goals (SDGs) into investment programs and projects. With the help of the Board, the CIIC team will ensure the integration of the Sustainable Development Goals in local public policies, supporting the implementation of the city's green projects.
- ***Youth Advisory Council***. The CIIC Board will support the mechanisms of youth involvement in the decision-making process and the development of public policies for the youth sector. Also, the CIIC Board will support the implementation of the youth action plan "Cluj for Youth 2030", which combines a series of projects from the urban and metropolitan level.

4. Cluj Cultural Center (CCC) - is a non-governmental culture and sustainable development organization. The mission of the association Center is to mobilize culture, in partnership with other sectors, to contribute to social transformation and sustainable development.

6.1.9. Conclusions - SWOT Analysis

Investment in Research, Development and Innovation is crucial for advance in science, for finding solutions to societal challenges for the development and use of impact technologies, quality of life, productivity and competitiveness, job creation and sustainability. Focused on value added and impact, this investment must have benchmarks for novelty, accountability, openness and sustainability.

Common, cross-cutting priorities of this investment, regardless of strategies and programmes, objectives and the sources of funding available to their implementation (national, NRPR, ESIF, etc.) or international (Horizon Europe, EU4Health, Digital Agenda, etc.) are: the human resource — developing, maintaining and attracting talents to create significant mass and capability in science; research infrastructure prepared for the challenges of open science to support experiments at the scientific frontier and provide technological and certification services; support private innovation, partnerships and technology transfer; concentration of resources and RDI capabilities in functional innovation ecosystems around smart specialisations and transitions.

The Romanian R&I system under-performs relative to the potential of the country and to its European peers, although several individual elements show excellent performance and high research quality. This system is too small compared to similar countries both in the number of individuals performing R&D activities and in terms of the size of R&D investments. At the same time there is a high number of public research units implementing R&D under MCID, ME, RA and a variety of other ministries, which makes the system complex.

STRENGTHS	WEAKNESSES
- Public and private research infrastructure and R&D-innovation activity well targeted in the region; - Cluj-Napoca is the research and development pole of the North-West Region; - High employment in high and medium to high tech manufacturing and high tech services knowledge - Increasing the number of researchers in region in the last 6 years; - There is a high proportion of women researchers; - Intensive research and development activity in higher education organisations and the sector government, underpinned by a high share of RDI spending, especially on industry and services; - The innovation and TT infrastructure is constantly developing; - Increased innovation capacity of product; - Increase in the percentage of people employed graduates of higher education institutions; - Steady growth of intelligence- intensive services such as R&D and ITC; - High density of SMEs; - Existence of strong clusters in areas of smart specialisation; - Increased digitisation and use of new techniques for managing information in public administration (e- government); - Information technology and computing remains a highly specific cross-cutting area in the region	- Low share of expenditure on R&D&I in regional GDP; - Low share of RDI expenditure in the private sector; - Low share of researchers in private sector in the region; - Low share of firms considered innovative and the need for an innovation policy mix; - Labour productivity is below the national average in all industries in apart from agriculture and information and communications; - Level of investment is below the national average and below the EU average; - Lack of dialogue and synergies between actions by public authorities and the private sector, in particular to develop business infrastructure; - Most companies in the IT and financial services in the region focuses on outsourcing activity; - Lack of an operational science and technology park in the region; - Low level of digitisation local governments; - Lack of involvement of interested companies

OPPORTUNITIES	THREATS
- European funding between 2021 and 2027 to encourage RDI; - Prospects for sustaining and developing research and innovation capacities and adapting advanced technologies; - Prospects for growth SME competitiveness and job creation through productive investment; - Funding for projects on skills development for smart specialisation, industrial transition and entrepreneurship; - A favorable EU legislative framework and political and financial support for emerging sectors such as energy renewable energy, cultural and creative industries, bio and nano-technologies, circular economy, etc.; - Existence of natural resources valuable in the region; - Existence of tourist attractions based on natural resources; - Existence of nationally and internationally recognised higher education structures for human resources training.	- High degree of co-financing requested under state/regional aid schemes for RDI projects; - Unfavorable national context for innovation; - Increased competition from imported products and services or from other regions of the country; - The decline of IT and financial services sectors specializing in outsourcing as a result of opening markets with cheaper labor; - Increased external migration, in particular in the young population; - Negative impact of Pillar II labour - Development of emerging sectors.

6.2. North-East BULGARIA Regional analysis of the innovation status



6.2.1. Introductory data about the region

According to NSI data the territory of the Republic of Bulgaria is divided into 28 administrative districts (provinces) which are subdivided into 265 municipalities as of 31 December 2019. The towns of Plovdiv and Varna, as well as the municipality of Sofia, are separated into administrative territorial areas. The Varna municipality is divided into 5 territorial areas.[156]

The total population in Bulgaria as of 31.12.2021 is 6 838 937, BG 33 has 913 468 inhabitants.[157] BG 33 is approximately 13.4% of the total population of the country. 13.20% of the country's area is in the (BG33) NER region. With an area of 14 645 sq.km, it is the smallest of the level 2 regions. Compared to the other two northern regions, the NER's economic situation is considered to be favorable.

According to NUTS 2021 classification[158] Bulgaria is classified with the code BG, where **NUTS 2 region – (BG33) The Northeastern Region (Severoiztochen)**, consists of four districts (provinces): BG331 Varna Province, BG332 Dobrich Province, BG333 Shumen Province and BG334 Targovishte Province.

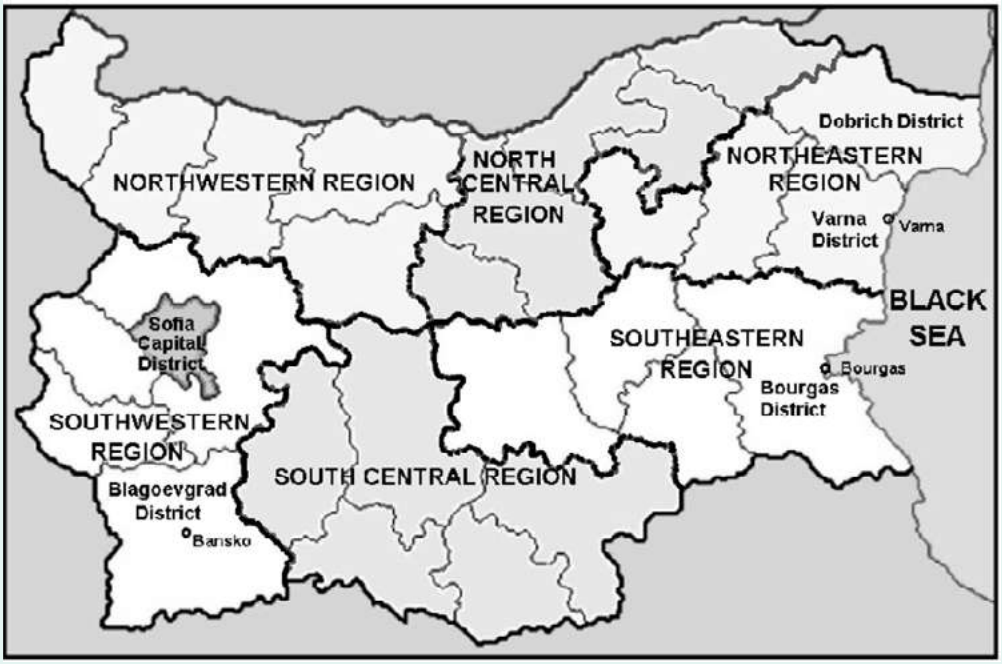


Figure no. 26. TheNUTS II regions of Bulgaria

The region's road network spans 2,682 km, of which 487 km are Class I roads and 95 km are motorways.), **and tourism** (it is among the two leading level 2 regions in the country in terms of tourism development), **the service industry is strongly developed in the region**. Regarding power generated from renewable energy sources, NER is in the first place. Another indicator ranking the region in the 1st place in the country is that it has enduring traditions in agriculture and cereals occupy more than 60% of the region's arable land.[159]

156. Administrative-territorial and territorial division of the Republic of Bulgaria as of 31 December 2019 (nsi.bg)
157. https://nsi.bg/en/content/2977/population-statistical-regions-age-place-residence-and-sex
158. Background - NUTS - Nomenclature of territorial units for statistics - Eurostat (europa.eu)
159. https://stateaid.minfin.bg/bg/page/432

Varna District



Fig. no. 27. Varna District

The district of Varna consists of 159 settlements, 83.2% is the share of the population in the cities and it is located on a territory of 3819 sq.km.[160] Varna District has a population of 468 614 where the population is concentrated in the municipality of Varna – 341 737.[161] Varna District is the biggest of BG 33 (51.3 % of the total population of BG33 is concentrated there).

Varna is the most developed District in BG33: Economic Development in Varna Province (Very good)

Varna is the only district in the North-Eastern area to succeed in attracting more residents over the past 10 years. Young and active people, a robust service sector that includes traditional tourism and rising number of digital enterprises, and a developed industry support the process of the development of the marine area. With a greater level of wages in the city of Varna as well as in the industry sector in the neighbouring towns, the Varna province leads the North-Eastern region in terms of wages.[162]

Income and living standard: The GDP of Varna District continues to grow and its size reaches BGN 16.3 thousand/person from the population in 2019.

Labor market: The trends of the labor market in 2020 place Varna District in a relatively favorable position. The coefficient of economic activity decreases slightly and remains below the national average. At the same time, however, employment is increasing and unemployment is decreasing to 2.2%, remaining one of the lowest in the country (at 5.2% for the country).

The use of European funds is increasing, but remains relatively low. As of June 15, 2021, the amounts paid to beneficiaries under the district's operating programs are BGN 1.5 thousand/person (compared to BGN 2.2 thousand in the country). Within the district, Byala municipality has the most funds paid out, and least of all – in the municipalities of Vetrino and Dulgopol.

160. https://www.regionalprofiles.bg/bg/regions/varna/
161. Население по области, общини
162. https://www.infobusiness.bcci.bg/sever-8-2-2021.html

Infrastructure: The District is performing very well in terms of the district's infrastructure. Local taxes: In the municipalities in the Varna District, the average level of the local taxes remains high in 2021. Taxes remain one of the highest on trade retail, Real estate properties, and of the legal entities.

Administration: Local government self-evaluations for the advancement of e-Government and the provision of "one-stop shop" administrative services are rapidly rising in 2021 and are well ahead of the national averages. Additionally, transparency is given higher marks as it is best represented in the municipalities of Beloslav and Devnya. Social Development in Varna District:

Demographics: Varna is in second place (after the capital) according to this indicator. Varna District continues to attract citizens and the high mechanical growth rate in 2021– 6.%. The district is among the districts with the highest share of the urban population (83.2% against 72.9% in the country).

Healthcare: In 2020, Varna had one of the lowest percentages of residents with health insurance (83.9% versus 88.7% nationally). The Varna district has more doctors than the national average, yet there aren't enough beds in the hospitals.

Regional statistics - Varna Province[163] (Between the years 2016 and 2020)

- Population decreases with 2530 people (mechanical rate is increasing)
- The unemployment rate (%) decreases with 5 % from 7.1 to 2.1
- The number of enrolled students in all types of schools (primary, junior high school and high school stage) decreases with 1449 students.
- Foreign direct investments in non-financial enterprises (thousand euros) were the highest in 2017 - 1 946 022.5, and the least in 2020 (1 487 864.7).
- Costs for acquisition of tangible fixed assets (TPA) (thousand BGN) in 2016 were 951 254 and in 2020 - 1 056 602.

Non-financial enterprises:

- Increase in Turnover (thousand BGN): In 2016 - 15 556 339, in 2020 - 17 693 257
- Increase in Produced output (thousand BGN): in 2016 - 9 004 396, in 2020 - 10 059 383
- Increase in Added value by factor costs (thousand BGN): in 2016 - 3 428 400, in 2020 - 4 257 382

Research and development

- Decrease in Costs for scientific research and development (R&D) - (thousand BGN): 2016 - 34 444, in 2020 26 459 (highest number is for 2019 - 42 560)
- Increase in Personnel engaged in scientific research and development (R&D) - number: in 2016 - 2 138,in 2020 - 2383.

163. Област Варна | Национален статистически институт (nsi.bg)

Information society

- Increase with 3.7 in Relative share of households with internet access (%): in 2016 - 73.8, in 2020 -77.5
- Increase with 5.3 in Relative share of persons aged between 16 and 74 using the Internet regularly (every day or at least once a week) - %: in 2016 67.2, in 2020 - 72.5.

The education component of social development is stated to be average.

Students in colleges and universities 1000 people (2021) 50.00 students:

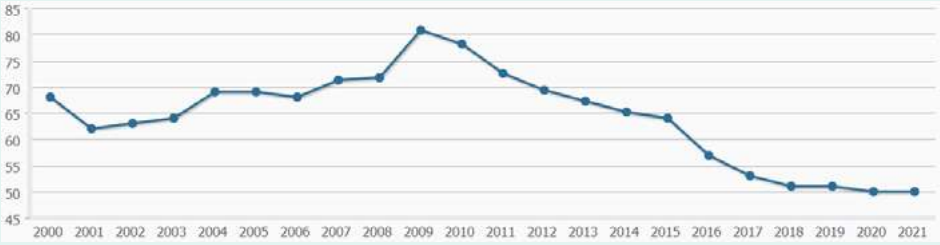


Fig. no. 28. Source: https://www.regionalprofiles.bg/en/regions/varna/ 2000 – 68; 2009 – 80.76; 2015 – 64

City of Varna: The most developed area in Varna Province/District:[164]

With a total production value of approximately BGN 10 billion in 2018 and 215,000 people employed throughout the district in 2019, Varna is the region's major economic hub. The "maritime capital" of Bulgaria has a top-notch educational system, is known for drawing talent, and has effectively reoriented its economy toward greater added value by using digital skills and research and development initiatives in the shipbuilding, informatics, and medical fields.

In the areas of public services, business, financial services, insurance, transportation (Located on the Black sea Coast, water transport is represented by the Varna port complex, which serves important national public transportation,and it is a part of the country's enlarged TEN-T network. Rail connections to lines 2 and 3 are available at the port, another port in BG33 of great importance is the third-largest cargo port on our Black Sea coast - Port of Balchik. Cereals, liquid vegetable oils, and livestock are the principal exports. Air transport is provided by Varna Airport.

Regional Comparative advantages

- The specific geographical location of BG 33 as the only NUTS2 region bordering two large water basins and transport arteries - the Danube and the Black Sea,
  - the only naval academy in the country is situated in Varna,
  - high level of performance of maritime industry and maritime shipping and services related to maritime transport and port activities;
  - well developed tourism sector

164. Varna_Profile_IME_2020_EN.pdf

- The wealth of cultivated land - The gross added value by the agricultural economic sector is the highest in the region.
- The quality of human potential - large number of higher education institutions and enrolled students in secondary and higher education, continually rising average wages, etc.
- Varna province has the potential to be a regional IT hub:
  - rising number of digital enterprises (The ICT sector is most rapidly developing in the city of Varna)
  - The Technical University located in Varna is generating young graduates ready to join the labour market each year after completing Bachelor, Master or PhD degrees. Other 6 public and private institutions in the region are providing education in IT, Tech, engineering fields in numerous disciplines related to the needs of the labour market.
- The existing industrial structures are prerequisite for the high potential of the industrial and technological sectors further development: chemical industry; metal and mechanical engineering and machine building; shipbuilding and ship repairing; light and food industry; textile industry; electrical engineering;production of building materials and construction, production of furniture, etc.

Dobrich Province



Fig. no. 29. Dobrich Province/District

Economic Development in Dobrich Province[165] (Good):

The GDP per capita in the district continues to grow, but the growth and its size are smaller than the average for the country. The district's unemployment rate is rising along with the decline in economic activity. Although it is still lower than the national average in terms of population, the district's use of European funds is expanding.

As of June 15, 2021, the value of the paid funds to beneficiaries under the operational programs is 1,722BGN/person of the population (at BGN 2,217/person in the country). In the municipalities of the district, local taxes are comparatively low in 2021. The evaluation of the municipalities for the transparency of the local self-government bodies is increasing significantly in 2021 and the district takes the top place with 83.6% (compared to 73.2% in the country). The ratings for the transparency are particularly high in the municipalities of Dobrich and Balchik. However, the development of e-government and the provision

165. https://www.regionalprofiles.bg/bg/regions/dobrich/

of "one-stop" administrative services in the municipalities of the district improved in 2021, but one-stop services lag behind national average scores. The mechanical growth rate is rising and is positive for the first time in almost 15 years.

Shumen Province

Economic Development in Shumen Province[166] (Average)



Fig no. 30. Region of Shumen

The GDP (reaches BGN 10.2 thousand), income and wages are continually increasing but still below average for the country. Employment is declining and unemployment is increasing in the Shumen district, both indicators are also still below average. The educational level of the workers continues to be a problem for the labor market. The district is among the areas with relatively small amounts of use of European funds. As of June 15, 2021, the value of the amounts paid to beneficiaries under the operational programs is BGN 1,690/person (compared to BGN 2,217/person in the country), the municipality of Novi Pazar has the highest share of use of operational programs.

The majority of the country's first-class roads and highways are found in Shumen. Local tax rates in the district's municipalities are comparatively low. The appraisal of the local self-government bodies' transparency is greatly improving. Local administrations' self-assessments on the development of e-government and the provision of one-stop administrative services increase in 2021 but remain relatively low. Healthcare suffers from a shortage of doctors and hospital beds.

166. https://www.regionalprofiles.bg/bg/regions/shumen/

Targovishte Province

Economic Development in Targovishte Province (Average)



Fig no. 31. Region of Targovishte

Eurostat data is presenting a 13.90% decrease in the population density in the period 2009-2018.[167] Although the district's GDP is growing pretty quickly(reaches BGN 10.5 thousand), its overall amount is still quite small (approx. BGN 17.2 thousand in the country). The amount of poverty is dropping. Indicators of the labour market place Targovishte as having the worst performance. A huge challenge for the labour market in the district is the deteriorated educational status of the workforce.

The condition of the road surface is among the best in the country. District administrations continue to rate themselves higher than the national average when it comes to e-government development. The use of European funds in the area remains low. As of June 15, 2021, the amounts paid to beneficiaries under the operational programs are BGN 1,321/person at BGN 2,217 in the country, and there is no municipality in the district that even reaches the average value in the country. Local taxes in the district are low. In 2021, the self-evaluations of the administrations in the region for the advancement of e-government and the provision of one-stop services grew and are higher than the national average. In 2021, the transparency rating for the district is 76.0% (compared to 73.2% in the country), being the highest for a municipality Targovishte, and the lowest – for Opaka municipality. Access to general practitioners (doctors) in the area is very limited.[168]

6.2.2. Macroeconomic indicators and business environment

Gross domestic product

According to NSI data at NUTS 2 district level as of August 2021 the gross domestic product in the Northeast region in 2019 reached BGN 12.3 billion. Among BG 33, Varna region has the largest contribution - 62.60% (BGN 7.7 billion), and Targovishte region is in last place with 9.75% (BGN 1.2 billion). Varna province (BGN 7,346 million for 2020 or 60.7%) is the most successful during the period of the analysis, and Targovishte province has the lowest indicators (BGN 1,217 million).

167. https://stateaid.minfin.bg/bg/page/432
168. https://www.regionalprofiles.bg/bg/regions/targovishte/

The North-East region of Bulgaria ranks third in the country in terms of gross domestic product, behind South-West and South-Central Bulgaria, with a value of BGN 13,300 per person. The Varna area also has the highest gross domestic product per capita for 2019 with BGN 16,000. In 2019, the region's gross added value was BGN 10.6 billion, of which BGN 6.6 billion was in the Varna region.[169]

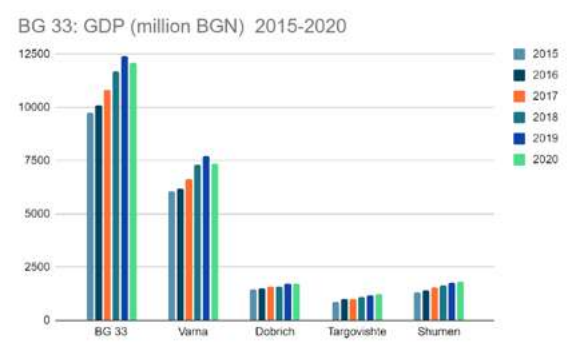


Figure no. 32. GDP evolution in BG 33: GDP (million BGN) 2015-2020[170]

GDP AND GVA BY ECONOMIC SECTOR

In 2020 Varna province accounts for 60.66% of the GVA in the region, 60.67% of the GDP and has the highest GDP per capita in the region. From the total regional GVA the industry sector GVA is 27.41% and 66.15% is the GVA from the Services sector.

According to statistics of the Institute for Market Economy[171], more than half of the GDP in the north region of the country is accumulated in Varna Province (The relationship of the domestic economy level and the industry sector are related mainly to the Devnya area industries and the shipbuilding sector.)

GDP AND GVA BY ECONOMIC SECTOR (evolution over time)

In BG33 during the period 2014 - 2020 the total GDP per capita increased by 34,23 % (2014 -9812 BGN; 2020 - 13171 BGN) and total GDP increased by 29.88% from 9344 to 12164 Million BGN.

In 2021 The GDP per capita in BG 33 region is 15135 thousand BGN (Varna province: 17872 thousand BGN). In the same year the total GDP: 13892 Million BGN.

The GVA 2014-2020 increased by 30.15% (8107 Million BGN , 10552 in 2020), in the Agriculture, Forestry and Fishery with 47 Million BGN or 7.47% (629 in 2014 and 676 in 2020), in the industry sector with 588 Million BGN or 25.68% (2289 in 2014 and 2877 in 2020), and highest increase was in the services sector with 1755 Million BGN or 33.82% (5188 in 2014 and 6943 in 2020).

In 2021 the Gross Value Added by economic sectors in total: 12153 Million BGN (1187 Million BGN in the Agriculture, Forestry and Fishery (9.76%), 3041 Million BGN (25.02%) in the industry sector and 7924 - 65.20% of the total BG 33 GVA are in the services sector).

169. https://www.economic.bg/bg/a/view/ikonomicheski-i-investicionen-profil-na-severoiztochen-rajon
170. https://esc.bg/wp-content/uploads/2022/10/ESC_4_025_2022.pdf
171. https://ime.bg/var/images/pres_SB_020221.pdf

Employment and labor market

The RIS data for 2021 is presenting the share of employment in different sectors, as following:

Share of employment in:	BG 33	BG	EU
Agriculture & Mining	9.1	7.7	4.6
Manufacturing	14.6	18.8	16.4
Utilities & Construction	14.1	10.3	8.2
Services	56.7	56.1	62.9
Public administration	5.6	7.1	7.1
Average number of employed persons per enterprise	5.3	6.0	5.2
GDP per capita (PPS)	12.800	16.500	31.200
GDP per capita growth (PPS)	4.10	5.74	3.21
Population density	64	63	109
Urbanisation	70.4	70.1	75.3
Population size (000s)	920	6,950	446,450

The share of average number of employed persons per enterprise is below average for BG and slightly above average for EU

GDP per capita growth (PPS) is below average for BG and slightly above average for EU.

The share of employment is:

- above average for BG and above average for EU in Agriculture and Mining, Utilities and Construction
- above average for BG and below average for EU in: Services
- below average for BG and below average for EU in: Manufacturing and Public Administration.

Employment in high-tech sectors (high-technology manufacturing and knowledge-intensive high-technology services), Percentage of total employment by NUTS 2 regions, BG33 region data (presented as % of total employment rate): There are 0.1 performance changes between the years 2015 (1.4) and 2021(1.5). In 2020 the value was 1.4 and in 2016,2017, 2018 - 1.9, and in 2019 - 1.6. (the data are aggregated according to the sectoral approach at NACE Rev.2 on 2-digit level and is oriented on the ratio of highly qualified working in these areas).

NUTS Region BG33 Severoiztochen

Population (Inhabitants)	Employment Rate (% of population aged 20-64	Unemployment rate (% of labor force aged 15-74)	GDP 2020 per inhabitants in PPS (% of the EU-27 average)
924 870.0 *2020	71.9 % *2020	6.1 % *2021	41.0 %

In 2021 the ***unemployment rate*** in the Severoiztochen Region (6.1%) scored lower than in the EU (7.1%) but there are numerous regional differences. In 2020, the unemployment rate was as low as 3.4% in Yuzhen tsentralen, but peaked at 13.0% in the least developed region of Severozapaden. According to the European Semester Bulgarian country report 2022 for the period 2015 to 2019, the unemployment rate dropped rapidly, but rose by 2.1 points (pps)[172] in Severozapaden and by 1.3 points in the capital area, in BG 33 Severoiztochen, it increased by only 0.2 ponts (pps). Sofia, the province in Bulgaria's capital, had the highest crude rate of population growth compared to all other EU NUTS 3 regions, with a growth rate of 50.8 persons per 1000 (11 800 people).[173]

The labour market in BG 33 is generally similar to the country data, however the trends in 2020 in the separate areas in BG 33 are different. The labor force is 423.2 thousand people (71.1% coefficient of economic activity - below the average in the country 72.2). Shumen district is the leader with 75%, Varna district - 71.8% and the lowest is Targovishte district - 63.4%. The employment rate for the BG 33 region decreases to 66.7% (country average 68.5%) by 2020. Varna province is the only province in the region, where it is higher than the average in the country– 70.2%. The lowest is in Targovishte province - 56.5%. The unemployment rate in the Northeast region is the highest in the country (followed by the North-West region) - 6.2% (5.2% for the country). In Varna province the unemployment rate is significantly more favorable - only 2.2%, and 10% and even higher in the other 3 provinces that are forming the BG 33. In 2020 the challenges BG33 is facing regarding the labor market in the area are related to the aging population and average low educational level of the workforce.

Indicators:	Value:	Varna	Dobrich	Targovishte	Shumen
Economic activity rate 15-64 completed years	(Per cent)	71.8	69.9	63.4	75
Employment rate 15-64 completed years	(Per cent)	70.2	63.2	56.5	66.5
Unemployment rate	(Per cent)	2.1	9.4	10.5	11.1
Relative share of the population aged between 25 and 64 years with higher education	(Per cent)	24.8	22.3	15.8	24.6
Schools (primary, lower and upper secondary educations stage)	Number	125	67	50	65
Enrolments in all type of schools (primary, lower and upper secondary educations stage)	Number	48927	15237	10397	16703
Foreign direct investment in non financial enterprises as of 31.12	Thousand EUR	1487864.7	369227.0	273659.2	118034
Staff engaged in R&D	Number	2383	331	12	735

172. https://commission.europa.eu/publications/2022-european-semester-country-reports_en
173. Eurostat regional yearbook — 2022 edition - Products Flagship publications - Eurostat (europa.eu)

SME density

According to the NSI the total number of non-financial enterprises in the country is 412 878 from which 389 592 are micro enterprises and 28 532 are SMEs.

The total number of non-financial enterprises in BG 33 for 2021 is 52 167, from which 52 088 are Micro (48 496) and SMEs (3592). Almost 7% of all BG 33 enterprises are SMEs, and if we include and Micro enterprises the number is rising to 99.85%. The ratio of non-financial firms in the Varna province in 2019 reached 71 per 1000 people, which is greater than the national average, while it is nearly twice as low in the Targovishte province, at 37 per thousand people.[174]

Population of active enterprises in BG 33:[175]

Districts in BG33	2015	2016	2017	2018	2019	2020
BG 33 Severoiztochen	51 771	52 695	52199	51 984	51 214	49 693
BG 331 Varna	32690	33366	33020	33 015	32 519	31 525
BG 332 Dobrich	8 624	8 720	8 563	8 461	8 163	7 817
BG 333 Shumen	6 611	6 705	6 707	6 615	6627	6 501
BG334 Targovishte	3 846	3 904	3 909	3 893	3 905	3 850

According to the NSI statistics in BG 33 in 2021 (52 167) the active non-financial enterprises increased with 2474 more enterprises than those in 2020 and with 396 more than in 2015. *(Birth rate is higher than the death rate of enterprises for that period)*. In 2018 the EU enterprise death rate was 7.8 %, while in BG33 Severoiztochen was among NUTS level 2 regions with the highest enterprise death rates (13.2 %).

Number, structure and growth of enterprises by statistical region, Bulgaria, 2018:

Statistical region	Number			Structure			Growth, 2017 – 2018, %			Growth, 2008 – 2018, %		
(NUTS 2)	SMEs	LEs	Total	SMEs	LEs	Total	SMEs	LEs	Total	SMEs	LEs	Total
TOTAL	412782	753	413535	99.82%	0.18%	100.00%	1.78%	1.21%	1.78%	28.12%	-9.39%	28.03%
BG 33	53523	82	53605	99.85%	0.15%	100.00%	0.85%	5.13%	0.85%	19.61%	18.00%	19.52%

174. https://www.regionalprofiles.bg/bg/news/economic-and-investment-profile-of-the-north-east-region/
175. https://ec.europa.eu/eurostat/databrowser/view/BD_SIZE_R3__custom_690164/bookmark/table?lang=en&bookmarkId=d2a6d7f4-d182-4961-9b6a-c33e49a75ee0

In 2018 12.96% of the SMEs in the country were performing in the BG33 region. 99.85% of the businesses in the region were SMEs, they faced growth of 0.85% for the period 2017-2018 and 19.61% for the period 2008 - 2018.

According to the Economic and investment profile of the Northeast region the area's economy is structured similarly to the country, with a higher proportion of agriculture (8% against 4% for the country). The share of gross added value in the agrarian sector reaches 13% in 2019 (compared to 4% for the country) in Dobrich and makes it one of the most agricultural areas in the country and in the region. In the Targovishte and Shumen regions, industry accounts for 1/3 of gross added value (compared to 1/4 nationally), and services account for less than 60% (compared to over 71% nationally). Services make up 73% of the region of Varna's added value, compared to 71% in the country which is strongly related to both the size of the area and its tourist appearance.[176]

BG 33 region has significant agrarian potential, participation of the agrarian sector in the created gross added value (2015-2020 average) is only 7%. The sector with the largest share is the service sector. Its strong presence is present in Varna and Dobrich areas, due to the tourism sector, and for Varna also to the transport sector.[177]

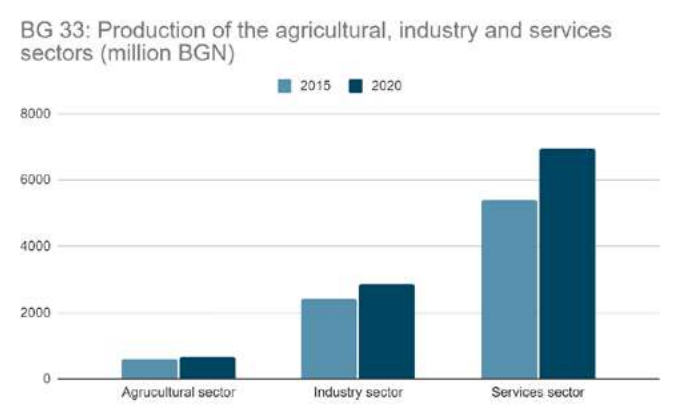


Figure no. 33. Evolution of main sectors in Region BG33, 2-15-2020; Source: https://esc.bg/wp-content/uploads/2022/10/ESC_4_025_2022.pdf

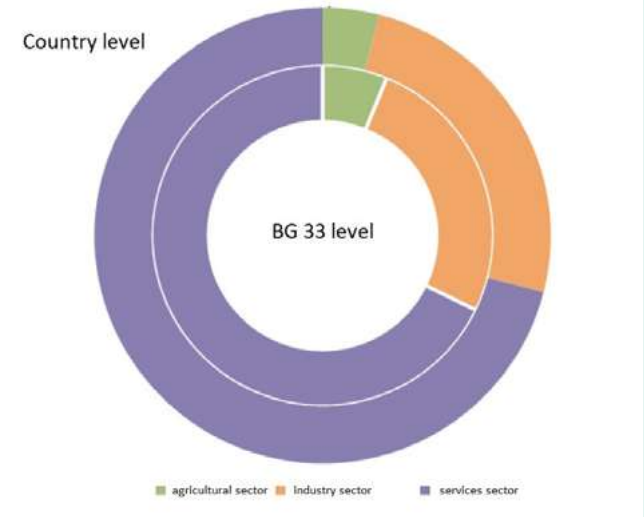


Figure no. 34. The gross added value by economic sectors, %, 2019 according to NSI

According to the Bulgarian Industry Map in the BG 33 region there is a higher number of companies in the IT - ICT, Food industry, Textile, Marine, Furniture and mechanical engineering sectors. The larger proportion of those companies is presented in the region's economic centre - Varna.

176. https://www.regionalprofiles.bg/bg/news/economic-and-investment-profile-of-the-north-east-region/
177. https://esc.bg/wp-content/uploads/2022/10/ESC_4_025_2022.pdf

BG33 Industry Map:[178]

Sector	Varna	Dobrich	Targovishte	Shumen	Total number of companies per sector for BG 33
Automotive	8	8	3	3	22
IT - ICT	557	46	15	46	664
Energy	28	7	3		38
Mechanical engineering	45	13	5	13	76
Mechatronics	4		2		6
Food Industry	323	127	59	123	632
Cosmetics	20		1	5	26
Textile	171	91	32	81	375
Marine	277	14	2	2	295
Furniture	140	43	19	26	228
Biotechnology	3				3
Renewable Energy Sources	2				2
Education and science	15	3		2	20

Analysys from The Institute of Market Economy define the ICT sector as the most rapidly developing in the city of Varna. For the period of 2015 to 2018, the production of IT companies almost doubled, and 600 new jobs were created. The city is already positioned as a leading IT destination, with two major investments from 2019 (Coca-Cola opened a financial services centre and Belgium's KBC opened a shared services centre). According to statistics of the Institute for Market Economy: As of 2019, more than 4,500 people are employed in the ICT sector in the North-Eastern region, mainly working in Varna (1200 more than the people employed in 2013).[179]

In 2022 there are more than 140 IT enterprises performing in the area of BG33 and more than 1200 IT employers hiring in Bulgaria.[180]

Varna Province> Trade and agriculture are the sectors that dominate the ranking for the 100 largest companies in the area. The revenues of agricultural companies in the Varna province grow from BGN 2.53 to 2.62 billion in 2020. Other important sectors in the area are related to tourism - hotels & restaurants

178. https://bgindustrymap.com/bg
179. https://ime.bg/var/images/pres_SB_020221.pdf
180. https://dev.bg/company/select/locationvarna/

(514.4 million), building and construction(2.14 billion), manufacturing (2.48 billion) and the leader is the trade sector with 62.6 billion BGN. The largest production is in chemicals, rubber and plastic goods, food, metal products, glass, concrete, etc., paper and cardboard, electrical equipment, clothing, machinery and equipment, metallurgy, electronics, automobiles.[181]

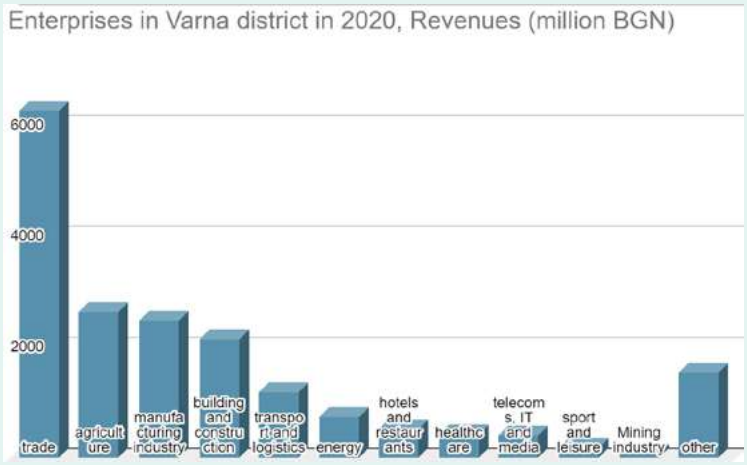


Fig. no. 35. Source:https://www.capital.bg/biznes/kompanii/2022/06/01/4342072_nai-golemite_kompanii_v_oblast_varna_liderite_ot/

From the top 10 companies with the largest revenues in BG 33, 3 are located in Varna, 3 are located in Devnya (Varna Province), 2 are located in Shumen, 1 is located in Targovishte and 1 in Tervel (Dobrich Province).

According to GEM, the Entrepreneurial Framework Conditions in Bulgaria in 2019 are:
(1 = highly insufficient, 5 = highly sufficient)

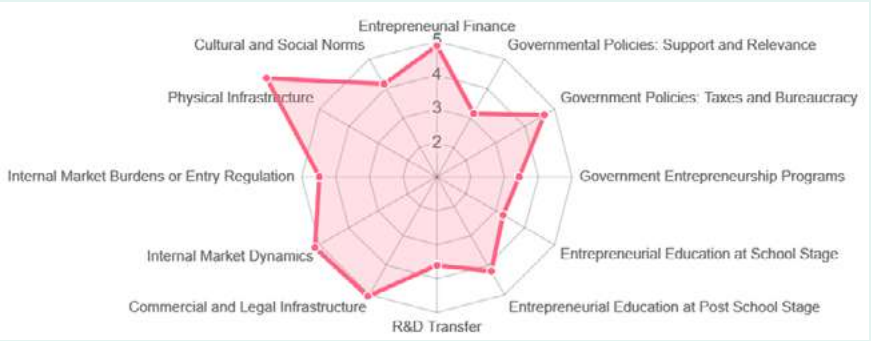


Figure no. 36. Source: Global entrepreneurship monitor

According to the national experts, Bulgaria has a number of significant low performance indicators, however the country' situation is favorable and better performance is observed in comparison to previous years. The most critical ones are related to the entrepreneurship education at both levels - school stage and post school stage and the lack of targeted government policies: Support and Relevance (3.15), and Entrepreneurship programs (3.45), and R&D Transfer (3.62). Bulgaria shows some strengths in entrepreneurial finance (4.88). The strongest among the EFCs in Bulgaria is the access to physical infrastructure (6.82), followed by Internal Market Dynamics (5.17) and access to commercial and legal infrastructure (5.05).[182]

181. https://www.capital.bg/biznes/kompanii/2022/06/01/4342072_nai-golemite_kompanii_v_oblast_varna_liderite_ot/
182. https://www.gemconsortium.org/economy-profiles/bulgaria-2

Innovative companies

Overview of the innovative activities in the bulgarian non-financial enterprises:

- Three out of four SMEs in the EU are equipped with outdated machinery
- In the past five years (55.6%) of SMEs have invested in new technology.
- The share of SMEs with a very low level of innovative activities is decreasing during the period 2011-2020 but half of the businesses engage in low degree of innovative activities.
- In 2019, 29% of SMEs released a new or upgraded product (19.7% of microenterprises, 34.7% of small businesses, and 49.1% of medium-sized businesses)
- 12% of SMEs have their own R&D unit
- In 2016 Bulgaria had a share of innovative firms of 22.7%. Innovativeness is present in 20.5% of small businesses, 44.3% of medium-sized businesses, and 81.9% of large businesses. (NSI data)
- In Bulgaria, SMEs introduce 16.3% of new products or processes, compared to the EU average of 33.3%; 15.7% of new marketing or organisational innovations (while the EU average is 33.4%); 13.8% of SMEs that innovate in-house (while the EU average is 28.9%); 3.7% of SMEs that collaborate with others in new product or process innovations (while the EU average is 12.2%); Sales of new-to-market and new-to-enterprise innovations is 6.0% (while the EU average is 13.4%).(SBA Fact Sheet for 2019)

BG	2020		
	Innovation-active enterprises	Enterprises with product innovation	Enterprises with business process innovation
Total	36.2	22.8	25.8
By industries (NACE Rev. 2)Industry1	41.0	26.3	28.5
By industries (NACE Rev. 2)Services2	31.5	19.4	23.2

ENTERPRISES THAT HAVE NEW OR IMPROVED PRODUCTS NEW TO THE MARKET, AS A SHARE OF ALL ENTERPRISES[183]

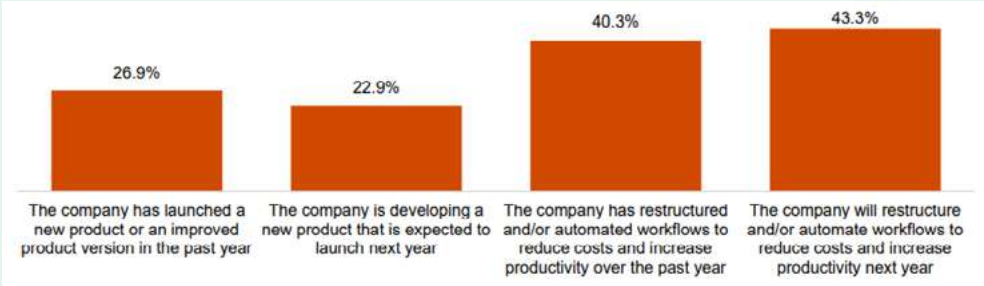
There is an improvement in the means of the innovations activities in the region with 8.2 for the period 2011-2020 and as the enterprises in the region were observed to be with a very low level of innovation activities in the beginning of the observed period they have been developed to the "Rather low level of innovation activity" in 2020.

BG 33: Innovation Index (enterprises)



183. https://www.nsi.bg/en/content/2714/enterprises-have-new-or-improved-products-new-market-share-all-enterprises

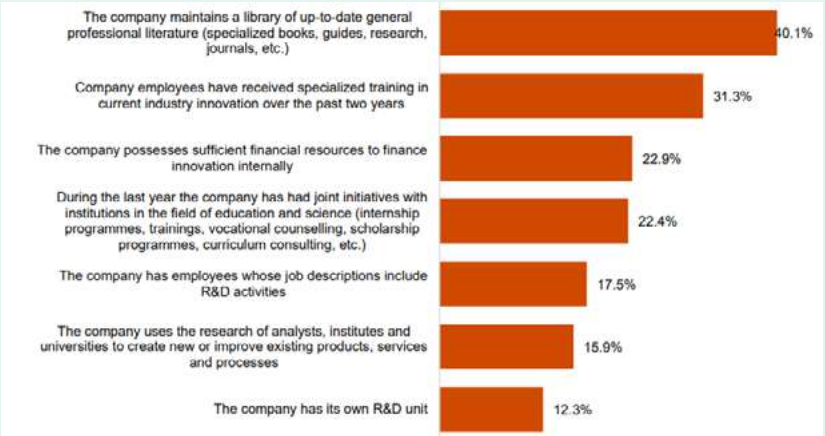
According to The 2019 – 2020 PwC SMEs survey companies are unlikely to launch or plan to introduce a new product but more likely they tend to conduct work process reorganisation. In order to cut costs and boost productivity, a sizable portion of SMEs reorganised and/or automated workflows in 2019 (40.3%), and a somewhat higher percentage plans to do so in 2020 (43.3%). A microenterprise's portion of such innovative activity is 35.4%, a small business' share is 42.9%, and a medium-sized business' contribution is 64.2%.



The share of high performing SMEs for the period between 2012-2020 has been increased in means of Innovations with 2.5%, and in ICT activities with 1.1%.



The development of the innovation infrastructure of the companies relates generally to the maintenance of professional libraries (40.1%). Almost one third of the enterprises have provided specialised training to their employees in the field of current industry innovations (31.3%).Enterprises that claim to have adequate financial means to finance innovation internally make up 22.9% of the total. In 2019, 22.4% of SMEs participated in cooperative projects with academic institutions. 15.9% of businesses use research produced by scientists, institutions, and universities to develop new or enhance already-existing goods, services, or procedures.



6.2.3. Business support framework

Bulgaria has been steadily moving toward being a significant center for innovation after years of serving as a location for outsourcing. More than 400 businesses, 15 venture capital and growth equity firms, and an expanding number of accelerators, supporting organisations, and co-working spaces are located in Bulgaria.

Industrial zones

In accordance with the law for industrial zones in Bulgaria, industrial zones are defined as designated areas of the country's territory where investment proposals by both domestic and international persons and legal companies are fostered[184]. In Bulgaria, there are more than 70 industrial zones operating and more than 5 in process of development.

The distribution of the industrial zones across the country and in GB33 region is the following:

- "National Company Industrial Zones": total 11 - 6 operating (1 located in Varna) and 5 in development (1 in Suvorovo, Varna Province)
- *Other industrial zones* : 68 (incl. 47 Industrial zones and 21 industrial parks in that number): 5 located in Varna province; 4 in Dobrich province; 2 in Shumen province*; 1 in Targovishte province; Also, under the Regional Urban Development Fund in Varna district there are 6 industrial zones, 1 is completed, 1 is under implementation, two are terminated and 2 are in the stage of idea.[185]
- 2 new industrial parks in developed stage (in Dobrich and in Vetrino - Varna province)[186]

Science and Technology Parks (STP):

1. The Black Sea High-tech Park - Varna (BSHTPV) The activity is developed in three main sectors: Researches/ Innovations/ Technologies; High-Technology environmental; Conference Center.;
2. Business Park Varna

Industrial Parks (IP)

In 2021, the new Law on Industrial Parks was promulgated, which for the first time regulates the status of industrial parks. According to the new law "An industrial park is a designated territory, located in one or more municipalities, for which structural, technical and organisational conditions for production activities are provided.

According to production activities, IP is:

- type A – general, in which there is no specialisation of production activities;
- type B – specialised, in which one type of production and related activities or similar production activities are carried out;
- type C – specialised, in which high-tech and related activities are carried out.

184. https://www.bcci.bg/bulgarian/events/industr_zakon.htm
185. https://jessicafund.bg/en/city/varna-en/?sector_filter=228
186. https://www.24chasa.bg/biznes/article/13454430

All industrial zones and parks established in accordance with private sector terms and conditions are required to register in an electronic private sector register, the formation and maintenance of which is within the responsibility of the Minister of Economy.[187]

Business incubators/ co-working spaces

In the late 1990s the first Business Incubator in Bulgaria was registered in Ruse with the aim of supporting SMEs. Since then more than 20 regional business centres, incubators, and agencies for regional development have been established. The Bulgarian Small and Medium Enterprises Promotion Agency (BSMEPA)[188] was established in 2004 as an administrative structure within the Ministry of Economy of Republic of Bulgaria.

There are more than 100 Business incubators/accelerators/co-working spaces in the country . The distribution in BG33 is the following:

- More than 5 Business incubators in BG33: 1 High-Tech Business Incubator, 1 East Accelerator in Varna and more than 10 business centres in the Varna province; 1 Business centre - Business incubator (in Targovishte); 1 Agribusiness Center - Business Incubator (in Shumen) 1 Business centre (in Dobrich);
- More than 10 co-working spaces in BG33.

The majority of incubators were built with funding numerous European projects and other international initiatives. Many business incubators have terminated their activities in the past 20 years due to poor quality of the services offered, a lack of funding and poor management. Some of the current incubators also display flaws in the range of services they offer, such as a lack of coaching and mentoring, mentoring and supporting businesses in the process of access to funding, and access to networks. Universities and other research organisations are rarely represented in the networks of existing incubators. By the number of coworking spaces (ex. about 2% of all the office space in Sofia are co-working spaces) Bulgaria is ranked 19th in Europe by the European Coworking Hotspot Index by Cushman & Wakefield. In Bulgaria the co-working spaces are generally private initiatives of local companies.[189]

Clusters

Clusters in Bulgaria have over 20 years of history, currently being more than 70 clusters. In 2009, for the first time, they united in the Association of Business Clusters. According to the Executive Agency for the Promotion of Small and Medium Enterprise, the clusters are classified as:"Developed", "Developing", and in the initial stage. In 2021 there are "Developed (4) and "Developing" (21) with different areas of activities. In the initial stage – 42 clusters and Uncategorized - 12 clusters.[190]

187. https://www.strategy.bg/PublicConsultations/View.aspx?lang=bg-BG&Id=5019
188. https://www.sme.government.bg/
189. https://www.mi.government.bg/files/useruploads/files/sme/FINAL_DG_Reform_SME%20Strategy_Technical%20Report_2020-04-27.pdf
190. https://www.eufunds.bg/sites/default/files/uploads/oprd/docs/2021-11/4_SIA_BG_Part_2%2008.2021-fin.pdf

In Bulgaria there were 18 Active Clusters until 2020.[191] In 2020 a new cluster was founded - In BG 33 region. In BG33 regional clusters are focusing on marine technologies, information and communication technologies, high technologies, tourism, agricultural equipment, bakery, bee-production and clothing were established. Active Clusters in BG 33:

1. Marine Cluster Bulgaria
2. Black Sea Energy Cluster
3. ICT Cluster located in Varna

Digital Innovation Hubs

According to the SSP[192] There are 7 Digital Innovation Hubs in Bulgaria (5 in preparation, 1 fully operational and 1 – potential from DIHs H2020).

Other significant players of the Bulgarian business ecosystem include:

> **national and regional business organisations and associations** (ex.Technology Transfer Offices and Technology Centres such as RAPIV, **The Bulgarian Chamber of Commerce and Industry, the Bulgarian Startup Association (BESCO), Enterprise Europe Network, the Association of Bulgarian Leaders and Entrepreneurs (ABLE), Bulgarian Business Forums and one of the most significant high-tech conferences in Southeast Europe - Innowave Summit organized by the organization on an annual basis, pre-accelerators (i.e. Start-It-Smart), Startup ecosystems),

> **more than 10 Seed and VC funds/hubs, Business Angel investors, Startup ecosystems** - more than 2 Tech Education providing online platforms, more than 50 Start-up events and communities (at least 5 events are happening on a yearly basis) from which in BG 33 more than 5 start-up events (2 on annual basis), and online access to all of the available start-up online education platforms and events

> **18 Entrepreneurship centres** since 2018 operating in universities in the country.

***The Bulgarian Chamber of Commerce* is a non-governmental organisation established in 1980. The NGO is one of the leading partners of the state in the processes of determining economic policies.[193] There are regional chambers of Commerce and Industry in each province of BG33 as partners of the general entity.

6.2.4. Private funding

A growing number of founders who started their ventures in the country have now raised Series A or even later rounds. As of the beginning of 2021, local entrepreneurs have access to over €200 million in VC capital.

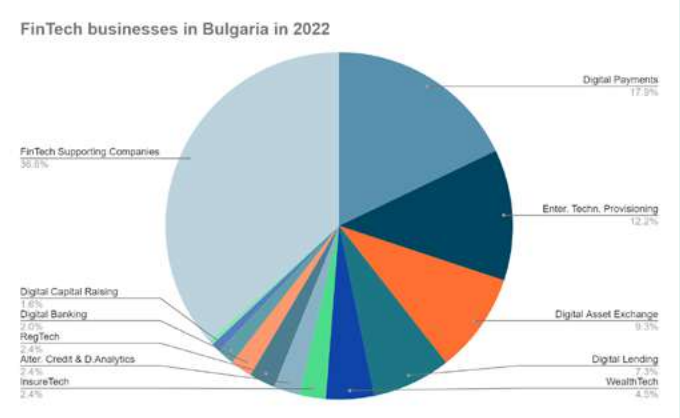
191. https://www.mi.government.bg/files/useruploads/files/sme/FINAL_DG_Reform_SME%20Strategy_Technical%20Report_2020-04-27.pdf
192. https://s3platform.jrc.ec.europa.eu/digital-innovation-hubs-tool?p_p_id=eu_europa_ec_jrc_dih_web_DihWebPortlet&p_p_lifecycle=0&p_p_state=normal&p_p_mode=view
193. https://www.bia-bg.com/

According to the The Annual Fintech Report 2020 released by the Bulgarian Fintech Association:

- There number of fintech businesses in Bulgaria is estimated to be 100 (100, 66 of which are emerging and 34 – established; 84 of the identified Fintech companies are being headquartered in the capital Sofia);
- The fintech industry's overall operational revenue has been expanding quickly over the past three years, steadily increasing by about 25% annually;
- Fintech businesses in Bulgaria achieved a record-breaking operating revenue of EUR 361 million in 2020.
- The Payments sector, followed by Blockchain and Capital Markets, is where the majority of Bulgarian fintech firms operate;
- A third of all VC investments in Bulgaria were made in the fintech sector in 2019;

Annual Fintech Report 2022, data is presenting:

- There are 156 fintech businesses in Bulgaria in 2022 of which 92% are SMEs, mostly located in Sofia - 131, Varna - 14, and Plovdiv - 5 (Digital Payments - 44, Enter. Techn. Provisioning - 30, Digital Asset Exchange - 23, Digital Lending - 18, WealthTech - 11, InsureTech - 6, Alter. Credit & D.Analytics - 6, RegTech - 6, Digital Banking - 5, Digital Capital Raising - 4, Digital Identity - 2, Digital Custody - 1, FinTech Supporting Companies 90+).



- In 2021, the number of FinTech employees reached an all-time high of 11,862.
- a 14% annual growth on average, the industry's total and operating revenues are rising and reached peaks of BGN 1.8 billion and BGN 1.55 billion in 2021, respectively.
- More than BGN 10 million has been invested in Bulgarian FinTech SMEs during the past two years (equals one-fifth of all VC investments made in Bulgaria in 2021).

2022 FinTech Ecosystem Snapshot, Bulgaria:

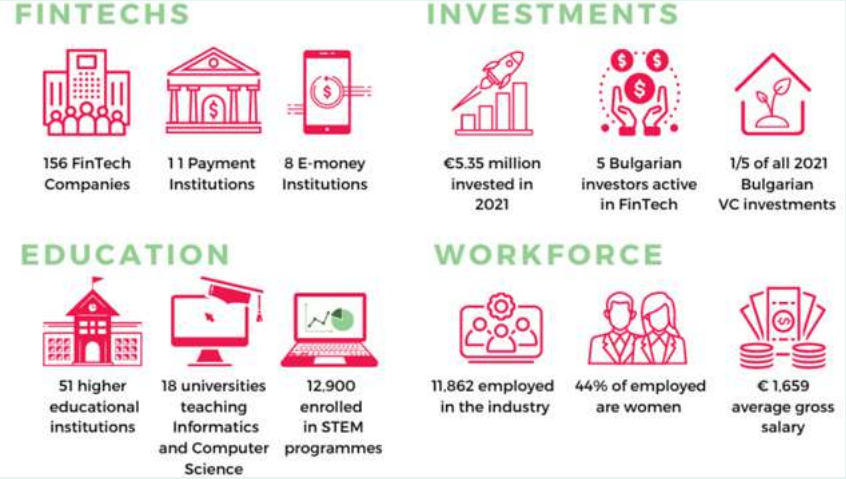


Fig. no. 37. Source: FinTech Ecosystem Snapshot

In 2012, when LAUNCHub and Eleven began supporting and mentoring startups in their early stages of development, the Bulgarian startup ecosystem was established. Following that, the number of venture capital firms in the nation increased along with the number of startups. With some of these startups, multi-million dollar agreements were made when purchasing foreign companies. There is also a network of angel investors offering a variety of financial options who assist start-up businesses in realising their business plans.

According to the Digital Riser Report, Bulgaria was the top digital riser Among countries in Europe and North America in 2020.Bulgaria's superior performance may be mostly attributed to its "Digital Bulgaria 2025" lighthouse initiative, which was introduced in 2018 as an extension of the national program "Digital Bulgaria 2015". Additionally, the Digital National Alliance spearheaded other free programs to advance digitalization, such as ensuring digital skills, coordinating business demands with educational goals, and fostering young Bulgarian talent both domestically and internationally.

Regulations: The Investment Promotion Act (IPA), which established the principle of equality between Bulgarian and foreign citizens and businesses, was announced to require coding in primary schools in 2018. The Bulgarian government designated high-tech industries as preferential, which resulted in cheaper investment capital requirements. Additional government efforts provided benefits to businesses in the areas of social security, taxes, and vocational training. Numerous IPA incentives exist for investments, such as subsidies for R&D and favorable land prices.

Bulgarian growth equity and venture capital ecosystem in 2020

Second and third-generation funds have both completed successful fundraising rounds while new Bulgaria-based funds have been launched. In 2020 Neo Ventures were looking to engage with new prospects in a few specific industries, including health technology, space technology, and AI platforms. With the founding of the EIF-backed Sofia Angels Ventures, the community of business angels is also growing. With EIF on board, there will be a chance for larger tickets to match angel investments, so we see a healthy expansion of the business angel network in the nation.[194]

194. https://bvca.bg/en/overview-of-the-growth-equity-and-venture-vapital-ecosystem-in-bulgaria/

At the end of 2020, a new fund called Sofia Angels Ventures entered the market, it is comparable to the ones already present, but also, it enables angel investors to take part in every transaction. The capital of the fund is expected to be 13 million euros, with participation from the three founders , and the majority of the funding will come from the European Investment Fund (EIF). In addition, each transaction must follow the fund's guidelines, which state that 50% of the investment must come from the fund and the other 50% must come from private investors. This means that at least another 13 million euros must come from a co-investor if 13 million euros are invested from the fund by the end of the investment period. In contrast to the prior model of funds for risk financing, this is the first such fund to be registered in Bulgaria and the first to include the EIF. Up until this point, the venture capital funds operating in Bulgaria were incorporated in either the Netherlands or Luxembourg. The fund's investments will be directed to companies in the field of ICT (information and communication technologies).[195]

With the founding of the EIF-backed Sofia Angels Ventures, the community of business angels is also growing. With EIF on board, there will be a chance for larger tickets to match angel investments, so we see a healthy expansion of the business angel network in the nation.[196] Other examples of importance on a national and regional level are the BBF Angels Club - Experts from the BBF Angels Club assist investors and companies during all stages of market realization or subsequent investment and the The Global StartupVillages Program - a tailor-made support for each young entrepreneur in rural and remote areas.

Trends in the PE and VC in Bulgaria

- Increasing concentration of fund managers in industries where they have developed extensive domain knowledge
- Bulgarian-based businesses (supported by the FMFIB) and managers that are after regional opportunities, with primary private investors
- All funds are expected to develop their own specialised markets and establish their own unique competitive advantages

Examples: In collaboration with businesses, Eleven Ventures is making investments in 4 industries: FinTech, HealthTech, Future of Food, and Future of Work. ***LAUNCHub Ventures*** is making investments in Web 3.0, Blockchain, Marketplaces, Digital Health, Fintech, Proptech, Big Data, and B2B SaaS. The following investment sectors were listed by New Vision 3: FinTech, AI, Big Data, IoT, Shared Economy & Platforms, and Blockchain. Since its start, ***PostScriptum Ventures*** has been committed to businesses that are focused on renewable energy and the environment.

- Some of the VCs focus on assisting entrepreneurs from Central and Southeastern Europe
- The business angels' community has established Chapters in several cities across Europe, including London and Vienna, to support the regional diaspora
- A representation of the business angels' community and a few VC funds are funding significant initiatives, such the San Francisco-based Bulgarian Innovation Hub, which aids in the growth of U.S. -based businesses with roots in Bulgaria.
- International entrepreneurs are establishing operations in Bulgaria thanks to Bulgarian VCs

195. https://forbesbulgaria.com/2021/06/01/%D0%BA%D0%BE%D0%B3%D0%B0%D1%82%D0%BE-%D1%84%D0%BE%D0%BD%D0%B4%D1%8A%D1%82-%D1%81%D1%80%D0%B5%D1%89%D0%BD%D0%B0-%D0%B1%D0%B8%D0%B7%D0%BD%D0%B5%D1%81-%D0%B0%D0%BD%D0%B3%D0%B5%D0%BB%D0%B8%D1%82%D0%B5/
196. https://bvca.bg/en/overview-of-the-growth-equity-and-venture-vapital-ecosystem-in-bulgaria/

Examples: Woom (BrightCap's investment), which recently expanded its Spanish R&D staff by moving them to Sofia. Because of this, programs like ***RE:TURN***, which links the Bulgarian diaspora abroad with the country's investors and entrepreneurs, are crucial and have helped make RE:TURN a landmark project for BVCA.

Bulgarian Fintech Association

The top fintech businesses in Bulgaria are united under the non-profit ***Bulgarian Fintech Association***. The Association's goal is to build a platform that unites all parties in Bulgaria with an interest in the financial technologies industry and to promote dialogue and idea sharing among them. In order to promote the growth of the industry, the Bulgarian Fintech Association works to represent and defend the shared values of its members before regulators, investors, financial institutions, foreign associations, partners, and other parties.

Bulgarian Venture Capital Association, BVCA

The association aims to establish and maintain good communication with the government on matters pertaining to the nation's investment market and on steps that must be taken to create an inviting business environment for investments, including the easing of regulatory constraints and the boosting of tax incentives for pension funds, insurance companies, and other private investors.

SEE REPORT 2022

According to the SEE report 2020 data - South East European startups have increased in total company value by 49.9 times since 2012, much faster than its neighbours in CEE (9.1 times) and the European average (12.1x).

Transportation, Fintech, and enterprise software are leading in SEE. In the area, VC financing is at an all-time high. Combined venture capital funding for firms in the SEE has already surpassed $1.3 billion in 2022. As business owners are increasingly inclined to look for VC funding to expand more quickly. Foreign and domestic investors alike are increasingly interested in creative SEE companies.

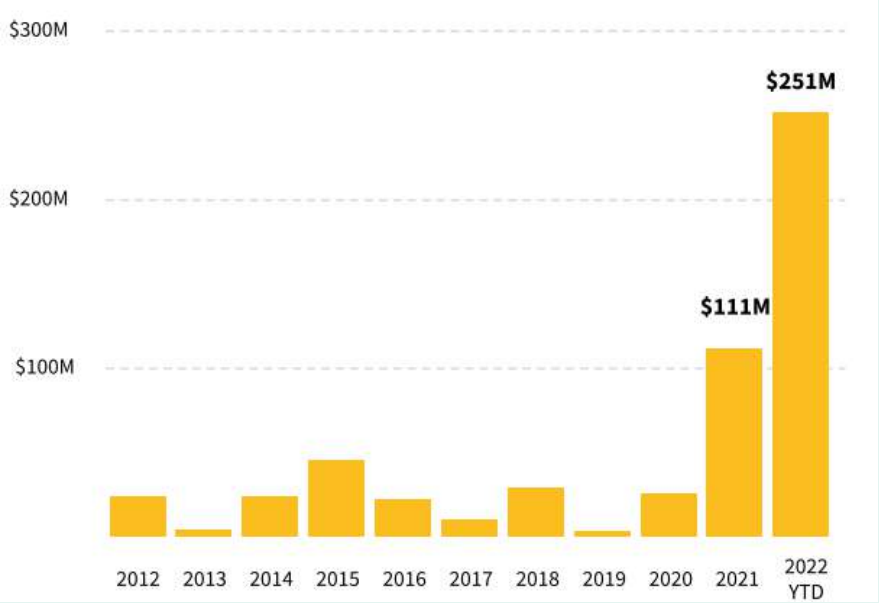


Fig. no. 38. Source: Dealroom.co. AUM - Assets Under Management.

Bulgarian startups are on the top list and 3 times more likely to be VC-backed compared to other SEE startups (ex. in Kosovo, Albania or Montenegro). Country enterprise value growth (2017-2022) is 6.2 times (from $ 903M reaches $ 5.6 B).

SEE has already produced 9 Unicorns, from which Payhawk comes from Bulgaria (2022 year). Bulgaria is in the top 5 in the list of distribution of startup job openings in SEE with 21%, the country is number one in the list for startup job openings per 100,000 inhabitants (80+).

SEE currently has 11 future unicorns spread across 5 countries, those coming from Bulgaria are: Gtmhub, Hyperscience, and Nexo*.



Fig. no. 39. Source: Dealroom.co.

South Eastern Europe is a popular location for international startups opening offices abroad, particularly in Bulgaria (60+) and Romania (115+). In SEE, Bulgaria has the most locally-based funds. 65% of the enterprise value generated in the region to date is in the fileds of enterprise software, fintech, and transportation. With bigger rounds and more venture capital funds participating, the investment climate in Bulgaria has matured. Only after the record-breaking year of 2021 (475M), 2022 is already the second-highest year for VC investment into startups in Bulgaria (with 244M). The next wave of prosperous enterprises in SEE and elsewhere are being developed with the assistance of angel investors (ex. from Bulgaria are Mr. Hristo Borisov, Mr. Georgi Zahariev). Since 2012, Bulgaria has seen a wave of new investment and has seen a huge raise in the funding in the past 18 months than ever before:

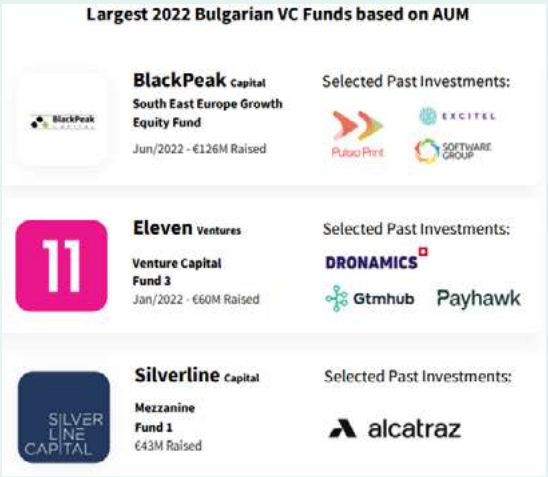


Fig.no. 40. Source: Dealroom.co. AUM - Assets Under Management.

Foreign VC investment into SEE startups as data observed in the SEE REPORT 2022 is presenting the accumulated investments in the 1st headquarter of 2022 to be 1.2 B., in comparison to 1.5 B in 2021, 0.7 B in 2020. Also, it is stated that Bulgaria has received the highest volume of VC funding when excluding megarounds.

There are two Bulgarian organisations with a membership in the EBAN community.[197]

6.2.5. Foreign direct investments

Investment growth in the country was moderate in 2020 but sharply decreased in 2021. After a significant decline at the beginning of the pandemic, exports of commodities recovered to their pre-pandemic level in Q2 of 2021. Private investment is predicted to suffer as a result of the heightened uncertainty, while public investment, which is supported by RRF funding, is predicted to entirely make up for this decline.[198]

The sectors with the highest % of FDIs are: Agriculture, forestry and fishing: (25%), Wholesale and retail trade, repair of motor vehicles and motorcycles:(18.66%), Real estate activities:(12.43%), Electricity, gas, steam and air-conditioning supply: 2 733 544.8 (9.69%), Other professional, scientific and technical activities: 1 806 515.0 (6.4%), Manufacture of rubber and plastics products, and other non-metallic mineral products: 1 319 893.5 (4.68%).

In manufacturing sectors the highest % of FDIs are in: Manufacture of rubber and plastics products, and other non-metallic mineral products:(4.68%), Manufacture of basic metals and fabricated metal products, except machinery(3.66%), Manufacture of food products, beverages and tobacco products: (3.43%), Manufacture of chemicals and chemical products: (2.33%),Manufacture of transport equipment: (2.16%), Manufacture of machinery and equipment n.e.c.: (2.08%), Manufacture of wood and paper products, and printing:(1.71%)

The total FDI in BG33 for 2021 are 2.269.086 thousand euro (0.12% decrease for the period observed).

2015-2021 FOREIGN DIRECT INVESTMENTS IN NON-FINANCIAL ENTERPRISES IN SEVEROIZTOCHEN (BG 33) REGION[199] (Thousand Euro)

Indicators:	Value:	**Varna**	**Dobrich**	**Targovishte**	**Shumen**
Foreign direct investment in non financial enterprises	Thousand EUR	1487864.7	369227.0	273659.2	118034

197. https://www.eban.org/membership-directory/
198. 2022-european-semester-country-report-bulgaria_en.pdf (europa.eu)
199. https://www.nsi.bg/en/content/1833/foreign-direct-investments-non-financial-enterprises-3112-statistical-regions-and-districts

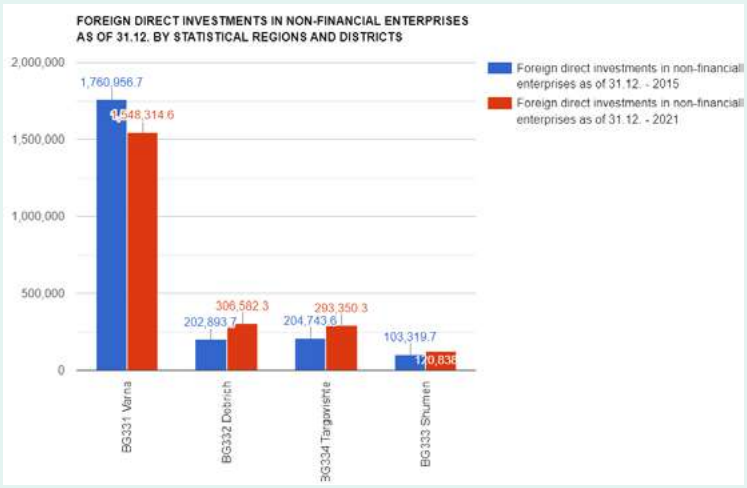


Fig. no. 41. Source: https://infostat.nsi.bg/infostat/pages/reports/query.jsf?x_2=595

Investment profile - Varna province: Despite some modest downward tendencies, investment and business activity in the Varna region are still very strong in 2019. The district's non-financial enterprise density has risen to 71 per 1,000 people, continuing to be fairly high (at 61 per 1,000 in the country). Contrary to the general trends in the country, the internal and foreign investment lags slightly behind. The amount of costs for the acquisition of fixed tangible assets fell by 1% (at a 15% country growth rate) to BGN 2.7 thousand/person of the population (at BGN 3.2 thousand in the country). To little more than 3.7 thousand euros per person (slightly less than 3.7 thousand euros in the country), the volume of foreign direct investments fell by 6% (about 3% growth in the country). The value of production is growing at a slower rate in the district (5% vs. 8% nationally) and is worth BGN 23.3 thousand BGN /person (vs. other 3 districts in BG 33 - 15/16 thousand BGN/ person).

Investments profile is stated to be at average level: Number of non-financial companies per 1,000 people (2020) – AVERAGE: 69.00 (In 2009, 2010, 2019 – 71.00)

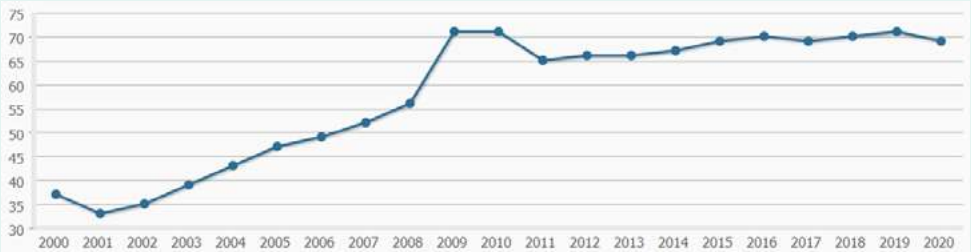


Fig. no. 42. Source: https://www.regionalprofiles.bg/en/regions/varna/

Foreign direct investment in non-financial enterprises per capita (cumulative) (2020) – AVERAGE: 3166.00 EUR

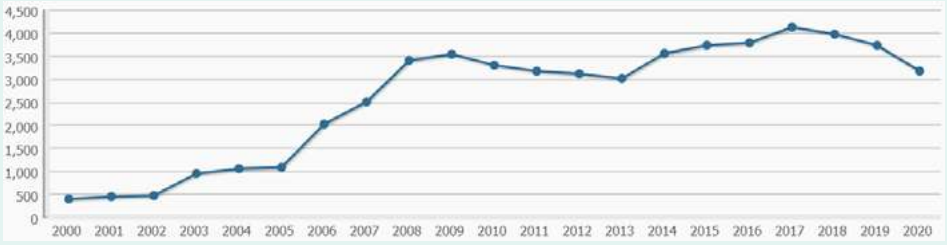


Fig. no. 43. Source: https://www.regionalprofiles.bg/en/regions/varna/ 2000 – 391.42; 2009 – 3532.42; 2017 – 4120

Foreign direct investments (FDI) in the non-financial sector in the province of Varna as of 31.12.2021 amount to 1,548.3 million euro (industry - 811.3 million euros with an increase in the relative share by 0.6%, in the sector "Operations with real estate"- 285.9 million euro with an increase in their relative share regarding the previous year by 2.4 point and reaching 18.8%, the service sector (trade, car and motorcycle repair, transport, warehousing and posts, hotels and restaurants) - 273.6 million euros with an increase in their relative share by 0.3% and the sector "Professional activities and Research; administrative and auxiliary activities" - 102.1 million euros.

Construction, "Creation and dissemination of information and creative products; telecommunications," and "Professional activities and research; administrative and auxiliary activities" all saw a relative decline in FDI of 1.1 percentage points each in comparison to 2020. **In 2021, Varna district ranked 5th in the country in terms of foreign direct investment**. Their share in the total amount for the country is 5.5% and, respectively, 68.2% for the BG33 region. Within Varna province, the largest volume of foreign investments is the municipality Devnya with 740.0 million euros, followed by the municipality of Varna with 713.5 million euros. The two municipalities together form 93.9% of the total volume of FDI in the province.[200]

The investment activity in the **Dobrich district** is relatively low and unfavourable in 2019. The number of enterprises decreased slightly to 55 per 1,000 of the population (at 61 per 1,000 people in the country). Strong shrinkage (by more than 10%) is observed at the costs for the acquisition of durable material assets and their amount reaches BGN 1,811/person (at BGN 3,155/person in the country). There is also a decrease in foreign direct investments - up to 1,707 euros/person (at 3,655 euros/person in the country), as well as in the volume of production - up to BGN 14.5 thousand/person (compared to BGN 28.0 thousand/person in the country).

Investment profile in Targovishte province:Both investment and production have decreased. Due to the local economy's pronounced industrial profile and the significant presence of major companies, Targovishte has a very low number of businesses—37 per 1000 people in 2019—with a tendency to grow. Despite ongoing production growth, the district's productivity remains low at BGN 16.5 thousand per person (at BGN 28.0 thousand in the country).The Amount of expenses for the acquisition of fixed tangible assets and of foreign investment is relatively stable, although they are significantly below the average levels in the country. Costs for acquisition of fixed tangible assets reach BGN 2,236/capita (compared to BGN 3,155 in the country), a foreign direct investments – 2760 euros/person (approx. 3655 euros in the country).

Investment profile in Shumen province:The district's investment activity is low. A drop is seen in the expenses associated with purchasing long-lasting tangible assets as well as the amount of foreign investment attracted. The number of enterprises in the district is low - 41 per 1,000 of the population (at 61 per 1000 people in the country). The cost of purchasing durable physical assets is BGN 1,804 per person (compared to BGN 3,155 per person in the country), and the cost of foreign direct investments is EU 665 per person (compared to EU 3655 per person in the country). These indicators also lead to a comparatively low production volume of BGN 16.7 thousand per person (compared to approximately BGN 28.0 thousand per person nationwide).

200. https://www.nsi.bg/tsb/wp-content/uploads/2023/01/Press-release_6_FDI2021.pdf

6.2.6. Education environment

As a result of Bulgaria's EU membership (since 2007),, numerous significant attempts to catch up to the nation's shortcomings in entrepreneurial education have been launched. The National Strategy for Fostering the Development of SMEs and other strategic papers made the promotion of entrepreneurial spirit and skills a top priority in line with EU policies.[201]

Improvements in the education curriculum

ccording to the Ministry of Economy's Implementation Report on the Entrepreneurship Action Plan 2020 - Bulgaria for 2017 there were several improvements in the curriculum, as following:

- Including STEM disciplines through the educational institutions:
- "Technology and Entrepreneurship" specialty has been included in the general education curriculum at the primary education level (I-IV grade), lower secondary education level (V-VII grade), and first stage of secondary education level since 2016. (VIII-X grade);
- "Entrepreneurship" specialty has been included in the structure of vocational education since 2018 (VIII grade).
- In 2017, 221 curricula in Bulgarian institutions were modified, and students in 193 fields got entrepreneurial education.

General facts:

- Approximately in the country 1.4 million people are engaged with educational activities in the country, 40% are students in lower education, 28% are participating in continuing professional education courses and about 16% are the students in higher educational institutions and children in kindergartens on annual basis;
- According to NSI - 220.4 thousand students were enrolled and 46135 graduated in higher education institutions for the academic year 2021/22 in Bulgaria; 31180 were enrolled and 6769 graduated in higher education institutions for the academic year 2021/22 in Northeast region BG 33 (4587 in Varna).
- As of 31.12.2021, 6,542 people, of which 679 are foreign citizens, are studying for the educational and scientific degree PhD "doctor" in the country (ex. of fields of education in numbers related to R&D&I: Environment - 39, Physical, Chemical and Earth Sciences - 214, Information and communication technologies - 227, Technical sciences and technical professions - 627, Mining and production technologies - 62, Engineering, manufacturing and construction, interdisciplinary programs and qualifications - 18, Healthcare - 865).
- 12% of students in Bulgaria, pursuing bachelor's and master's degrees, study in private educational institutions.
- The number of students in BG33 is continuously decreasing as in 2014/2015 in the region the

201. https://jei.uni-ruse.bg/Issue-9-2009/14.pdf

number of students is presented to be 100 226 and in 92 335 - 7.87% decline, which is in accordance with the national trend of annual decrease in the number of students by average 1.1%.[202]

14% of the enrolled students in higher education institutions are in BG 33 and 21.7% are with a secondary level of education (country basis)[203]. Despite the numerous higher education institutions in Varna province the % of people aged 25-64 with higher education (25%) is lower than the average for the country (29%), but the number of people with secondary education that are forming higher % of the population in the area (61%) is higher that the average in the country (54%). In the other 3 provinces from BG33 the percentage of people with primary or lower education is above 25% (17% in the country), in Targovishte province it is 38%. ICT usability is increasing at the fastest rates reaching 76.1% (higher than the national average of -73.9%), and a large share of people who have basic digital skills (25.7%) in the region. One notable exception is Targovishte, which has one of the lowest national rates of digital skills (14.7%).[204]

According to the data presented by NSI for the academic year 2021/22:

- 12.96% of the universities in the country are located in BG33 region, 85.71% of the BG33 universities are located in Varna, and 12.04% of the teaching staff in higher education institutions in the country are located in BG 33 (Severoiztochen) region.
- Almost 76% of the enrolled students in higher education from BG 33 are enrolled in Varna. 22.11% are enrolled in Shumen. 14.14% of the students enrolled in the country are from BG 33 region.
- 23% of the students enrolled in Professional bachelor's degree, 14.05% of the students enrolled in Bachelor's degree programs, and 13.37% of the students enrolled in Master's degree programs in the country are from BG 33.
- 14.67% of the graduates are from BG 33 region (67.76% from Varna, 29.70% - Shumen and 2.52 - Dobrich)

Statistical zone Statistical region District	Higher schools			Teaching staff				
	Total	Colleges	Universities and equivalent higher schools	Total	In colleges		In universities and equivalent higher schools	
					Total	Of which: under labour contract	Total	Of which: under labour contract
Total	**54**	**4**	**50**	**20 695**	**672**	**294**	**20 023**	**12 506**
Severoiztochen	**7**	**-**	**7**	**2 493**	**63**	**29**	**2 430**	**1 834**
Varna	6	-	6	1 917	25	16	1 892	1 487
Dobrich	-	-	-	38	38	13	-	-
Shumen	1	-	1	538	-	-	538	347

202. http://www.bgregio.eu/media/Programirane/2021-2027/3_SIA_BG_Part_3_Final.pdf
203. https://esc.bg/wp-content/uploads/2022/10/ESC_4_025_2022.pdf
204. https://www.regionalprofiles.bg/bg/news/economic-and-investment-profile-of-the-north-east-region/

Statistical zone Statistical region District	Students enrolled				Graduates			
	Total	At colleges	At universities and equivalent higher schools		Total	From colleges	From universities and equivalent higher schools	
		Professional bachelor's degree	Bachelor's degree	Master's degree		Professional bachelor's degree	Bachelor's degree	Master's degree
Total	**220 439**	**7 799**	**139 000**	**73 640**	**46 135**	**1 864**	**23 269**	**21 002**
Severoiztochen	**31 180**	**1 796**	**19 532**	**9 852**	**6 769**	**552**	**3 131**	**3 086**
Varna	23 608	1 118	15 140	7 350	4 587	381	2 423	1 783
Dobrich	678	678	-	-	171	171	-	-
Shumen	6 894	-	4 392	2 502	2 011	-	708	1 303

Table no. 4. : HIGHER SCHOOLS, TEACHING STAFF, STUDENTS ENROLLED AND GRADUATES BY STATISTICAL ZONE, STATISTICAL REGION AND DISTRICT IN 2021/2022 ACADEMIC YEAR, Source: NSI

Research universities

In 2020, revisions to the higher education law introduced the status of a research university. It is presented to higher education institutions that, through excellent scientific research and successful scientific research activities, significantly contribute to the development of significant public sectors. The number of scientific publications cited in international databases Scopus and/or Web of Science, the number of scientific monographs and book chapters visible in these databases, the number of patent applications filed by the graduate school, as well as the number of independent citations in Scopus and/or Web of Science, are all included in the "scientific results" indicator, by which the higher schools will be evaluated. The second evaluation indicator, "scientific capacity and reproduction of the academic staff," will be based on the number of scientists who have earned the scientific degree "Doctor of Sciences" and doctoral candidates.[205] With decision No. 539 of July 22, 2021 the Council of Ministers accepted the List of research universities for a four-year period.

The total number was 7 universities from which only one was from the BG33 region - Medical University "Prof. Dr. Paraskev Stoyanov" - Varna. With decision No. 839 October 27, 2022 for adoption of an updated List of Research Higher Schools 3 more were added but still there is only one located in BG 33 region. Research universities will receive additional targeted funding for the development of scientific activity. In the coming years, the main source of these funds will be the National Recovery and Resilience Plan under the "Scientific Research" Fund of the Ministry of Education and Science (MES) - almost BGN 240 million are foreseen to the research universities by the end of 2026. For this purpose, each of these universities must present a four-year strategic research and innovation development program.[206]

Universities in BG33:

Technical University, Varna provides education in Bachelor, Master and PhD degrees in the following professional fields: Communication and Computer Engineering, Electrical Engineering, Electronics and Automation, General Engineering, Machine Engineering, Plant Growing, Power Engineering, Social Activities, Transport, Navigation and Aviation and professional Bachelor degrees in Machine Engineering, Plant Growing,Transport, Navigation and Aviation fields.Total enrollment of over 7000 students.[207]

205. https://www.segabg.com/node/187932
206. https://web.mon.bg/bg/101062
207. https://fs.tu-varna.bg/specialties/

Nikola Vaptsarov Naval Academy, Varna provides education in Bachelor degrees in the fields of Navigation, Ship mechanical engineering, Ship electrical engineering **and Master degrees** in the fields of Information and communication technologies. Total enrollment of over 2500 students.

University of Economics – Varna provides education in Bachelor, Master and PhD degrees in professional fields: "Economics", "Administration and Management", "Tourism" and "Informatics and Computer Sciences". Total enrollment of over 7500 students.

The Medical University of Varna provides education in Bachelor degrees in the fields of Nursing, Midwifery, Health Care Management, Nursing Management, Kinesitherapy, Professional Bachelor degrees in Healthcare and Social Work, and Master degrees in Medicine, Dental Medicine, Pharmacy, Health Care Management , Nursing Management, Pharmaceutical Management, Health Information technology and Master's in Public Health Programme. Total enrollment of over 2000 students.

Varna Free University teaches over 10,000 students in more than 67 bachelor's and master's programs (ex. Cybersecurity, Software engineering and management, Data science and Digital marketing and web design programs) **and 29 PhD programs** (ex. of PhD in the field of Computing and computer science are Information Systems and Technologies, and Computing and Computer science programs).

Varna University of Management teaches Bachelor programs in the fields of Software systems and technologies, Hotel management, Business administration, Gastronomy and culinary arts, International business management, Hospitality and culinary arts, Food technology in the culinary arts, Pedagogy of education in hospitality and restaurant business, Pedagogy of education in economics and management, **Master programs** in the fields of business administration and International tourism and **PhD program** in the field of tourism. Total enrollment of over 800.

Shumen University: Under its faculty of technical sciences there are programs in "Management of security systems", "Communication and computer technology", "Geodesy" and "Engineering logistics". The university teaches Bachelor programs, Master programs and PhD programs and has an LLL program. It has several faculties: Faculty of Humanities, Faculty of Mathematics and Informatics - programs: Mathematics; Informatics and computer science;Economics;Pedagogy of training in ... (mathematics and informatics). he Faculty of Natural Sciences includes 5 departments: Plant Protection, Botany and Zoology, biology, Geography, Regional Development and Tourism, Physics and Astronomy, Chemistry. Total enrollment of over 6000 students.

Veliko Tarnovo National Military University: (Faculty in Shumen) provides programs for cadets and students in 3 fields of higher education: social, economic and legal sciences, technical sciences (ex. Automotive technology and transport logistics; Construction and special machines; Communication technique and technologies; Computer technologies for design; Computer systems and technology; Cyber security; Computer systems and cyber security; AI), security and defence and doctoral students in 5 accredited scientific specialties in the faculty - "Organization and Management of the Armed Forces", "Radiolocation and radionavigation", "Dynamics, ballistics and flight control of aircraft", "Communication networks and systems", "Application of the principles and methods of cybernetics in various fields of science" and 13 at the headquarter in Veliko Tarnovo in professional fields of Electrical engineering,

electronics and automation, Communication and computer engineering, Transport, shipping and aviation, General engineering, and others.

Innovative schools

The List of Innovative Schools for 2021/22 lists 510 schools from 137 municipalities in 28 regions of Bulgaria that have been given innovative status. New teaching techniques, the addition of creative components to training's structure or content, new or enhanced management practices, the training and educational environment, as well as newly created learning materials, curriculum, and programs are all covered by the proposed innovations. For the first time, 73 of them are classified as innovative. Innovations from earlier years persisted in 437.[208] For 2022/2023 the list added 32 schools and the number rises to 542 Innovative schools. In BG 33 there are 58 (Varna province: 28;Dobrich province: 12;Targovishte province: 10;Shumen province: 8) - 10.7% of the total number.

Great example of a secondary level education institution in BG33: Professional high school of computer modelling and computer systems with a STEM centre „Creative free space" established in Varna in 2020. The school is a state institution and it was created on the initiative of the Minister of Education and Science as a result of successful cooperation between the Technical University, Varna and the University of Economics, Varna. Specialties for the academic year 2022/2023 include: System programming, Artificial intelligence programming, Robots programming, E-commerce, Renewable energy sources, Electric power engineering. Specialties from previous years enrollment include:

Security equipment and security systems, Economic Informatics, Microprocessor technology, Machines and systems with digital program control, Industrial aesthetics and design.

Varna: the third-largest city in Bulgaria, is home to a number of institutions that provide professional education. There are high schools for electrical engineering (150 places), shipping and marine engineering (100 seats), forestry (130 places), construction and surveying (130 places), fashion and textiles (100 places), trade and economy (270 places), and food technology (100 seats). The majority of the outlying municipalities also provide vocational training, such as for ship fitters (25 seats), sales representatives (50 places), chefs (100 places), and farmers (100 places) (180 places). Along with secondary schools for languages and sciences, the area is home to numerous artistic schools. Along with the only naval school in the country - *Nikola Vaptsarov Naval Academy, there are four state institutions - Technical University of Varna, University of Economics – Varna, The Medical University of Varna , and two private universities, Varna Free University and Varna University of Management, and a Faculty of Shumen University*.[209] Varna province is among the provinces with the best performance in the field of education. In accordance with the recent national decline in higher education student enrollment, the district's enrollment is declining. Despite the decline the number is still much higher than average 50 per 1000 of the population compared to 32 per 1000 in the country in 2020.

Dobrich: A considerable variety of vocational schools are available in the Dobrich municipality. The most prevalent profile is tourism, which includes welders, electricians, locksmiths, (160 students) and other technical professions (300 students). The professional fields include veterinary medicine (100 students)

208. https://www.segabg.com/node/187932
209. https://www.regionalprofiles.bg/bg/ec/varna/

and economics and finance (110 students). Given the vital role that agriculture plays in the local economy, the agricultural school comparatively has a low enrollment (110). The periphery municipality lacks any vocational schools. A recognized language school, as well as ones with a focus on the natural and mathematical sciences, are located in the centre. The performance of the Dobrich District in the indicators measuring education is weak. The labour force's relatively low level of education in 2020 continues to be a difficulty for the labour market. The percentage of adults aged 25 to 64 with a higher education is 22.3% (compared to 29.2% nationally), and the percentage with only a primary or lower education is 25.6% (vs. 16.9% nationally). Branches of the Shumen University and the Varna Technical University and University of Management - Varna provide higher education.[210] Those who graduated from secondary education in 2020 in general education and vocational schools are respectively 482 and 375 students and the number enrolled in the "professional bachelor" degree of higher education for the academic 2020/2021 year is 656.[211]

Shumen: In the district, eight high schools and one auxiliary school offer professional education. A technical high school and a high school for agriculture are the only two vocational schools in the municipality of Veliki Preslav; the other six are in the municipality of Shumen. The training is for professionals in the fields of apparel, chemical and food technology, rural tourism, mechanical engineering (including automotive), and building and architecture. As in other regions of the country, the excessively large share (nearly 20%) of agriculture-related places in the enrollment plan is presented. In 2016, the number of students decreased for the tenth year in a row, in line with the general trend in the northern part of the country. With a modest decline to 27.1%, the proportion of adults aged 25 to 64 with only an elementary education is still higher than the national average (16.9%). Additionally, the proportion of higher education graduates rose to 24.6% (29.2% nationally). After 2006, interest in Shumen University drastically decreased. In a decade, the proportion of students fell from 45 to 38 per 1,000 people, but it is still higher than the national average (32 per 1,000). The Shumen University offers training in three main areas - humanities, natural sciences and mathematics and informatics. In 2004, the Faculty of Technical Sciences was opened, which prepares engineers in fields such as "Architecture, construction and geodesy" and "Communication and computer technology". Along with the Shumen University, a faculty of the Veliko Tarnovo National Military University and a faculty of the Medical University of Varna also perform on the territory of the district of Shumen.[212]

Targovishte: Nearly all of the professional education institutions in the district are located in Targovishte municipality. There is only one veterinary and agricultural professional school in Loznica, and according to the admissions schedule for 2016–17, there are spaces available for 25 veterinarians, 60 farmers, and 25 agricultural economists. In contrast, Targovishte provides a greater selection of courses, including 100 spots in a school of culinary and tourism, 130 in an economics and informatics vocational school, 80 in an agricultural school, 90 in a construction school, and 100 for mechanics and electricians. In Targovishte, there are two high schools with specific profiles: a sports high school, and a high school for foreign languages. Targovishte is among the districts with the lowest coverage of the education system. The share of the population aged 25–64 with primary and lower education has increased in recent years and in 2020 is the highest in the country - 38.3% (compared to 16.9% in the country). The share of graduates decreases to 15.8% (at 29.2% in the country). There are no higher education institutions and the majority of schools in the district are elementary schools.

210. https://www.regionalprofiles.bg/bg/ec/dobrich/
211. https://www.nsi.bg/tsb/wp-content/uploads/2021/05/Obrazovanie_Dobrich_2020.pdf
212. https://www.regionalprofiles.bg/bg/ec/shumen/

6.2.7. Research & Innovation

Innovation index

Severoiztochen (Northeast) NUTS II region BG33 is an Emerging Innovator, according to the Regional Innovation Scoreboard.[213] The region is ranked in 78th place in the Regional Innovation Scoreboard (RIS). During 2014 -2021 the RIS index Severoiztochen (Northeast). NUTS II region BG33 has had the following development:

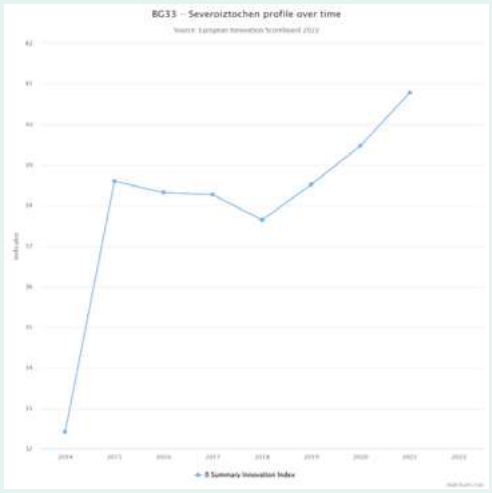
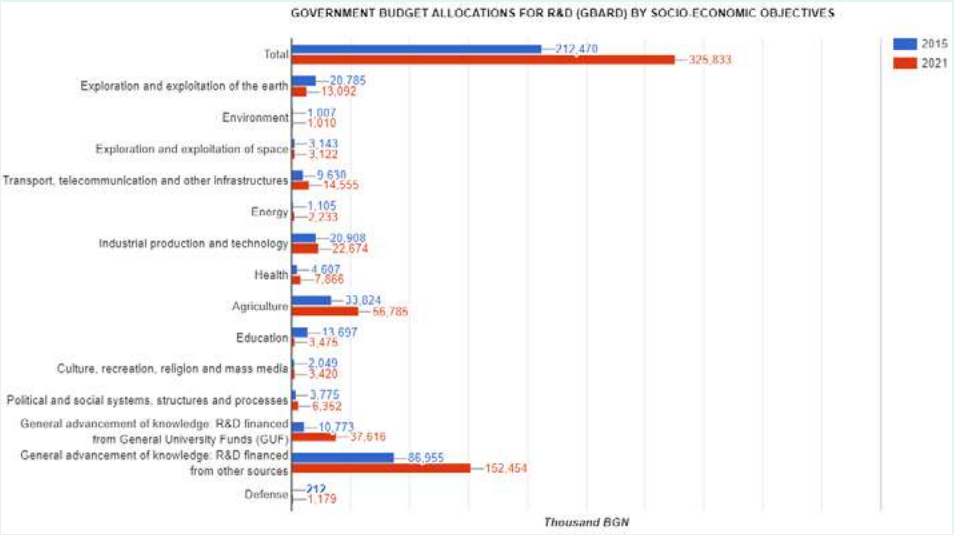


Figure no. 44. Evolution of the Innovation index of BG 33 region over time;
Source: Summary Innovation Index over time(base year 2014)

There is 8.358 points performance change between the years 2014 (32.4) and 2021 (40.8) and 1.306 points performance change between the years 2020 (39.473) and 2021. **Performance in terms of innovation has improved over time (8.4%)**. The services sector accounts for the largest portion of the gross added value produced. In 2019, every area increased in their sectoral share, with growth ranging from 1.04 to 1.07 times.

GOVERNMENT BUDGET ALLOCATIONS FOR R&D (GBARD) BY SOCIO-ECONOMIC OBJECTIVES[214]



213. https://data.europa.eu/doi/10.2873/674111
214. https://www.nsi.bg/en/content/2708/government-budget-allocations-rd-gbard-socio-economic-objectives

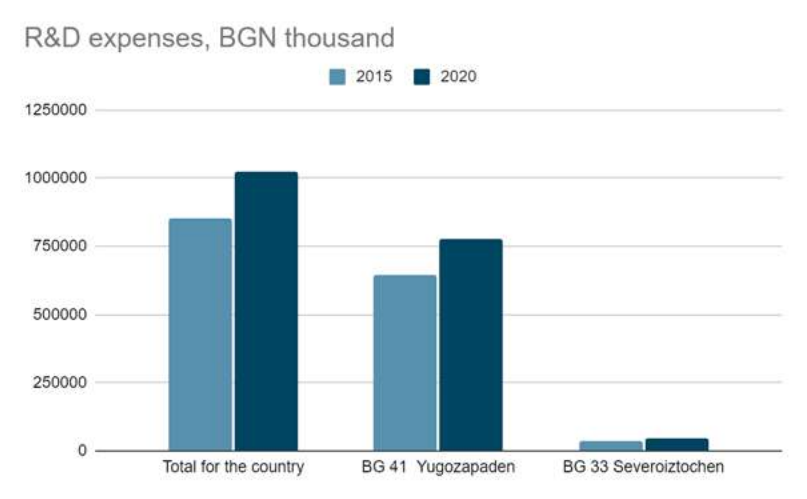
According to Eurostat data from 2009 to 2018, the country's average R&D spending was 0.49 percent of GDP, compared to 2.1% for the EU-28. In 2018, business enterprises spent 594.8 million BGN on R&D (60.6% of which came from SMEs), and there were 13.0 thousand R&D workers and researchers overall (of which 71.1% worked for SMEs).

According to NSI data: GBARD in 2021 with the highest level is in the field of General advancement of knowledge: R&D financed from other sources - 46.78% (slightly improvement of the % over time - in 2015 the allocations in the field were 40.92%) , followed by **Agriculture - 17.42%**. In comparison the government allocations in the agriculture field for 2015 were 15.91%. In 2021 for **General advancement of knowledge: R&D financed from GUF is 11.54%. Industrial production and technology - 6.95%** (in 2015 were allocated 9.84%). Transport, telecommunications and other infrastructures - 4.46%, Health - 2.41%, Education - 1.06%, , Exploration and exploitation of space - 0.95%, , Energy - 0.68%, Environment- 0.30%

TOTAL INTRAMURAL R&D EXPENDITURE (GERD) BY STATISTICAL REGIONS AND SECTORS – 2021[215]

	2021(Thousand BGN)				
Statistical areas	Total	Business enterprises	Government	Higher education	Non-profit institutions
Total for the country	1 074 004	707 194	291 274	69 282	6 254
Severoiztochen (BG 33)	48 188	20747	17 338	...	...

For 2020, R&D expenses in The South-West (Yugozapaden) region was 76% of those made in the country, followed by the South central region - 8.9%, and in the other regions the expenses were between 3.1-4.5%. 70% of all expenses were related to enterprises. 47% of those employed in R&D are in the production sphere, and 25% in public institutions.[216]



215. https://infostat.nsi.bg/infostat/pages/reports/query.jsf?x_2=671
216. https://esc.bg/wp-content/uploads/2022/10/ESC_4_025_2022.pdf

On a national level the business enterprise sector has a share of almost 66% of the four institutional sectors of R&D performance, the largest in 2021. It was followed by the government sector, in which research institutes and organisations formed 27.12 % of the total R&D expenditure. The spending on R&D by tertiary schools and university hospitals amounted to 6.4 % and respectively by the non-profit organisations - almost 0.6% of total R&D expenditure. In BG33 the R&D expenditures are equal to 4.48% of the total amount for the country. The enterprise sector has 1.93% of the total amount for the country and 43.05% at BG33 level, followed by the government sector with almost 36% at BG33 level and 1.61% of the total R&D expenditure at the country level.

BG 33: total GERD evolution 2015 - 2021;

BG:33 Business enterprises sector GERD evolution 2015 - 2021:

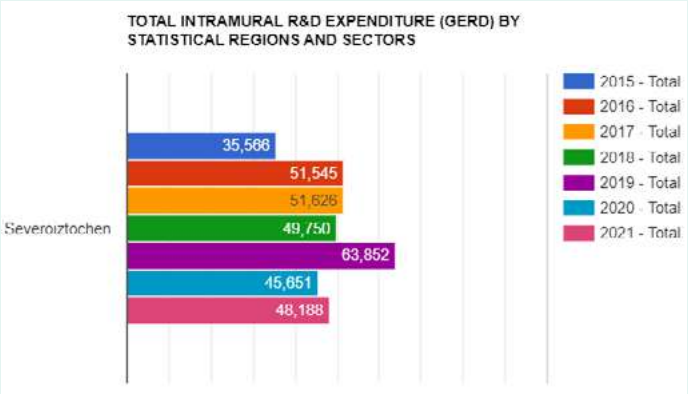


Fig. no 45. Source: https://infostat.nsi.bg/

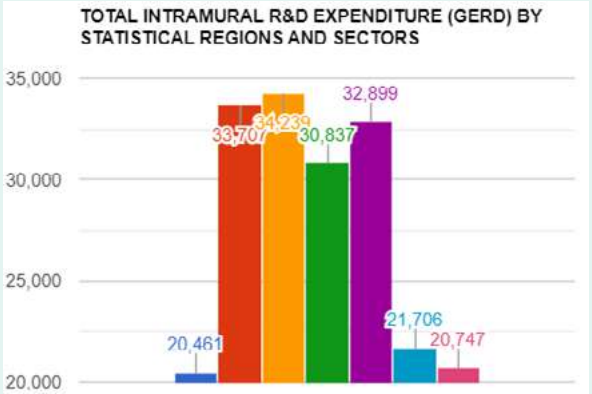


Fig. no 46. Source: https://infostat.nsi.bg/

The overall amount spent on research and development activity (R&D) in 2019 was 1 002.1 million BGN. R&D intensity (R&D expenditure as a percentage of GDP) increased from 0.76% in 2018 to 0.84% in 2019.[217]

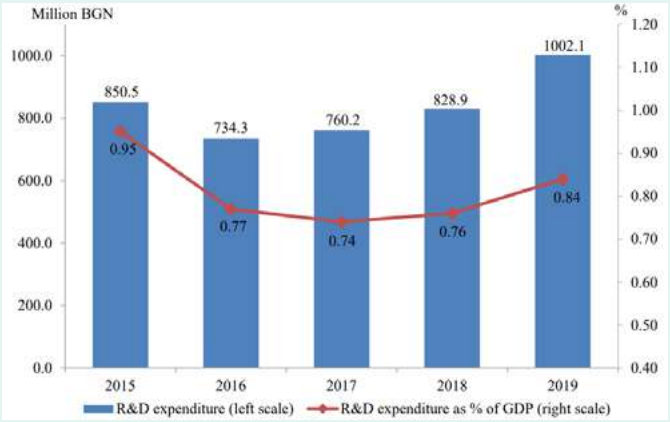


Figure no. 47. Source: NSI

For 2020, R&D expenses in The South-West region was 76% of those made in the country, followed by the South central region - 8.9%, and in the other regions the expenses were between 3.1-4.5%. 70% of all spendings was related to enterprises. 47% of those employed in R&D are in the production sphere, and 25% in public institutions.[218]

217. https://www.nsi.bg/sites/default/files/files/pressreleases/NIRD_2019_en_O2NGWYK.pdf
218. https://esc.bg/wp-content/uploads/2022/10/ESC_4_025_2022.pdf

Compared to businesses in EU28, the enterprises in Bulgaria devote much fewer resources to intangibles like R&D, software, data, IT, and website operations. According to the 2019-2020 PwC SMEs survey the creation and management of an internal R&D unit as well as the hiring of a dedicated R&D staff are the least common innovation-related activities in the country's enterprises. One in ten businesses (12.3%) have their own R&D department, and one in six SMEs have employees performing R&D work(17.5%).[219]

In 2018 the R&D intensity of operations was at least twice as high in the capital city region compared to the other regions of Bulgaria. The employment in high-tech industries accounted for 7.9% while knowledge-intensive services accounted for 39.6% higher than the national average.[220]

In 2021, the total **number of the personnel engaged in R&D** is 16057 of which 59.45% were researchers. 35.64% of the total number of the personnel engaged in R&D were engaged in Manufacturing activities, 30.13% in Professional, scientific and technical activities, and 23.51 in Information and communication activities. In the Government sector: 5 018 of which 2 877are females and in Higher education sector:8 509 of which 4 673 are females.

The distribution within the districts of GB33 region is the following:

BG 33 Region: Regional National statistics (Source: NSI)

Indicators: **Personnel engaged in scientific research and development (R&D) - number**	Years				
	2017	2018	2019	2020	2021
Varna District	2 378	2 564	2 601	2 383	2 386
Dobrich District	319	336		331	
Targovishte District	15	24		12	
Shumen District	676	749	769	735	722

Patents

According to the GII 2022 Patents by origin were equal to 293.0 in 2020, an increase of 33 % from the previous year and a ranking of 38 on the indicator. According to the Patent Office of the Republic of Bulgaria, the submitted patent requests and actions on the territory of the Republic of Bulgaria for the period 2020 - 2022 are in the fields of: Chemistry, pharmacy; Electrical engineering, electronics; Mechanical engineering.

The applications for inventions by type of applicants were separated into 3 groups: by BAS and Universities, by Legal entities and by Individuals, accumulating a total number of: 246 in 2020, 171 in 2021 and 171 in 2022.

Acting patents in total are: 14 104 in 2020, 14 545 in 2021, and 14 681 in 2022. Registered industrial designs in the period 2020-2022 are 302, and registered trademarks in the period 2020 - 2022 are 14,577.[221]

219. https://www.mi.government.bg/files/useruploads/files/sme/FINAL_DG_Reform_SME%20Strategy_Technical%20Report_2020-04-27.pdf
220. https://joint-research-centre.ec.europa.eu/system/files/2021-09/jrc126268.pdf
221. https://www.bpo.bg/uploaded/files/1102-Statistika-2020-2022.pdf

The low penetration level of intellectual property-related activities in Bulgarian SMEs is determined by their level of innovation:

- 6.7% of businesses have registered patents, 2.8% have registered patents in the EU, and 2.2% elsewhere
- 3.5% of SMEs have declared plans for registering such in 2020

In terms of registered trademarks, the numbers are higher: 20.1% of businesses report having registered trademarks in Bulgaria, 9.7% in the EU, and 5.0% elsewhere. 6.9% of SMEs reported having plans to register such.

The size of the business significantly affects intellectual property-related activity. Microbusinesses account for a very small percentage of registered patents (2.5% in Bulgaria, 1.6% in the EU, and 1.3% in other countries), compared to 22.6%, 11.3%, and 11.3%, respectively, for medium-sized businesses. Lack of funding is another obstacle to these operations; 75.7% of businesses in Bulgaria have presented this as a reason for not undertaking such activities.[222]

In BG 33 there are: 7 universities and a faculty of non BG33 university, of which 2 are private institutions; 3 Research Institutes within the premises of universities in the region; 2 National Institutes (BAS); 3 Regional centres (BAS). **Almost all of the universities in BG33 are performing research activities**, but only MU Varna is accredited as a "Research university".

At **Varna University of Management** all lecturers are actively engaged in the process of developing scientific research activities in the following areas:[223] "Organization of an annual International Scientific Research Conference", "Organisation and participation in youth events with the partaking of prominent scientist from the European academic community", "The release of the first Bulgarian scientific magazine "European Journal of Tourism Research" for scientific research in the field of tourism", "The release of Journal of Pedagogy and Educational Management", "The release of VUM Management Review", "The development of a Bulgarian-Romanian centre for sustainable development of tourism", "The development of software packages and educational handbooks".

Research Institute within the TU Varna has several objectives:[224]

– to establish cross-sectoral cooperation between different academic fields, based on in-depth and fundamental knowledge of each field;"

– to remove barriers between people inside and outside academia and to establish international contacts for research purposes;"

– to increase the flexibility and mobility of teachers and researchers at the university;"

– to achieve a greater connection between the university, business and society;"

– to create a living unified research environment that is evolving and will lead to tangible results."

The R&D&I activity at **Shumen university** is one of its general objectives and it explores fundamental and scientifically applied research through: innovative, artistic-creative, and other creative activities, as well

222. https://www.mi.government.bg/files/useruploads/files/sme/FINAL_DG_Reform_SME%20Strategy_Technical%20Report_2020-04-27.pdf
223. https://vum.bg/research/
224. https://fs.tu-varna.bg/research-institute/

as exploratory, analytical, predictive, expert, developmental, technological, normative, and implementing activities. The fundamental objective of the Shumen University's research and creative endeavors is the advancement of traditionally recognized intra-university priority areas as well as priority scientific fields on a national and international scale. Specific goals include the following: the production of novel scientific insights and technologically innovative products in several scientific disciplines and application of the results of scientific research and artistic-creative activity for the scientific-methodical provision of the training organised by the university in the areas of higher education within its structure. Other specific goals include the application of scientific findings and their distribution; raising the level of scientific expertise of the university's academic staff; encouraging creativity and fostering environments that will allow graduate and undergraduate students to develop their creative skills; Knowledge exchange on a national and international scale.

Areas of scientific research: pedagogical sciences, humanitarian sciences, health care and sports, agricultural sciences and veterinary medicine, social, economic and legal sciences, natural sciences, mathematics and informatics and technical sciences.[225]

Within the framework of the **University of Economics - Varna** is a service unit called **"Research and Doctoral Studies."** The main objective is to make sure that the academic staff's potential is deployed and used more effectively in order to carry out high-quality theoretical and scientifically-applied research that meets the needs of training and practical service. The presence of a highly qualified academic staff with enduring qualities, a doctoral student staff that is qualitatively formed, a favourable environment for implementation of an intense scientific life through scientific communication and scientific research activity. In 2015 the **Research Institute at the University of Economics - Varna** was founded by the Council of Ministers of the Republic of Bulgaria to conduct long-term research operations in the institution's key scientific fields. The institute consolidates the University of Economics - Varna's six current research centres into one building. Main priorities for the Research Institute at the University of Economics - Varna: Economic, social, and territorial cohesion; Green economy and sustainable development; Digital transformation and digitalization; Innovation and competitiveness; Crisis management.[226]

The R&D activities at the Naval Academy VVMU "N.Y. Vaptsarov" are generally related to development of scientific and methodological publications. The publishing centre is a structure of the Scientific Section of "Scientific works of VVMU, Marine Science Forum, Monographs, Publications of scientific conferences, Textbooks and teaching aids". Activities in scientific research and development assist in making VVMU "N.Y. Vaptsarov" a hub for naval sciences and marine technology. Naval armaments and equipment, shipping, marine technology, and maritime education and qualification of personnel for the Navy and the maritime industry are the school's main research focus areas. Perspective and scientifically applied research are the two main areas of scientific effort. In the areas of naval armaments and equipment, maritime science, and technology, theoretical studies, concepts, forecasts, reviews, and analyses are carried out. The scientific division is engaged in projects from the plans for the Ministry of Defense's research and development operations, for the requirements of marine and water transportation, and for the Military Academy of Medical Sciences. The university cooperates at regional, national, and international levels with institutes and executive units. Cooperation agreements between VVMU and the Institute of Hydro- and Aerodynamics, the Institute of Oceanology, industries affiliated with the Republic

225. https://www.shu.bg/nid/
226. https://www.ue-varna.bg/bg/p/7809/za-nas/nauchnoizsledovatelski-institut

of Bulgaria's military-industrial complex, etc.In organisations like the National Oceanographic Commission at UNESCO, the High-Tech Business Incubator in Varna, and others, VVMU takes part in the founding of scientific alliances and the development of cooperative prospective research programs.[227] The university has a planetarium as part of its infrastructure for the need of education in the fields of Astro and Marine Navigation.[228] Other important educational facilities include 35 laboratories and 11 simulators, which allow training to be conducted in similar conditions as in reality.[229]

Medical University of Varna

Innovation Strategy of MU-Varna 2021-2025 [230]

"The strategy is developed in accordance with the strategic goals of European research space"

Priority scientific directions of the MU Strategy:

> **Food and nutrition**; Expected results: development and production model of nutritional supplements in a study workshop of the Faculty of Pharmacy. Creation of a state-of-the-art chromatographic laboratory analysis.
>
> **Regenerative medicine and implantology**; Expected results: development of tissue cultures in a type for direct transplantation and partial replacement of damaged structures of the human body and creation of a tissue bank – with a clinical and research department.
>
> **Neurosciences and diseases of the central nervous system**; Expected results: development of a model for diagnosis, prediction of diseases and outcome and neurodegeneration and its application as a therapy of last resort.
>
> **Oncology and rare diseases**: Expected results: establishment of a modern genetics laboratory. Mastering the technique of cyber-surgery in oncological diseases.
>
> **Prevention, management of diseases and health systems**; Expected results: development and model of electronic files, registers (hospital and population) and models for telemonitoring, storage and transfer of medical information; building a centre for evaluating the functioning of the health system.

Specific goals: Innovation and education, Innovation and R&D, Innovation and Healthcare"

Research Institute **at the Medical University of Varna** (RIMU-Varna) was founded in 2016, by the Council of Ministers of the Republic of Bulgaria. Foundational, clinical, and translational research are mostly conducted at RIMU-Varna. According to national scientific priorities in the domains of medicine, dental medicine, pharmacy, healthcare, public health, and other multidisciplinary areas, this research is conducted in the areas that are a priority for the Medical University of Varna. RIMU-Varna supports the use and dissemination of research findings with the purpose of enhancing human health and medical treatment. The Medical University of Varna is developing a reputation as a research institution of

227. http://www.naval-acad.bg/research
228. http://www.naval-acad.bg/training-facilities/planetarium
229. http://www.naval-acad.bg/training-facilities
230. https://www.mu-varna.bg/BG/ACRO/Documents/%D0%A1%D1%82%D1%80%D0%B0%D1%82%D0%B5%D0%B3%D0%B8%D1%8F%20%D0%B7%D0%B0%20%D0%B8%D0%BD%D0%BE%D0%B2%D0%B0%D1%86%D0%B8%D0%B8%20%D0%BD%D0%B0%20%D0%9C%D0%A3-%D0%92%D0%B0%D1%80%D0%BD%D0%B0%202021-2025.pdf

significant national and international stature thanks to the notable scientific activities of RIMU-Varna. The six departments of the RI-MUV correspond to the MUV's primary scientific interests (2021-2025)[231]

Institute of Oceanology (IO) **(BAS) - founded in 1973 in Varna** by the Council of Ministers. The Institute of Oceanology conducts research in the following areas: "physics, chemistry, biology and ecology of the sea; geology, geomorphology and archaeology of the seabed and the coastal zone; coastal zone hydrodynamics and lythodynamics; marine climatology, hydrology and hydrometeorology;operational oceanography, oceanographic data and information management".[232]

National Institute of Meteorology and Hydrology (Varna) - scientific research institute – an independent legal entity, with a budget within the budget of the Ministry of Environment and Water. Engaged in observations and research in the fields of meteorology, hydrology and water problems.

Bulgarian Ship Hydrodynamics Centre (BSHC) , (BAS) - established in 1976 in Varna with the support of the International Maritime Organization (IMO) and the United Nations Development Program (UNDP) as a centre for scientific experimentation and study in the field of hydrodynamics ships, floating objects, and marine-based facilities.The BAS General Assembly, the BSHC has been further reorganized as a detached research unit within the frameworks of the Institute of Metal Science, Equipment, and Technologies "Acad. A. Balevski" at BAS since 2010. The BSHC conducts a broad range of basic and applied research in the areas of ocean engineering, sea and river crises and catastrophes, marine ecology and coastal protection, facilities for fisheries and aquaculture, renewable energy sources, national security, and defense.[233]

6.2.8. Public authorities - innovation and digitalization

History[234]

The Unified System for Civil Registration and Administrative Services of the Population (ESGRAON), which was founded in 1977 by the Council of Ministers of the Republic of Bulgaria, is where the phrase "Bulgarian electronic government" first appeared, based on the Scandinavian model, gathers and retains data about citizens in a variety of categories. Important principles like "one-stop shop" and "single collection and multiple use" of data, including personal data, "in order to provide fast, accessible, cheap and high-quality administrative and legal services to citizens" were established in 1985. Private business was not legalised at that time. Political changes in 1989 led to the creation of a new administrative and legal system. Numerous electronic services were stopped. As a result of the globalisation of information and communication technology through the internet and the negotiations for Bulgaria's entrance to the European Union during the 1990s, the present reform process toward e-governance started. The National Policy for the Information Society was adopted in 1999, making Bulgaria one of the first nations in Europe to have such a strategy. Since 2001 the Republic of Bulgaria has been working on the establishment of e-Governance. The **Information and Communication Coordination Center** - developing and implementing e-governance technologies. The Center was crucial in coordinating the adoption of the EU's e-Europe and e-Government guidelines until 2008.

231. https://www.mu-varna.bg/EN/AboutUs/Pages/Research-Institute.aspx
232. https://www.bas.bg/?page_id=24441&lang=en
233. https://www.marinecluster.com/en/members-more/bulgarian-ship-hydrodynamics-centre-bshc-varna-at-bulgarian-academy-of-sciences
234. https://www.freiheit.org/sites/default/files/2021-01/re-designing-public-services-for-the-21st-century_bg_0.pdf

Mid Term trends and significant events 2011 - 2016 Without any significant publicity or education campaigns, 50% of Bulgarians chose online registration for the regular census in 2011; Development of the Digital National Alliance (DNA), created in 2014; 70% of voters in a 2015 referendum on electronic voting, which had a comparatively large voting turnout, approved of it; Creation of a draft of the National program "Digital Bulgaria 2015"

2016 - The year for the "Electronic Governance" - adoption of the new Law on e-Government: The institutional framework established in 2016 is distinguished by two key elements: the establishment of a Unified System Operator, who will coordinate the integration and maintenance of new and existing e-solutions for the administration, and the creation of the State Agency "Electronic Government," (The existing infrastructure for e-identity is primarily associated with online banking).

Obstacles and weaknesses: Public distrust due to the absence in the **Law on e-Government** of any regulation for the citizens' control over their data, for the registers built and stored by public institutions and data flows. Another reason for distrust is that it was first adopted in 2007 and reshaped and re-adopted 5 times only until 2016; Parties in the parliament were not looking in one direction and at first when adopting the period for implementation of the e-government was stated to be several months and later extended to 4 years period. Another prerequisite for the unpleasant citizens' situation is the unstable situation in the country's governance - in that period there were elections each year and this is a continuing event (7 elections in the country for the period 2017 - 2022).

Available electronic services: e-financial services (online banking); e-business services (e-commerce)

e-administrative services:

- In the 2011 population census, for the first time the National Statistical Institute offered online registration; Most of the municipalities offer some form or aspect of electronic services; A number of universities, including private ones, provide distance learning and interactive online courses.

Current Situation: Due to its poor performance in most indicators, according to DESI, Bulgaria faces significant challenges in digitising its public services. According to the European Commission's Digital Economy and Society Index (DESI) for 2022, Bulgaria is ranked 26th out of the 27 EU members. Over the previous five years, Bulgaria's DESI score increased at an average annual rate of 9%:

- *Human capital* - on digital skills the country scores 32.6, 13.1 lower than the EU average. Bulgaria underperforms the EU average in terms of the percentage of ICT professionals in the labour force (3.5% against 4.5%).
- *Connectivity: Bulgaria performs exceptionally well in terms of Fibre to the Premises coverage* (85% of households compared to 50% in the EU) and has affordable costs, although both fixed and mobile broadband take-up is low (just 25% of the available 5G spectrum has been allocated, the EU average is 56%).
- *Integration of digital technology*: SMEs continue to adopt digital technology at a rate that is approximately half of the EU average. Big data, the cloud, and AI are only used by 6%, 10%, and 3%, respectively, of Bulgarian businesses.
- *Digital public services*: Only 34% of internet users in the country (compared to 65% in the EU) communicate with the government online and the country is ranking 25th in the EU in this indicator. In order to contribute to the 2030 Digital Decade aim of all major public services being supplied entirely online the country should improve in terms of the provision of digital public services for citizens (accumulating a score of 59 in 2022 - 16 lower than the EU average - 75). Bulgaria has already

started the reform of the National Registry and laid out a plan to advance digital transformation in order to meet this objective.

- The country receives a score of 58 out of 100 for the amount of information that is pre-filled in online forms for public services, which is 6 points lower than the EU average.

- With A score of 76 for digital public services offered to enterprises, Bulgaria also performs less than average in the EU.

- The use of open data is 3% lowen than the average in the EU.

Data from the UN e-Government Development Index (EGDI) report for 2020 show that the country is 44th out of 193 in terms of e-Government Development Index, and have officially joined the very high category of e-governance development, in the e-Participation Index, there is a rising in the ranking by as many as 12 positions and from the 35th place to the 23rd place among 193 countries. In 2022 there are decreases in the rankings: + 8 and the country is 52nd in in terms of e-Government Development Index and + 6 in the e-Participation Index ranking it on 29th place.[235]



Fig. no. 48. Source: https://publicadministration.un.org/egovkb/en-us/Data/Country-Information/id/26-Bulgaria/dataYear/2022

Under the funding for the **National Recovery and Resilience Plan** the overall budget allocated for the digital transition is EUR 1.6 billion (25.8% of the total funding for the plan). Several components include necessary reforms and investments, with a special emphasis on digital connection (under pillar 3 - Connected Bulgaria) and the digitalization of the public sector (pillar 4 - Fair Bulgaria). Despite the long history of inclusion of e-government in the country , Government agencies must take action to update the infrastructure so that citizens may connect with public platforms easily from both a communication and a form-filling and form-uploading perspective.

According to reporting data, 398 administrations (67.80%) offer electronic administrative services in 2021 accessible through:

- The single portal for access to electronic administrative services (www.egov.bg) – 345 administrations; information on 1,329 electronic services is published on the portal, as a result of the Unified model for application, payment, and provision of electronic services, 860 of them are implemented through centralised application, more than 1,100 electronic forms have been created for their application (service forms and supporting documentation).
- An administration-specific portal - 116;
- a portal created to implement the Unified model for application, payment, and provision of electronic services - 160;

235. https://publicadministration.un.org/egovkb/en-us/Data/Country-Information/id/26-Bulgaria/dataYear/2022

- Federated/virtual portal to egov.bg – 29;
- A portal that has been developed for a group of administrations – 28.

For access to electronic administrative services, 534 administrations use the State e-Government Agency portals, and 144 of the administrations use other portals, specifically developed for them or for a group of administrations. 191 administrations do not provide services electronically through an electronic portal or through electronic registered mail. During 2021, 165 administrations kept electronic or paper registers pertaining to the delivery of electronic services to individuals and organisations, while 232 agencies disapproved. There are 266 administrations providing electronic services to residents and enterprises that are not administrative services and are not required to be listed in the Register of Services. In addition to administrative bodies to the Unified application model, payment and provision - by the end of 2021, 480 administrations have been added , of which 33 are central, 300 municipal and regional, 27 regional and 120 specialised territorial administrations.[236]

The e-governance development strategy 2014-2020 in the Republic of Bulgaria

Regional and local level: Several eGovernment initiatives of local interest are being implemented by regions and municipalities. They carry out operations associated with the supply of electronic services via horizontal e-government systems. These consist of eForms for requesting eServices, eDelivery, and ePayment. The administrations have the opportunity to join the single model for requesting, paying for and providing electronic administrative services, which is now being managed by the Ministry of eGovernment. Municipalities, which are Bulgaria's local self-government entities, coordinate local eGovernment activities. The organisation that stands for local governments on a national level in the Republic of Bulgaria is the National Association of Municipalities.[237]

Under the Recovery and Resilience plan it is intended to further develop the Agricultural fund system for electronic services "**Electronic Agriculture**" which will allow all public bodies and systems for managing support and control over the volumes, movement of resources and raw materials in Bulgarian agriculture to be digitised.

E-municipality Varna is a great example for electronic services on municipal level. It is a service provided by the municipality for the sectors:

- Electronic services of Varna Municipality through the portal
- Electronic service and information provision for state institutions and municipalities
- Public records
- Checkout, payment and information about local taxes and fees
- Electronic submission of documents under the tourism law
- Nursery, Preschools, Kindergartens and First Grade education admissions
- Public procurement - Buyer profile
- Secure electronic delivery system

236. https://iisda.government.bg/annual_report/564
237. https://joinup.ec.europa.eu/collection/nifo-national-interoperability-framework-observatory/governance-bulgaria

Under the official website ot Varna Municipality there are 11 websites, from which examples are:

- VISIT.VARNA.BG
- LIVE.VARNA.BG
- VARNANAMLADITE.COM

The example of VARNANAMLADITE.COM:

A platform that presents information under the Directorate "Education and Youth Activities" of the Municipality of Varna and the main source regarding national, regional funds and initiatives, the Varna volunteering service and other important information for the use of NGOs and youth organisations and representatives in the region.

The Geospatial Information System

The Municipality of Varna intends to implement a **centralised and integrated Geospatial Information System**: The Geospatial Information System will be consolidated and integrated by the Municipality of Varna. The municipal budget for 2022 has almost BGN 4.2 million set aside for this purpose. The Planning program was approved by the "Architecture and Town Planning" Committee within the budget for 2022-2024. All data will be combined into a single database under the new system, which will significantly enhance services for both people and companies. The administration will be able to offer computerised administrative services through it in addition to having an informative site for public registries. Another highlight of the program is the creation of a green cadastre of tree vegetation and green areas in the central part of Varna. BGN 180,000 is planned for it in the budget.

6.2.9. Conclusions - SWOT Analysis

A supportive innovation environment is currently developing in the country. To encourage R&D&I, Bulgaria has steadily created a variety of laws and regulations.The Government prioritising high-tech industrial and technological advancement through numerous policies and strategies for scientific research and ICT designated high-tech industries as preferential, which resulted in cheaper investment capital requirements and additional benefits to businesses in the areas of social security, taxes, and vocational training; in NRRP slightly more than the half of the funds support climate objectives and almost ⅓ support digital objectives, resulting in good environment with the potential to deliver breakthrough growth for businesses and innovation: EIS 2022 country profile is presenting performance increases in Research systems, Innovatos, Linkages, Employment impacts, and Sales impacts, and strong performance increases since 2015 in: product innovators (SMEs), innovative SMEs collaborating with others, knowledge-intensive services exports; Initiated innovation in sectoral policies: green economy, digital economy, space policy and defense; These policies have set the framework for an innovation environment, led the creation of public R&D and innovation entities, and given incentives for R&D and innovation activity. The results of the analysis show a constant increase in Gross domestic product (GDP) in the country. The presence of innovation strategies, policies and the establishment of a Ministry of Innovation and Growth in 2021 in order to facilitate them, together supporting the so-called innovative system, are the provisions to further

develop and implement a competitive economy (national, regional, and local). Among the essential components of the system are:

Business representatives - Start-up businesses, SMEs, large corporations, and high-tech businesses (Startups, small businesses, and medium-sized enterprises struggle to use their innovative potential because they lack the resources essential to conduct research and development activities. The large corporations and high-tech businesses have crucial positions to implement creative ideas. In order to do R&D, develop innovative and cutting-edge products and procedures, have an impact on the market, improve cash flow, and take leadership positions, they have the requisite knowledge, funds, and qualified personnel. In 2020 R&D spendings are the most in the South - West region (76%) and in BG33 approximately 3-4%. R&D intensity is slightly increasing over time. With a share of 67.2% of the overall R&D expenditure in 2019, the business enterprise sector had the biggest institutional R&D performance.

Numerous research and development centers - developed and many in process of idea or development (They create and disseminate new knowledge but exclude government research as well as R&D departments of businesses and research facilities for higher education. They stand for advances in science, cutting-edge technologies, and innovations.)

More than 50 University units - 10 among them are so called "Research Universities" (providing the general public with various learning opportunities, promoting lifelong learning, and playing a crucial part in the transmission of information through research and its practical, applied usage, which is embodied in innovation)

Hundreds of intermediary organisations (business incubators, consultancy organisations, branch associations, trade associations, regional development agencies, technology parks, and innovation centers, etc.),

Increasing availability of financing institutions (venture capital companies, business angels networks, foreign direct investments, national and international funding programs).

STRENGTHS

NER's economic situation is considered to be favourable in comparison to the other northern regions in the country, the unemployment rate is lower than in the EU; Between 2014 - 2020 the total GDP per capita increased by 34,23 %; GVA increased by 30.15%;

Continuous increase in the Agriculture, and in the industry sectors, highest increase in 2020 was in the services sector. In 2021 the services sector was 65% of the total regional GVA. In the areas of public services, business, financial services, insurance, transportation and tourism the service industry is strongly developed in the region.

- A growing sector of active SMEs.

- ICT usability is increasing at the fastest rates reaching (higher than the national average).

- Strategic transport-geographical area (transport infrastructure – relatively high share of motorways from the national network, rail, air transport, and water transport roads along the Danube and the Black Sea- prerequisite for market expansion and cooperation on local/regional/national and international level)

- Developed structure-determining industries – chemical industry, transport engineering, products from mineral raw materials, food industry;

- Availability of scientific institutes and higher education institutions and scientific potential for the development of high-tech industries;

- Availability of raw material and energy sources with potential for development by attracting foreign investments;

- Well-developed engineering infrastructure

- Trend towards growth in the industrial sector

- Presence of enterprises with expertise and well established relations on local, national markets.

- Relatively high share of foreign investments - the presence of private and foreign ownership of enterprises supports the processes of quality production of products and services and increasing productivity in certain services.

- Well developed service sector

- High growth rate of the knowledge-intensive sectors of the economy

- **6 Universities** located in BG33, more than the half of the universities are producing significant scientific output,2 Research Institutes within the premises of universities in the region; **307 Schools** (primary, lower and upper secondary);

- Availability of **qualified researchers in the field of natural and mathematical sciences, computer science technology and engineering sciences and medicine** due to high performance of R&D in universities, 2 National Institutes (BAS) and 3 regional academic centres under its jurisdiction on the theritory of BG 33, and other organisations/enterprises engaged with R&D processes.

- A growing sector of active SMEs; Availability of potential for development of high-tech productions

- Emergence of regional clusters and branch organisations; Presence of a network of NGOs

- Active implementation of the processes to meet the requirements and criteria of the EU (environmental, safety requirements, implementation of quality management systems and others.);

- **Varna province is the economic Hub and R&D&I hub of the North-East Region**; The overall economic development and the social development of Varna province are very good:The biggest province (51.3 % of the total population of BG33 is concentrated in the province). More than half of the GDP in the north region of the country is accumulated in Varna Province;

The ratio of non-financial firms in the Varna province in 2019 reached 71 per 1000 people, which is greater than the national average; it accounts for approximately 60 % of the GVA in the region in 2020. **Varna province is the only province in the region, with employment higher than the average in the country**- employment is continuously increasing and unemployment is decreasing to 2.2%, remaining one of the lowest in the country in 2020.

Varna province continues to attract citizens (2nd in the country after the capital), with a high value of mechanical growth – 6% and **the only district in the north-eastern area to succeed in attracting more residents** over the past ten years. The district is among the districts with the highest share of the urban population.

Trends in Non financial enterprises: **Increase in Turnover, Increase in Produced output, Increase in Added value by factor costs**; personnel engaged with (R&D) is increasing; **Increase in relative share of households with internet access**;

The “maritime capital” of Bulgaria has a top-notch educational system, is known for drawing talent, and has effectively reoriented its economy toward greater added value by using digital skills and research and development initiatives in the shipbuilding, informatics, and medical fields.

Varna province leads the North-Eastern region in terms of wages. A good environment for the development of startups and digital development;

- 015-2021: Birth rate of enterprises is higher than the death rate of enterprises for that period. Growth in the number of Micro and SMEs. Strong NGO sector; In the region a higher number of companies are present in the IT

- ICT, Food industry, Textile, Marine, Furniture and mechanical engineering sectors.

- **In terms of power generated from renewable energy sources, NER is in the first place. Another indicator ranking the region in the 1st place in the country is that it has enduring traditions in agriculture and cereals occupy more than 60% of the region's arable land** (in almost all municipalities of the region and highly developed crop production, exploited opportunities of the national agricultural fund).

- **Advancement of e-government and the provision of one-stop shop services is growing and are higher than the national average in 2 of the provinces in BG33**

- **The share of employment is above average for BG and above average for EU in: Agriculture and Mining**, The share of employment is above average for BG in Services, Utilities and Construction.

WEAKNESSES

National Development Strategy of scientific research in the Republic of Bulgaria 2012-2020 results were unsatisfactory as commitments made to the EU related to the national participation in the construction of the European Research Area were not fulfilled and official data showed decline in the field of scientific research due to lack of state policy support and appropriate reforms and long-term priorities in the field, outdated educational infrastructure and deteriorated quality of the educational system, low quality and low level of intensity of research and innovation activity.

- Lack of a good connection between higher education and research and development activities and businesses.

- Regional Innovation Strategies under the EC's "Innovating Regions in Europe" generally have not been implemented resulting in: lack of connections between business, policies, education, and research, as well as constrained innovation politics on regional level, systematic confidence in Bulgaria's R&D system has been eroded over the past years, it has diminished the trust that firms and entrepreneurs have in Bulgaria's research system to give them access to knowledge and technology that will help them grow and expand their companies.

- Clear imbalance of the proportion of funds for R&D in the separate planning areas (strong geographical concentration of the research activities in the capital area), only 1 "Research University" in BG33, 2 BAS centres and not well determined and established R&D infrastructure. Intra-regional differences and imbalance in the living environment

- Varna province, especially when observing the economic centre

- Varna city and Shumen and Targovishte (significant demographic losses - migration to the economic centre and to external migration - national/international).

- In 2018 BG33 Severoiztochen was among NUTS level 2 regions with the highest enterprise death rates. A high percentage of decrease in LEs was seen in BG 33 , with drop rates of -18.0% in 2018.

- In 2020 the labour market in BG 33 provinces trends are different for each province - ex. the lowest economic activity is in Targovishte province, and the employment rate decreases even under the country average - the highest in Varna.

- The unemployment rate is among the highest in the country except for Varna city
- In 2021 the unemployment rate in the Severoiztochen Region (6.1%) scored lower than in the EU (7.1%) but higher than the national level.
- BG33 is also facing challenges regarding the labour market in the region related to the ageing population and average low educational level of the workforce. Again Targovishte province has the lowest indicators in terms of GDP.
- The use of European funds remains relatively low in all provinces. Employment in high-tech sectors is low. ;
- Low e-government performance and the low level of provision of one-stop shop services led to low level of transparency in 2 provinces in BG33.
- Decrease in spending for (R&D) on annual basis - High level of population decrease, especially in the periphery of the region
- Ranking of SIR among underdeveloped European regions, highly dependent on new challenges and threats
- globalisation, climate change, demographic decline, energy dependence;
- The service sector is dominant, which places the local economy in the position of strong dependence on market fluctuations;
- Obsolete production facilities
- Fragmented low-efficiency agriculture
- Insufficiently developed public-private partnerships- Insufficient absorption capacity of funds under pre-accession and structural funds
- Slow penetration of the knowledge economy

OPPORTUNITIES

More than **50 reforms and 50 projects** will be implemented only under NRRP to support the innovation policy foundations from the previous reporting period and implement the new policies and strategies on national/regional level (in **NRRP** slightly more than the half of the funds support climate objectives and almost ⅓ support digital objectives);

- The achievement of the ultimate goal **"Innovative Bulgaria"** with national and regional economy based on knowledge and smart growth through measures in the field of education, digital skills, science, innovation, technology, and the interrelationships between them by implementing projects under competitiveness funds of the EU and the NRRP and other regional and national programs;
- BG 33 to take advantage of: partnerships amongst the research and innovation performing and dependent/demanding organisations – scientific organisations, universities and businesses, their confederations and civil society organisations, partnerships amongst institutions developing and implementing (sectorial or generic) policies in science and innovation, basically aimed at inter-ministerial coordination; Partnerships amongst institutions developing and implementing (sectorial or generic) policies in science and innovations, and research and innovation performing and dependent/demanding organisation and increase public trust in the regional R&D system under the **"Better Science for a Better Bulgaria 2025"**

- By following the regional strategic priorities: to increase the region's dynamism on a global scale through the growth of intelligent industries with high growth potential — increasing specialisation in goods and industries with high levels of technological and R&D intensity; business and industrial development infrastructure; support for a marine economy; activation of rural areas through sustainable agriculture; diversification of the region's tourist product;

- Supportive and developed environment with the potential to deliver breakthrough growth for businesses and innovation: EIS 2022 country profile is presenting performance increases in Research systems, Innovatos, Linkages, Employment impacts, and Sales impacts, and strong performance increases since 2015 in: product innovators (SMEs), innovative SMEs collaborating with others, knowledge-intensive services exports, which will reflect and on regional level.

- The presence of a large city with significance on European level and presented as economic hub in the country - Varna: Further expand the city importance on national and international level through cooperation and investments ; Increasing the role of Varna in the network of European cities and as the second urban centre of the country with high economic, transport-commercial, scientific, educational and cultural importance - the "sea capital"; Stimulating the development of social partnership and activating public dialogue for participatory budgeting;

- Good energy security and availability of conditions for the use of RES;

- Strong potential of Varna in the field of medicine and biotechnology,

- The Government designated high-tech industries as preferential, which resulted in cheaper investment capital requirements and additional benefits to businesses in the areas of social security, taxes, and vocational training - new investments Improving the efficiency of public spending and ensuring redistribution of public spending on activities increasing the growth potential of the economy

- Construction of modern scientific research infrastructure, wider introduction of program project financing

- Attracting foreign direct investment in knowledge-intensive sectors of the economy

- Specialisation in high-tech sectors using a highly skilled workforce

- Utilisation of the country's renewable energy production potential

- Establishment of the region as a producer of organic agricultural products -

- Improving the connections of higher education and research and development activities with business activities in the area;

- Improvement of regional and local infrastructure - development of transnational infrastructure networks, provision of access to European infrastructure networks, construction of a coastal transport corridor;

- Development of new energy sources with high energy potential for the development of the national economy;

- Using the potential for the development of technological zones, including in partnership with local universities to support the transformation of the local economy; Digitization of productions and use of modern ICT;

- Transition to a circular economy, reduction of resource and energy dependence and reduction and utilisation of waste. Cross-border cooperation with Romania - Improvement of the investment climate in Bulgaria.

THREATS

-Shared institutional responsibility for implementation of policies and strategies may result in the limited possibility of their implementation;

- Unsatisfactory performance over the new reporting period to further cause negative effect to the regional development , leading to: unfavourable demographic trends, insufficient specialised staff and business infrastructures.

- Decrease or lack of specialists for the labour market

- Occurrence of a shortage of qualified teaching, scientific and medical personnel due to weak attractiveness of these professions in the country

- Deepening of unfavorable demographic trends

- Difficult realization in the labor market of those leaving the education system due to its low Quality
- Further deepening of differences in welfare and development between the center (the coastal area, especially Varna) and the periphery (rural, remote areas)

- Emigration of young people from the area - Focus and Investment only in the regional city and neglect the needs of small municipalities

- Global economic/energy crisis

- Environmental crisis

- Transboundary pollution along the Danube and Black Sea

- Environmental pollution (air,waters, soils and water area) in the industrial and residential agglomeration “Varna-Devnia”

- Challenges caused by climate change

- Macroeconomic and political destabilization in Europe or the Balkans

- Failure to compete in business terms with other the EU innovation hubs

- Underdeveloped public-private partnerships

- Ignorance by manufacturers of EU production and trade standards

- Chronic shortage of financial means for completion and maintenance of the existing infrastructure

- Challenges to the sustainability of public finances in relation to the aging of population,

- Imposition of sanctions by the EU in case of non-fulfilment of commitments in the field of environment

6.3. **Catalunya** Regional analysis of the innovation status



6.3.1. Introductory data about the region

With an estimated population of 7.7 million inhabitants (2021), Catalonia is the second most populated Autonomous Community in Spain. Catalonia is organised in 947 municipalities and “veguerias”, 41 counties (comarcas) and 4 provinces: Barcelona, Girona, Lleida and Tarragona.



Fig. no. 49. Catalan counties

Despite the 947 municipalities, Catalonia has a small rural population because the majority of citizens (around 95%) are concentrated in around 300 municipalities with more than 2,000 inhabitants and are, therefore, considered to be urban.

Politically, as established by the *Estatut de Autonomia*, Catalonia is organised in the Generalitat de Catalunya, which is formed by the Parliament, the Presidency, the Executive Council, and the institutions created by the Parliament. And, as it has been mentioned, Catalonia has a wide range of exclusive legislative powers, shared legislative powers (with the central state) and executive powers of the state legislation, which are included in the Estatut de Autonomia, and that enables Catalonia, among others, to create their own innovation Policy and Business Development and support system.

6.3.2. Macroeconomic indicators and business environment

Catalonia has an unemployment rate of 9.3% of the active population, which is lower than the national rate (12,67%):



Fig. no. 50. Unemployment comparison Spain and Catalonia

Among the cities with the lowest unemployment rate in Catalonia, Sant Cugat del Valles stands out with an unemployment rate of 4.6%, followed by Castelldefels (6,53%), Sant Feliu de Llobregat (6,96%) and Barcelona (7,01%). All of them are from the Province of Barcelona.

Catalan GDP is 229,418 M€, which places it as the second largest economy in Spain by GDP volume out of the 19 Autonomous Communities, after Madrid (234,639 M€).

In Catalonia, the largest economy is the county of Barcelonès with 85.1558 M€, followed by el Vallès Occidental with 27.778,5 M€.

The 229.418 M€ in Catalonia represents an increase of 5.8% compared to 212.438 million in the previous year:

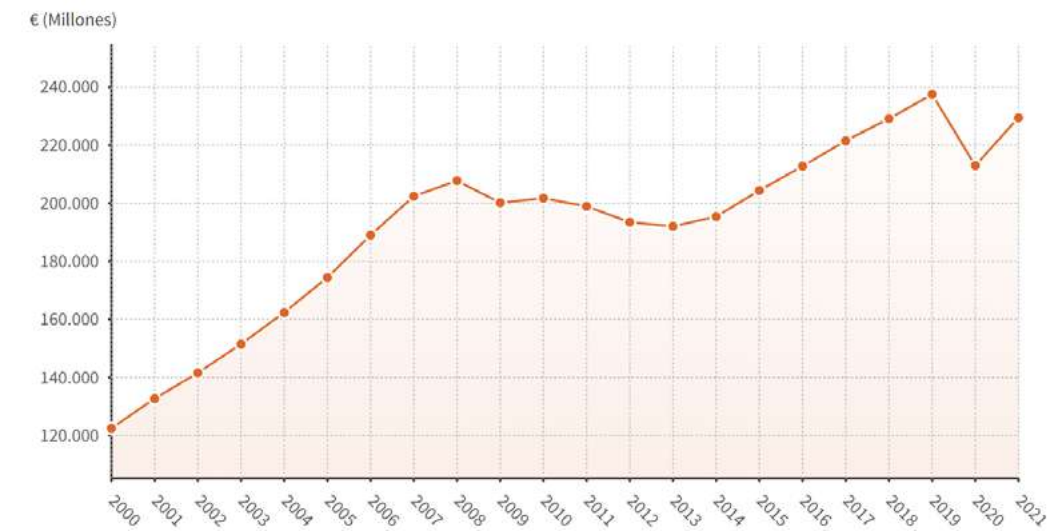


Fig. no. 51. Catalan GDP evolution (INE)

In terms of GDP per capita, which is a good indicator of quality of life, in Catalonia in 2021, it was €29,942, compared to €25,500 GDP per capita in Spain. If we order the Autonomous Communities according to their GDP per capita, Catalonia is in a very good position in terms of the standard of living of its inhabitants, as it is ranked 4th in terms of GDP per capita out of the 19 Autonomous Communities.

In Catalonia, despite the fact that the Barcelonès county is the one that generates the highest GDP, the county with the highest GDP per capita is Ribera d'Ebre with an average of 51.100 euros per person.

According to the latest available data (last update was in February 2022) in Catalonia there are a total of 630.474 companies that have their registered office there (18.5% of the total number of companies in Spain). The business structure shows the predominance of companies without employees. The distribution is as follows:

- 57.7% of companies have no employees.
- 42.3% of companies have employees.
  - 37.9% have between 1 and 9 employees.
  - 3.6% have between 10 and 49 employees.
  - 0.8% have more than 49 employees.

The following table shows the number of companies established in Catalonia per sector and number of employees (2021):

	Industry	Construction	Services	Total
Companies established in Catalonia	**35.720**	**75.565**	**519.207**	**630.474**
Without employees	11.654	45.324	303.297	360.275
1-9 employees	17.094	27.075	193.822	237.991
10-49 employees	5.096	2.813	16.280	24.189
50-249 employees	1.348	293	4.128	5.769
250 or more employees	510	60	1680	2.250

Table no. 5. companies established in Catalonia per sector and number of employees (Idescat)

According to the Department of Economy and Finance, the financial crisis had serious consequences for business demographics, causing the net disappearance of 43,059 businesses between 2009 and 2014, of which 17,286 were without employees and 25,773 with employees. During the subsequent recovery period, between 2014 and 2019, there is a net increase of 54,310 companies. The recovery of pre-crisis companies, however, has been largely thanks to companies without employees, which have increased by 42,642 units. In relative terms, the ones that grew the most were the medium and large ones, followed by small and non-salaried companies.

As of 2019, the statistical concept of company is modified, which is why there is a break in the time series. During 2019, the number of companies continued to expand, especially medium and large companies.

The outbreak of COVID-19 has had negative implications for the business dynamics of the Catalan economy, with the net disappearance of 6,909 companies (compared to January 1, 2020), of which 6,418 were without employees. In relative terms, small and medium-sized companies are the ones with the greatest reduction.

Innovative Companies in Catalonia:

According to the barometer of innovation and digital and green transformation in Catalonia for the year 2021, created by ACCIÓ, half of all Catalan companies (50.7%) with more than nine employees have carried out some innovative activity during 2021; 24.4% of innovative companies had acquired or developed R&D in 2021; and 23.2% of innovative companies collaborated in 2021 with technology centres, research centres and/or universities.

Innovation is concentrated to a greater extent in start-ups and more mature companies:

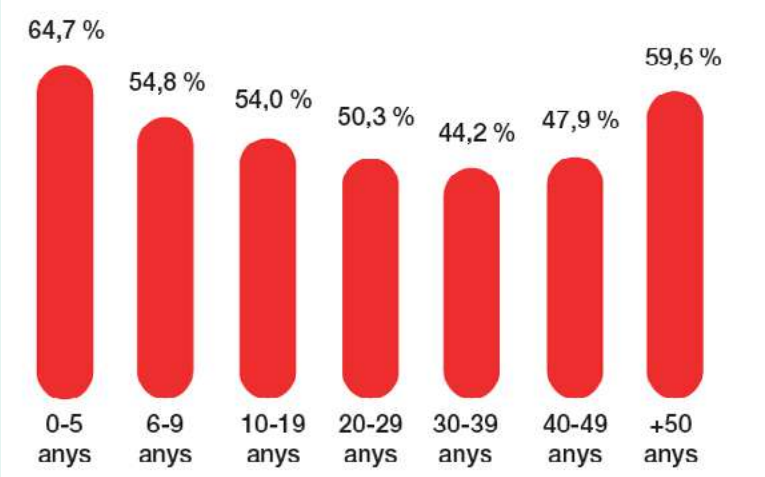


Fig. no. 52. Innovative enterprises by age groups 2021. (Acció)

During 2021, Catalan companies innovated mainly in product (57,8%) and information and communication systems (42,8%).

Barcelona is considered the most innovative city. In fact, The Catalan government promotes initiatives to continue positioning the city of Barcelona as a true hub for urban innovation, research and modernization through the creation of self-sufficient and sustainable management solutions to improve public policies, services and goods with a social impact.

6.3.3. Business support framewor

In Spain there are various institutions and public bodies responsible for supporting and promoting Spanish companies. These institutions belong to both the central State Administration and the Autonomous Communities.

In Catalonia, **ACCIÓ** is the public agency for the competitiveness of Catalan enterprise, attached to the Ministry of Business and Labour of the Generalitat of Catalonia. It aims to promote the competitiveness and growth of the Catalan business fabric by promoting innovation, internationalization and by attracting investment.

ACCIÓ assists enterprise in the process of competitive differentiation and in the continuous search for new business opportunities. The agency also advises companies in their search for funding, helps them grow through training programmes and guides them on issues concerning clusters, among other programmes and support services. It is also responsible for attracting foreign investment to Catalonia through Catalonia Trade & Investment.

In addition, the most representative business organizations in Catalonia are FOMENT, PIMEC and FEPIME.

Foment del Treball Nacional (Foment) is the confederation that represents employers and the powerful Catalan industry since 1771. As an independent, private and non-profit organization, protected by the constitutional and legal right of association of employers, it is governed with democratic criteria by freely elected representatives.

PIMEC, founded in 1975, is the most representative employers' confederation that represents and defends the interests of micro, small and medium-sized enterprises (SMEs) and the self-employed in Catalonia. PIMEC is one of the most representative social agents in Catalonia, participating in more than 430 working groups and commissions with public administrations and other social agents, as well as regularly expressing its opinion on legislative initiatives and public policies and making proposals to defend and represent the interests of SMEs and the self-employed. This work is carried out in Catalonia at all levels (local, regional and autonomous), as well as in Spain and Europe.

Federació d'Empresaris de la Petita i Mitjana Empresa de Catalunya - FEPIME Catalunya is the employers' association representing micro, small and medium-sized companies in Catalonia. Founded in 2000, Fepime represents, directly and indirectly, around 400 territorial and sectorial organizations. Currently, FEPIME and Foment have initiated an integration process.

At the local level, other organization supporting business development is "Barcelona Activa", which is the agency for local development of Barcelona. Among the services that Barcelona Activa offers to companies, it is worth mentioning management and business strategy, digitalization, and business innovation

Supporting innovation through clusters in Catalonia

Catalonia stands out for having a very successful cluster policy, which has been in operation for 30 years. Thus, clusters play a crucial role in supporting the Catalan business fabric. In Catalonia there are 74.438 associations, according to data from the Department of Justice in 2020. At the whole Catalan level, it is difficult to quantify the exact number of clusters. Nevertheless, following a regional report based on Barcelona and its metropolitan area, there are 32 clusters with presence in this area that represent 54% of the total. Thus, Catalonia has over 59 clusters, 26 of which have the distinctive of "Catalonia Clusters" (programme promoted by ACCIÓ).

Barcelona is one of the most powerful provinces in terms of clusters. In fact, there are 32 clusters, and 1.480 companies out of the 2.740 companies that belong to a cluster in Catalonia, are in Barcelona and its metropolitan area. Of which 1.021 are in Barcelona city (representing 68% of the Metropolitan Area and 37% of the total of Catalonia). Currently, the clusters employ more than 150.000 people in Barcelona and its Metropolitan Area and account for more than 50.000 million euros in turnover.

Industry in Catalonia

There are over 1.400 industrial parks in Catalonia, in which 44.000 companies are represented. This number represents 24% of the total for Spain, positioning Catalunya with the highest number of industrial parks in Spain.

The industry in Barcelona-Catalonia is highly diversified, with the main branches being **chemicals and plastics, food and beverage, motor vehicles,** and **life sciences.**

The **chemicals and plastics** are the No.1 sector in Catalonia's economy, representing 16.9% of its industrial GVA. It is, in fact, the largest chemical hub in Southern Europe, enjoying the presence of multinational companies such as BASF, Dow, Kao, Covestro, Puig, and Repsol.

Food and beverages represent the second largest industrial sector in Catalonia. Most leading food companies in the world, such as Nestlé, Danone, Unilever, Kellogg's, Haribo and Griffith Foods, have set up productive centres, R&D departments and logistics activities in Catalonia.

The **motor vehicles** sector is also strong: 17% of the vehicles in Spain are produced in Catalonia, making it a leading automotive powerhouse in Southern Europe. The region hosts SEAT's (Volkswagen Group) automotive OEM development centre and most of the engineering units of the parts suppliers Tier 1 and 2.

Life sciences is experiencing exponencial growing in Barcelona-Catalonia. The region has a world-class network of medical institutions, hospitals, research centres, biotech startups and pharma companies. Moreover, 40% of the top global companies in life sciences are present in Catalonia, such as Teladoc Health, AstraZeneca, Sanofi, Novartis or Roche.

Startups, accelerators, incubators, hubs:

Barcelona is the 5 th best ecosystem of the EU to create a start-up, following Paris, Berlin, Stockholm, and Amsterdam and it is the 4 th ecosystem of the EU with the highest number of scaleups. Below there are some statistics from the recent report on Barcelona & Catalonia Startup hub, created by ACCIÓ:

- In 2022 there were 2.020 startups, which supposes an increase of 86% between 2016 and 2022; and an increase of 6,3% compared to 2021.

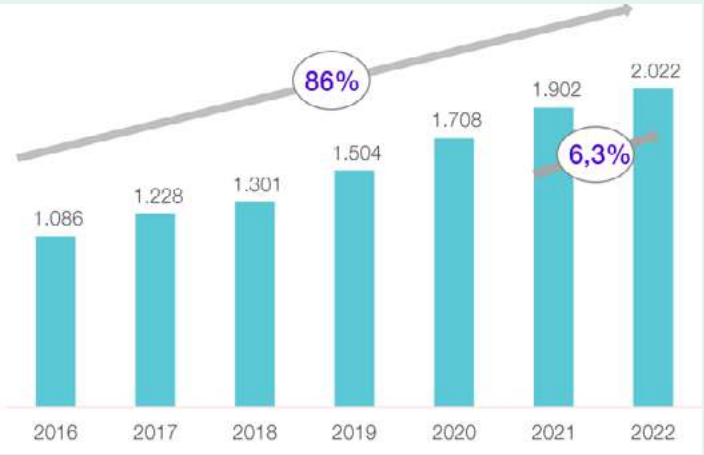


Fig. no. 53. Startups evolution in Catalonia (Barcelona & Catalonia Startup Hub 2022)

- 87,7% of the startups are in Barcelona and its metropolitan area.
- 76% of the startups work with technologies linked to industry 4.0, being Artificial intelligence and big data the main technologies.
- 79% of startups invest in R+D.
- 49% of startups have some kind of patents or protection systems.
- Ecommerce & MarketPacle and SaaS are the predominant business models.

The following graph shows the distribution of startups by sectors (top 10 %):

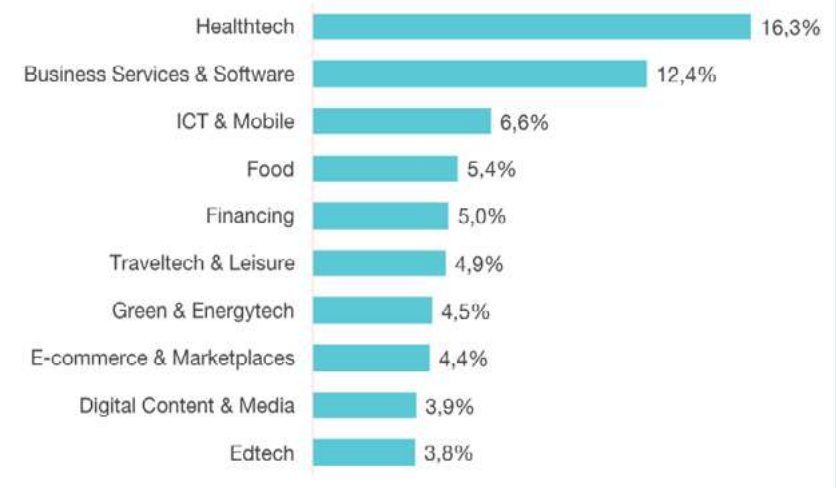


Fig. no. 54. sectoral distribution of startups. (Barcelona & Catalonia Starpup Hub, 2021, ACCIÓ)

6.3.4. Private funding

The volume of private equity investment in Spain reached 7.494 billion euros in 2021, according to the first estimates obtained by the Spanish Association of Capital, Growth and Investment (*Asociación Española de Capital, Crecimiento e Inversión*, ASCRI) through the European EDC platform. A total of 841 investment transactions were closed and did not suffer as a result of the pandemic. In fact, it was a historic year for venture capital and the second best year on record in the middle market, only behind 2019.

Venture capital broke its ceiling in 2021, with 1.942 billion euros marking its highest amount to date and with 691 deals also beating previous figures. International venture capital played a major role in this milestone, with a total of 1.575 billion euros disbursed in 173 investments, 248% more than in 2020.

According to the report "Capital Stock in Spain and its Autonomous Communities", elaborated by BBVA and IVIE, private investment plays an important role in the post-pandemic economic recovery. Indeed, the performance of private investment represented 91% of the total investment (2021). While during the first pandemic year private investment fell by more than -10%, in 2021 it grew by 4.1%.

The following types of private financing are highlighted in Spain:

- Friends, Family & Fools (FFF).
- Business Angels. There are 35 Business Angels networks distributed among 9 autonomous communities. Their investment, according to AEBAN (Association of Business Angels networks) are between 50,000€ and 500,000€.

According to AEBAN report on Business Angels, during 2021 a significant proportion of business angels invested through venture capital funds (36%) and crowd equity platforms (36%), in addition to making direct investments in startups.

Technology and software (39%), health and medical equipment (33%) and biotechnology (29%) are the sectors that have attracted the most investors' interest in 2021.

- Venture Capital: In the past years, the Venture Capital ecosystem has experienced a period of clear growth. The covid-19 pandemic has slowed down the rate of growth, but there are still large expectations for the coming years. 2019 was a record year since 151 were carried out investments, all between €1M and €10M, a growth of 55.7% compared to 2018.

All the national investments came from 79 Spanish investment funds, of which some of which also base their operations on international investments: from 'Axon Partners Group', €150M, to 'BeWater Funds', €7M. These funds have a net worth to invest of €50M.

- Crowdfunding: According to the report prepared by Universo Crowdfunding, in collaboration with the Complutense University of Madrid, in Spain, in 2015 the volume of transactions represented only 29.8 million euros, but as of that date it has experienced a strong growth, going to 73.2 million in 2016 and 101.7 million in 2017 (35.33% more than in 2016). This figure represents a very significant amount, but also, all the indicators suggest that this growth will continue unstoppable for the next few years.

- Investment funds: The average profitability of investment funds in Spain in the last 15 years (1.9%) was lower than the investment in 15-year Spanish state bonds (3.4%) and investment in the IBEX 35 (2.7%). 93 of the 614 funds with 15 years of history had a return higher than that of government bonds at 15 years and 146 to the IBEX 35. 52 funds had negative returns.

- BME Growth: The companies listed on BME Growth have overcome the pandemic, as shown by their financial data at the end of 2021. These companies are consolidating their position as a key player in the Spanish economy and are achieving a very positive evolution in turnover, EBITDA and number of employees.

In part, this positive trend is due to the fact that companies from the most innovative sectors are mainly part of this BME market. In fact, if we compare the increase with respect to 2020 only of the group of companies in expansion, which excludes the real estate sector, this amounts to 46.1% in turnover, 32.5% in EBITDA and 37.1% in headcount.

According to the financial information published, the total of BME Growth companies at the end of 2021 has increased its turnover by 28.9% to 3,636 million euros, consolidating a compound growth of 26.6% over the last 5 years.

- Bank funds: Spain's high levels of private debt, in particular bank debt, together with increased public debt levels, is making it extremely difficult for Spanish banks to tap wholesale funding markets, currently their main source of funding. Such difficulties have essentially led banks, and to an even greater degree cajas, to rely on shorter dated, secured debt instruments. However, in the actual context of greater risk aversion for peripheral Eurozone countries, only the Spanish Treasury is successfully able to raise money in the primary market. Temporary ECB liquidity support measures have provided some necessary breathing space for the Spanish financial system. But, Spanish credit institutions must recover the confidence of the markets and come back to traditional funding channels in order to reduce their heavy dependence on Eurosystem liquidity

6.3.5. Foreign direct investments

Catalonia is a leading European ICT hub that attracts foreign investment in technology. Barcelona is considered the world's fourth most technology-oriented city, and most prepared for the technology of the future. It is the fifth European city in attracting technology investments and it is recognized by the Financial Times for having Europe's best foreign investment attraction strategy.

Regarding investment for startups, in 2022, the investment attracted (1.653M€) was 4.3% higher than in 2021 (1.585M€). The investment raised for startups in Catalonia in the last 5 years is 296% higher than that raised in the previous five years:

	2013	2014	2015	2016	2017	TOTAL (2013-2017)
Inversió en startups (M€)	133	269	279	308	282	1.271

	2018	2019	2020	2021	2022	TOTAL (2018-2022)
Inversió en startups (M€)	456	902	448	1.585	1.653	5.043

296%

Fig. no. 55. Evolution of Startup investment (Dealroom 2023).

Barcelona ranks 6th in the ranking of EU cities by volume of venture capital investment raised.

In 2021, Catalonia Trade & Investment attracted €612M, the highest figure on record, and it is the region that received the most R&D investment projects in all Europe, making it a key innovation hub in the continent. In total, 82 foreign investment projects were executed in Barcelona-Catalonia in 2021, creating 3,211 jobs and maintaining an additional 2,471 jobs.

Regarding investment in Innovation, in the last 3 years, 22.3% of companies invested in innovation. Catalonia ranks third in this ranking, only surpassed by the Basque Country, with 24.3% of innovative companies, and the Valencian Country, with 22.7%. It is ahead of communities such as Madrid (21.2%) and Navarra (19.9%).

In 2021, the interest of international funds in the Spanish market was strongly linked to the excellent figures achieved in both the private equity and venture capital segments. In total, over 81% of the amount invested in Spanish companies came from abroad. In fact, this capital offset the reduced amount invested by national fund managers, which, spread over 501 transactions, stood at 1.285 billion euros compared to 1.474 billion euros the previous year

In its analysis of investments in 2021, ASCRI looks at both the source and destination of capital. This has allowed it to detect a greater maturity in the venture capital, by counting up to 1.505 billion euros invested in 182 transactions in what it calls late stage venture capital; i.e. in companies with a certain presence.

6.3.6. Education environment

In Catalonia, for the period 2020-2021, there were 2,3% of university students enrolled (270.000) and 18.024 students enrolled for a doctorate.

Spain has more STEM students than the EU average, and Asturias and the Basque Country lead in percentage of graduates in these careers. No current and concrete data on STEM students are easily available in Catalonia. Nevertheless, it is estimated that the percentage of new students from 2015/16 to 2019/20 was almost 24%. In 2019, the "STEMCat Plan" was approved to promote scientific, technological, engineering and mathematical vocations, but an in depth analysis needs to be done.

6.3.7. Research & Innovation

In all research and development (R&D) activities in Catalonia, 59.5% of the personnel employed are men. A weight that increases up to 2 points more if we refer to researchers, according to the latest data collected by Idescat, corresponding in 2018.

As for university staff, although women are still below 50% in the positions of permanent and non-permanent PDI (teaching and research staff) -with percentages of 42% and 46% respectively-, again the weight of the female collective is very significantly reduced in the highest category, that of university professor, representing only 22.8% of the total, according to data corresponding in 2019 collected by the Uneix system indicators.

Regarding Catalonia's university system, it includes 12 universities (7 public, 5 private and 1 virtual), five international schools and five campuses of excellence. According to The Times, it is the third best university system in Europe. Barcelona is also the seat of IESE, ESADE and EADA, business schools, considered among the most prestigious in the world.

Barcelona and Catalonia also stand out for their open and multicultural nature and their ability to attract international talent. The Catalan capital is considered the fourth most attractive city in the world to work in and has a wealth of skilled labour in science and technology.

6.3.8. Public authorities - innovation and digitalization

Catalonia also encourages innovation in public administration. In fact, the Generalitat has developed several tools, such as ApLAB, which is a meeting point, both physical and virtual, to promote innovative projects that improve public services, especially digital ones; or Innoteca, which gathers innovative experiences carried out in the administration of the Generalitat de Catalunya and its public sector.

The digitization of the public sector in Catalonia revolves around 4 areas: people, processes, data and technologies. Also, it is important to highlight that the Catalan RIS3CAT strategy fosters, mainly innovative public procurement and co-creation processes. However, in the public administration other tools are being used: testing, open innovation, ideas competition, agile processing, among others.

The most characteristic services are e-administration and e-government, training, and rapid response to citizens.

At the national level, there exists the Quality and Innovation in Public Management Awards. In Catalonia, there exists the Alfons Ortuño Awards of innovation and good practices in Catalan public administrations. Catalonia has other awards such as: eGovernment Awards, Discapnet best practices model, and "Laus de Bronze" awards.

6.3.9. Conclusions - SWOT Analysis

a) STRENGTHS- "Sweet spots"

- The Catalan research system, which has a high capacity to produce, attract and retain talent, is an internationally recognized model of success.
- With 1.5% of the EU-27 population, Catalonia generates 2.9% of publications, 2.2% of the funds of the 7th Research Framework Program, and attracts 3.29% of the projects of the European Research Council projects (third EU country in terms of projects per million inhabitants). With 0.1% of the world's population, Catalonia produces 1% of all scientific publications.
- There is an important base of centres for the generation and application of knowledge (12 universities and 3 of Europe's top 25 business schools), which gives rise to a significant critical mass of graduates highly valued in the world of work and science. There are also hospitals and research centres that have great international prestige from a scientific and knowledge transfer point of view.
- In Catalonia, over the last twenty years, stable public policies have been agreed in order to have stable public policies, with a political commitment to R&D. This is the case, for example, the National Pact for Research and Innovation (2008), the innovation (2008), the science law and the strategic plan for research, innovation and and the Strategic Plan for Agrifood Research, Innovation and Transfer of Catalonia.
- The ICREA program has the capacity to attract and retain talent: 294 researchers of international prestige (40% of whom come from EU institutions and 20% from the United States), 70 of whom are involved in European Research Council (ERC) projects.
- Catalonia has scientific and technological infrastructures of international recognized prestige (the National Center for Genomic Analysis, the Alba synchrotron and the Barcelona Supercomputing Center).
- The R&D&I system is competitive enough to face new challenges and play a role in the major scientific and technological projects of the future:
    1. Catalan research centres and groups participate in the two Flagship research projects selected by the EU.
    2. The success in the calls for proposals of the European Research Council's "Proof of Concept" initiative is an example of the incentives to increase the commitment to knowledge transfer from research centres and universities to the productive sector.
- Incentives are provided for the concentration and consolidation of research agents to increase critical mass and competitiveness (SUMA, a program of the Generalitat of Catalonia for the integration of CERCA centres).

- The network of technology centres, which is highly developed, is progressively improving the positioning in European and international platforms and projects.

- There are multiple collaboration initiatives between the agents of the research and innovation system. The 15 Connect-EU Groups stand out, made up of public and private agents that collaborate to agree on strategic R&D agendas in specific technological areas and with applications to industry.

- Catalonia, especially Barcelona, is internationally recognized for its emerging creative class and for design. The creative elements are a great asset of the Catalan innovation system.

b). Weaknesses

- The research and innovation effort is still below the eurozone average.Cooperation and strategic alliances between companies and between them and the knowledge-producing system are limited.

- Catalonia does not have sufficient decision-making capacity in key areas for research and innovation. There is little coordination between the R&D&I policies and instruments of Catalonia and the Spanish state (lack of a complicit state).

- Patent production is significantly lower than the European average.

- There is a lack of a culture of cooperation between SMEs and the rest of the agents of the research and innovation system. SMEs often have a low capacity for absorbing knowledge and do not have qualified personnel to develop R&D or to take advantage of external R&D

- There is little relationship between universities and business, and the mobility of researchers between the public and private sectors is low.

- The potential of public procurement and investment as a strategic driver of innovation is underdeveloped

- There is little investment capital willing to take risks in knowledge-intensive business projects, especially in the early stages of expansion.

c). Opportunities

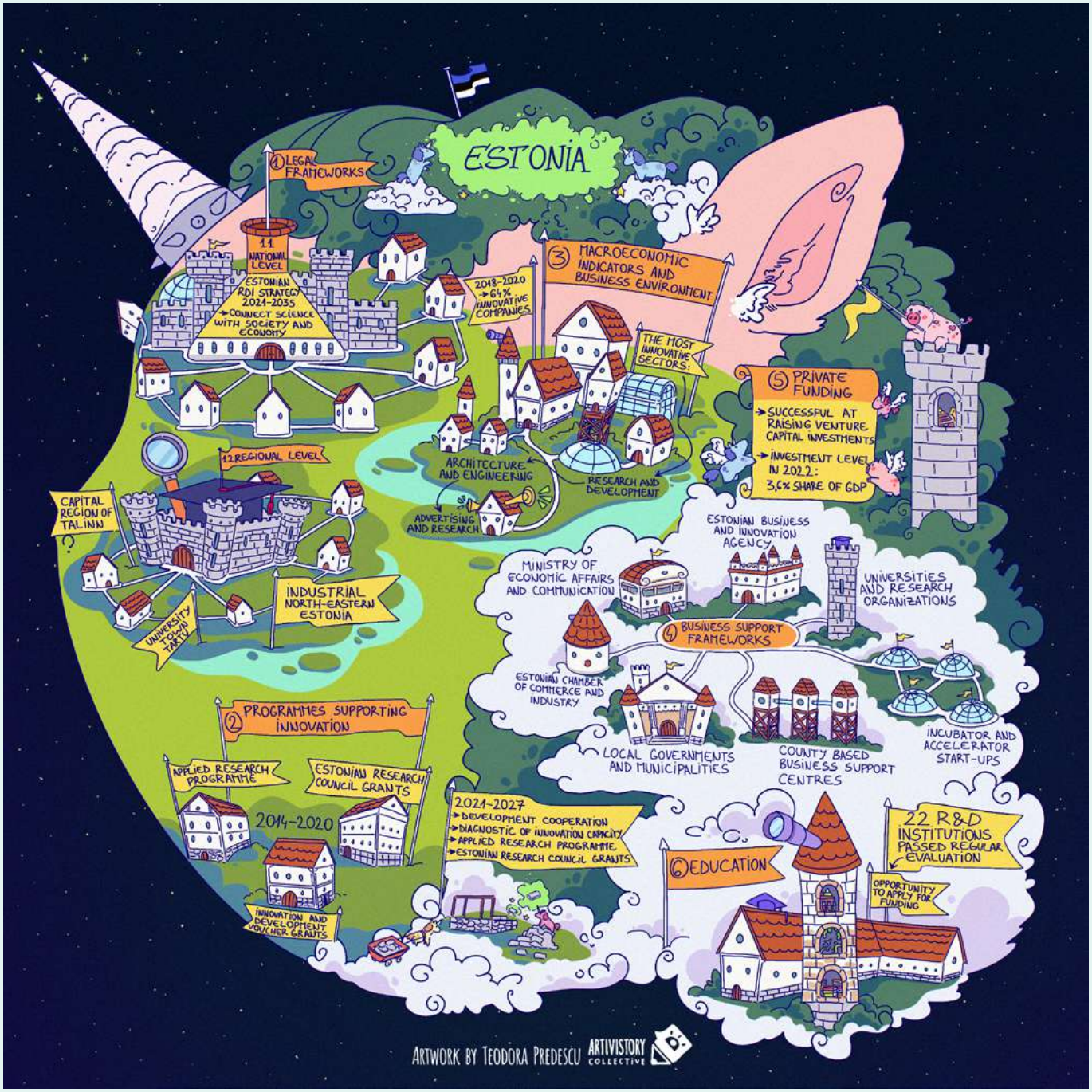
- R&D&I processes are increasingly global and open. The Catalan R&D system is well positioned: it is a pole of attraction for researchers with international prestige and is fully interconnected in European networks and platforms.

d). Threats:

- The economic crisis and the containment of public spending threaten the economic sustainability of the R&D system, which is mainly financed with public funds.

- Within the framework of smart specialization strategies, countries and regions are looking for ways to improve their positioning in the scientific and technological niches that have the greatest potential for the future. There is a risk of not standing out in anything due to a lack of capacity to focus and bet on the scientific and technological areas in which Catalonia has a competitive advantage.

6.4. **Estonia** Analysis of the innovation status



6.4.1. Introductory data about the region

Estonia has 1.33 million inhabitants in 2022, 615 000 of them live in the capital city Tallinn and the surrounding county. The other bigger regional centres include Tartu, Narva and Pärnu, and altogether 62% of the population lives in urban settlements.

Majority of the research and development activities takes place in the capital region of Tallinn, university town Tartu and industrial north-eastern Estonia.

The unemployment rate was 5.6% in IIIQ 2022 in Estonia.



6.4.2. Macroeconomic indicators and business environment

The innovativeness of Estonian companies has remained relatively high in recent years. According to the innovation survey conducted for the years 2018–2020, 64% of Estonian companies were innovative. The result has fallen somewhat compared to the past, but remains at a good level. The most innovative are large companies with more than 250 employees, almost all of which, or 92%, are innovative. The most innovative industries are architecture and engineering, research and development, and advertising and market research companies. The least innovative is the wholesale, transportation, and warehousing sector. Companies in the industrial and service sectors are at a relatively similar level of innovation, 65% and 63%, respectively.

	2015	2016	2017	2018	2019	2020	2021	2022
50-249 employees	1 200	1 184	1 150	1 172	1 159	1 156	1 122	1 136
10-49 employees	6 281	6 293	6 391	6 548	6 779	6 509	6 284	6 572
less than 10 employees	109 722	112 777	119 887	123 744	125 662	130 143	138 134	140 783
Total SMEs	117 203	120 254	127 428	131 464	133 600	137 808	145 540	148 491
Population	1 313 271	1 315 944	1 315 635	1 319 133	1 324 820	1 328 889	1 330 068	1 331 796
SMEs per 1000 persons	89	91	97	100	101	104	109	111
GDP per person EUR	20 631	21 282	22 515	23 367	24 241	24 107	26 039	

Table no. 6. Estonian SMEs and GDP per person, 2015 -2022

The innovativeness of companies is divided into two: process innovation and product innovation.

Process innovations are activities during which companies have developed their work or production processes. The survey shows that in recent years more emphasis has been placed on renewing the work

organisation. This may be caused by the fact that during the study period there was a massive spread of the coronavirus, which is why it was imperative for companies to change their work arrangements, and a lot of people began to use the option of working from home offices.

Product innovation refers to the development of companies' goods and services, including competitive and non-competitive products. Competitive products are goods and services that others already offer, but which are new to the company itself. Non-competitive products include products that are not yet offered on the market. Estonian companies are rather characterised by the renewal of competing products and the improvement of goods and services.

Innovations related to the environment were also an important part of this study, which show the extent to which companies are committed to the environmental issues and to what extent they adapt their operations to be more environmentally sustainable. At the time of the survey, environmentally friendly innovations that reduce the use of energy or the CO2 footprint both in work processes and in the consumption of products were mostly dealt with. A lot of attention was also paid to the reduction of materials and water in the work processes.

6.4.3. Business support framework

In Estonia, the main stakeholders of the business support framework are:

- Ministry of Economic Affairs and Communications,
- Estonian Business and Innovation Agency, formerly Enterprise Estonia, which is the key national entrepreneurship supporting agency.
- Estonian Chamber of Commerce and Industry, representing more than 3600 companies, who pay more than 40% of all the taxes in Estonia.
- Local governments and municipalities, among them Tallinn and Tartu focusing a bit more among other topics also on innovativeness of companies.
- County based business support centres (in total 15), who provide a variety of business support services for early-phase and experienced entrepreneurs..
- Universities, research and development organisations, University of Tartu and Tallinn Technical University being the largest research organisation.
- Incubators and accelerators for startups, where the number has rapidly increased during the last 5 years, including at least 35 incubators and accelerators for pre-start-ups, start-ups and scale-ups.

Regarding innovation, a few networks can be highlighted.

2% club as a section of **Estonian Employers' Confederation**: community of development managers and entrepreneurs who invest 2% of their companies' turnover or at least one million euros per year in research and development activities.

Estonian Innovation Leaders Club: The Innovation Leaders Club is a community of corporations, universities, start-ups and business support organisations, whose joint activities pave the way for innovative future solutions that put Estonian companies at the forefront of innovation in the world.

6.4.4. Private funding

Estonia is one of the most successful countries, when it comes to raising venture capital investments per capita out. In 2022 Estonia had investment levels at a 3.6% share of GDP. The only other country in the 'above 1% of GDP' category on their investment levels is Croatia.

"Estonia, one of the smallest countries in the Central and Eastern Europe, leads the whole of Europe when it comes to VC investments per capita as well as start-up creation — €1,967 per capita raised and one start-up per 1,048 people — which won't come as a surprise to many readers," wrote Sifted in 2021.

In 2022 the tech market is experiencing a dramatic overhaul, and Estonia is at €994 invested per capita, beating the European average of just €132. The closest competitors are the Nordic nations: Iceland (€511) and Sweden (€449).

6.4.5. Foreign direct investments

Estonia is among the leading countries in Central and Eastern Europe regarding foreign direct investments per capita.

The country is highly developed in the FDI-attractive fields of IT, biotechnologies, and green industries. A balanced budget, a free trade regime, a fully convertible currency, a competitive banking sector, and an investment-favorable environment have all contributed to the success of the country. FDI by field of activity, share in total (2021):

- 30% financial and insurance activities
- 18% wholesale and retail trade
- 17% real estate activities
- 11% manufacturing
- 7% professional, scientific and technical activities
- 5% information and communication

Origin of FDI (2021):

- 21% Finnish companies
- 19% Luxembourgian companies
- 13% Swedish companies
- 8% Latvian companies
- 6% Belgian companies
- 4% Lithuanian companies

6.4.6. Education environment

Upon regular evaluation, i.e. external evaluation, research of a specific field of the R&D institution is assessed, comparing it with the internationally recognised criteria. Twenty-two Estonian research institutions have successfully passed regular evaluation in at least one field, including six public universities: the University of Tartu, Tallinn University of Technology, Tallinn University, the Estonian University of Life Sciences, the Estonian Academy of Music and Theatre, and the Estonian Academy of Arts

Compared to non-evaluated institutions, a positive evaluation grants R&D institutions an opportunity to apply for funding from the state budget for their research and development activities.

6.4.7. Research & Innovation

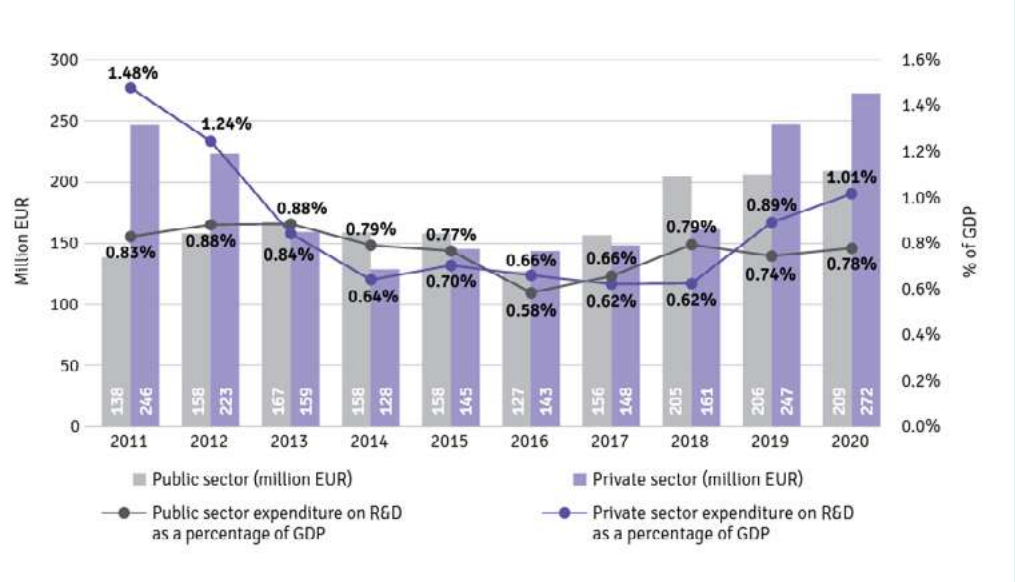


Fig. no. 56. Public authorities – status in relation to innovation / digitalization [general info about the level, which innovative instruments are used, if its a national digital network or local, which kind of services are digitized] - + example of used cases / awards

In 2019, private sector R&D investments increased after a long period of time, and the growth continued in 2020 as well, reaching 1.01% of GDP. In absolute terms, the investments amounted to 272 million euros, which exceeds the result of the record year 2011 (246 million euros), when Eesti Energia made large investments in the Enefit Technology. The number of companies investing in research and development has been on an upward trend since 2015, although 286 companies with R&D expenditure are only a tiny drop in the ocean of Estonian economy, with about 50,000 economically active companies. In addition to very few companies investing in R&D, these investments are also highly concentrated, and the concentration has increased over the last ten years. 75% of the total investment in 2019 was made by only 9.1% of all enterprises with R&D expenditure (14.2% of enterprises in 2008) and 90% of the total investment by only 25.2% of enterprises (32.2% of enterprises in 2008).

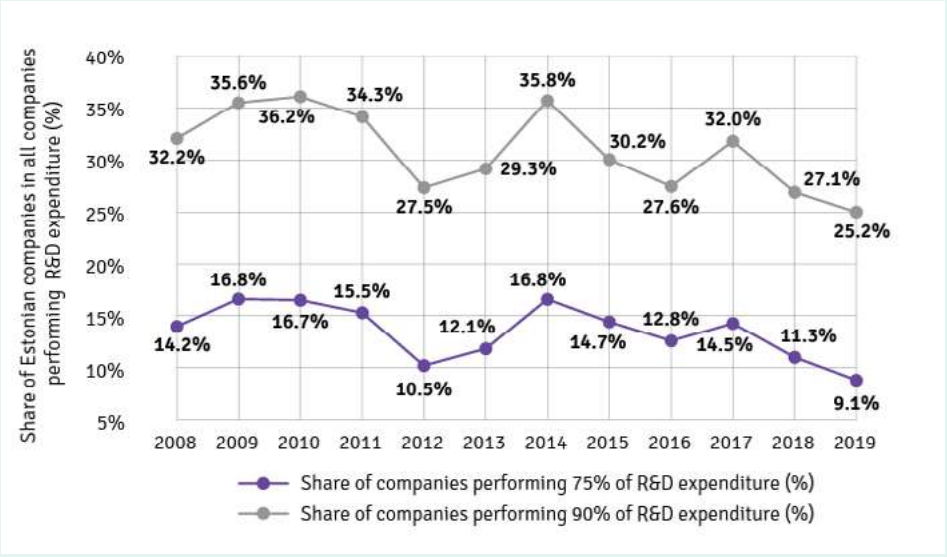


Fig. no. 57. Share of Estonian companies in all companies performing R&D expenditure, which accounted for 75% and 90% of all business R&D expenditure in 2008–2019. Source: Statistics Estonia.

As expected, larger companies are also the largest R&D investors: in 2019, 65% of investments were made by companies with more than 100 employees (57 companies), including 45% of expenditures by companies with more than 250 employees (28 companies).

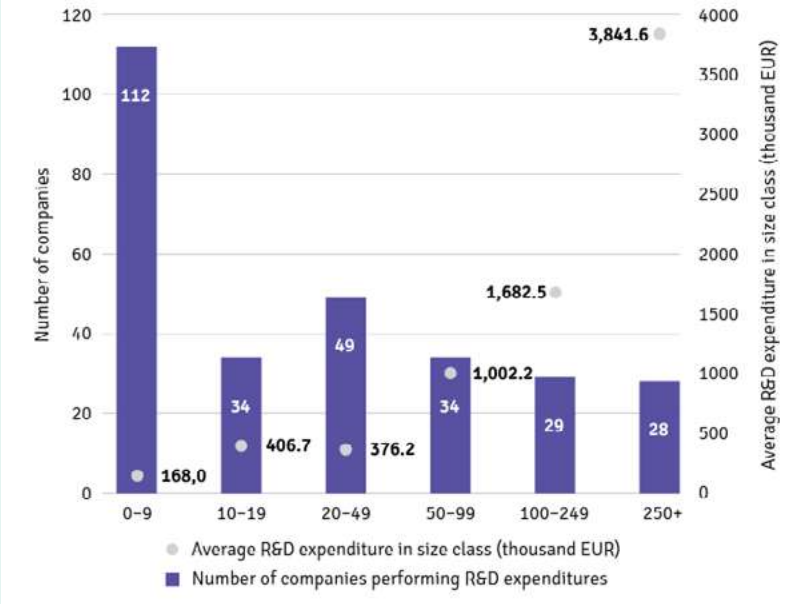


Fig. no. 58. Estonian companies performing R&D expenditures by size classes in 2019. Source: Statistics Estonia.

6.4.8. Conclusions - SWOT Analysis

STRENGTHS - "sweet spots"

- E-Governance: Estonia's e-governance system is one of the most advanced in the world, providing digital solutions for everything from healthcare to taxes.
- Start-up Ecosystem: The country has a thriving start-up ecosystem with a supportive environment for innovative businesses.
- Government Support: The Estonian government provides significant support for innovation, including funding for research and development and tax incentives for technology companies.
- Digital Infrastructure: Estonia has a highly developed digital infrastructure, making it an ideal location for technology companies.
- Talent Pool: The country has a highly educated population and a strong talent pool in technology and engineering, contributing to the development of innovative technologies.
- Collaboration: There is a strong network of collaboration between universities, research institutions, and industry, fostering a culture of innovation and knowledge transfer.
- Cybersecurity: Estonia has a well-developed cybersecurity infrastructure and is known for its expertise in the field.
- Digital Identity: The country's digital identity system is one of the most advanced in the world, providing a secure and efficient way to manage personal information online.
- Data Exchange Platform: The country has a data exchange platform that allows for the efficient sharing of information between government agencies and businesses.
- Innovation Policy: The government has a comprehensive innovation policy that includes funding for research and development, tax incentives for technology companies, and support for start-ups.

WEAKNESSES - weak spot

- Limited Domestic Market: Estonia has a small domestic market, which limits the potential for the growth of innovative companies.
- Dependence on Foreign Investment: The country's innovation system is heavily dependent on foreign investment, which limits its resilience in times of economic downturns.
- Limited Access to Capital: In some sectors (e.g. deep-tech) start-ups and small businesses face difficulties accessing capital, which limits their ability to grow and innovate.
- Skill Gaps: Despite a strong talent pool, there are skill gaps in certain areas, such as data science and artificial intelligence, that need to be addressed.
- Lack of Diversity: The innovation ecosystem in Estonia lacks diversity in terms of both gender and ethnicity, which to some extent limits its ability to tap into a full range of ideas and perspectives.
- Competition for Talent: The country faces competition for talent from larger technology hubs, which makes it difficult to attract and retain top talent.
- Regulations: The regulatory environment in Estonia is too rigid for some innovative companies, and there is a need for more flexibility and adaptability.

- Language Barriers: Despite the high level of English proficiency in Estonia, there may still language barriers that limit the ability of non-native speakers to participate fully in the innovation ecosystem.
- Collaboration Challenges: There are certain challenges for collaboration between different sectors and organisations in the innovation ecosystem, which limit the effectiveness of the system as a whole.

OPPORTUNITIES - near-to-market opportunities

- Encouraging Diversity: The innovation ecosystem in Estonia does not fully reflect the diversity of the population, and there is untapped potential to increase diversity in terms of gender, ethnicity, and background.
- Supporting Social Innovation: While the country has a strong focus on technology innovation, there are opportunities to support and encourage social innovation as well.
- Building International Partnerships: There is untapped potential for partnerships and collaborations with other innovation hubs around the world.
- Attracting International Talent: Despite its strong talent pool, there are opportunities to attract top talent from other countries to further strengthen the innovation ecosystem.
- Developing Infrastructure: While Estonia has a strong digital infrastructure, there are opportunities to improve and develop other areas of infrastructure, such as transportation and energy, to support innovation.
- Encouraging Collaboration: Despite the existing network of collaboration, there are opportunities to further encourage and facilitate collaboration between different sectors and organizations in the innovation ecosystem.
- Investing in Research: While there is significant funding for research and development, there are opportunities to increase investment in basic and applied research to support long-term innovation.
- Fostering a Culture of Innovation: While innovation is valued in Estonia, there are opportunities to further foster a culture of innovation and encourage more people to pursue entrepreneurial and innovative initiatives, especially in knowledge intensive areas.

THREATS - external

- Competition from larger, more established innovation ecosystems, such as those in Western Europe and North America.
- Lack of funding for startups, particularly compared to other innovation ecosystems.
- Difficulty attracting and retaining top talent, particularly for early-stage startups.
- Limited access to international markets, which could limit the potential for growth and success.
- Lack of infrastructure and resources to support innovation and entrepreneurship.
- The need to constantly adapt to rapidly changing technologies and market conditions.
- Competition for attention and resources from other industries and sectors, such as tourism and manufacturing.

6.5. Southern DENMARK Regional analysis of the innovation status



6.5.1. Introductory data about the region

The region consists of the Southern part of Jutland and the island of Funen. The Region consists of 22 municipalities and has a population of 1.235.747 people an area of approx. 12,000 km². It is the 3rd largest region in Denmark measured by number of inhabitants. The main municipalities in the region are: Odense, Vejle, Esbjerg, Kolding and Sonderborg.

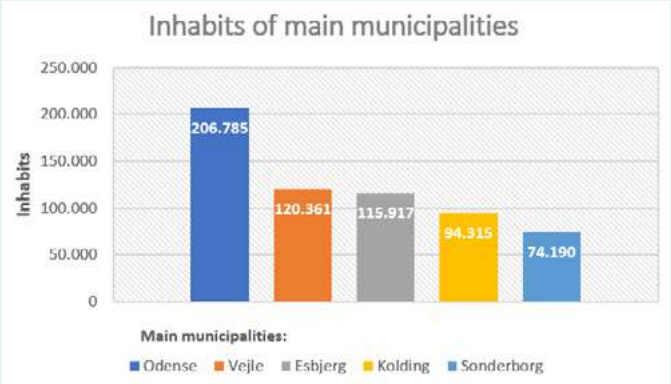


Fig. no. 59. Inhabits of main municipalities. Source: Statistic Denmark table FOLK1A

Half of all inhabitants in the region live in the five largest municipalities, which are the municipalities of Odense, Vejle, Esbjerg and Sonderborg. Municipality of Odense located on the island of Funen is the largest municipality in the region with 205.000 inhabitants. Municipality of Vejle is the 2nd largest in the region measured by inhabitants as the figure above shows.

Region Southern Denmark NUTS II region DK03 is a strong innovator[238] . The region is ranked at 78 place in 2021 in the Regional Innovation Scoreboard (RIS) with a total of 125,2 index. Between 2018 -2021 the region has been above the average with index values in-between 120,3-125,2

6.5.2. Business areas and business forces

Region Southern of Denmark consists of Southern Jutland and the island of Funen. The areas have different strengths and important business areas, which are driving forces for growth and development in Region Southern Denmark. Common to both South Jutland and Funen is that companies, research and educational institutions and the public sector work closely together with business development in the clusters. The following sections are an overall introduction to business areas and business forces Region Southern Denmark (A) and Funen (B).

(A) Business areas and business forces of Southern Jutland

Business activity in South Jutland has a number of significant, international industrial companies as visible flagships. These are typically family-owned companies that have grown into international market leaders by incorporating international markets into their business model at an early stage. The most significant examples of this are LEGO, Danfoss and ECCO.

238. EIC - Regional profile Denmark

An international way of thinking also has fertile ground in many of the region's other companies, including the broad layer of SMEs. With the region's close location on the Danish-German border, there is a tradition of extensive trade with German companies.

Seen across the municipalities in South Jutland, there are a number of significant business forces and business areas which are in Production and processing of food, Maritime industry and logistics, Energy, cleantech and offshore, Industrial manufacturing business and tourism.

The highlighted business areas of South Jutland are:

Food sector. The food industry employs more than 45,000 people in South Jutland. The county has a high level of specialization in the food sector compared to the national average. The food companies in South Jutland form a value chain: from laboratories specializing in food safety to manufacturers, specialized logistics, packaging and trade and service.

Energy and cleantech and offshore. A large number of South Jutland companies work with technologies, components, knowledge and services that contribute to an intelligent and efficient use of energy. Some of the world's strongest competencies in energy efficiency are gathered around Als and Sønderborg. Part of South Jutland's activity in the energy area is linked to offshore energy production that takes place in the Esbjerg area.

Tourism. With 9.5 million overnight stays in 2018, Southern Denmark accounted for 25 per cent. of the total overnight stays in Denmark. Among the special attractions are Legoland, the three world heritage sites The Kings of Jelling, Christiansfeld and the Wadden Sea.

Maritime business and logistics. The transport sector plays an important role in South Jutland. This applies to the Triangle Area and the Padborg area near the German border, which is the logistics center for a large part of international truck transport, and where many companies work with the handling of refrigerated and frozen goods. At the same time, the maritime area contributes in the form of the industrial ports in Esbjerg, Aabenraa and Kolding.

Manufacturing industry. There are more than 59,000 employees in South Jutland production companies and a relatively large regional specialization within the business area. South Jutland is home to business concentrations within mechatronics, the stainless steel industry, plastics and aluminum.

The Triangle Area - Center of the manufacturing industry.

There is a large concentration in the total number of the manufacturing industry in " The Triangle Are '' The area is a center of the manufacturing industry in Denmark with 40.000 of the 59.000 jobs in the industry. The triangle area is a traffic hub in Denmark. There are about 14,000 jobs in the transport and logistics industry in the Triangle Region[239].

239. The Triangle Region: https://www.trekantomraadet.com/



Fig. no. 60. Map of Triangle Area Denmark

Geographically, Kolding is only 25 km, located away from Vejle. Vejle and Kolding are part of the area known as the triangle area in Denmark. Together in the organization **"Triangle Region"**, 7 municipalities work together with a common strategy to create growth and attractiveness through culture and experiences in the Triangle Region: Kolding, Fredericia, Vejle, Middelfart, Billund, Vejen, and Haderslev.

(B) Business areas and business forces of Funen

The highlighted business areas in Funen are in Robot and drone technology, maritime professions, construction sector and welfare technologies.

Robot and drone technology

Funen is very strong in the robotics area. Odense is the home town of Odense Robotics , which is a Danish national cluster. A large part of the Danish robotics industry has been developed and established in Funen within the last decade. With more than 130 robot and drone companies and 3,600 employees, the industry attracts millions of investments and drives exports in the billions, especially within collaborative robots, cobots. Funen's robotics industry today has a global market share of almost 60 per cent. A similar development is underway within the closely related technologies in the drone area. Both areas are based on research weight at an international level.

Maritime professions

Denmark is among the world's leading maritime nations. Here, the area of Funen is a strong player with more than 250 companies and over 7,000 employees, which are centered around the growing Lindø Industrial Park and a strong maritime training center on South Funen.

Welfare technology

Funen is an attractive area for development and testing of welfare technology due to a strong ecosystem. The strength comes from a high concentration of companies, public institutions and knowledge institutions.

The ecosystem is further strengthened by organizations such as the Center for Innovative Medical Technology (CIMT) under Odense University Hospital (OUH) and Southern Danish University (SDU), Health Innovation Centre of Southern Denmark, Healthcare Denmark and Danish Life Science Cluster, which make a living by promoting innovation for better health.

The strong environment around welfare technology has attracted Finnish, Dutch, Icelandic, Japanese and Norwegian companies, which have established subsidiaries on Funen in order to gain an entrance to the European market. In the past four years, 97 companies, nine municipalities, two hospitals, one university, one university college and one social and health school have been active in welfare technology in Funen. Exports make up 32 per cent. of turnover in the industry, and Funen's efforts are focused on making the companies global, so that they can deliver to the growing international market for welfare products.

Construction sector

Building and construction is one of Funen's largest industries, where companies in the construction value chain provide more than 20,000 jobs, among other things due to significant investments in construction and infrastructure. The focus is on sustainable construction, where the market is growing in Denmark and globally. The green transition in the construction industry in Funen is thus a central area of action

6.5.3. Macroeconomic indicators and business environment

Southern Denmark has had a positive development in the regional GDP[240][241] . In 2020, the region had a GDP of 35,600 euros, which corresponds to 15% above the EU average. Since 2014 and until 2020, it has increased steadily every year with 2-4% per year. The region's GDP is 12% below the total GDP for Denmark. In the table below, GDP per capita displayed for the EU, Denmark and Region Southern Denmark, calculated according to Purchasing Power Standard (PPS).

240. Eurostat - Purchasing power adjusted GDP per capita
241. Gross domestic product (GDP) NUTS 2 regions

Purchasing power adjusted GDP per capita								
Year	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**
Region South Denmark	31.200	31.900	32.600	33.800	34.500	35.600	35.600	n/a
Denmark	34.300	35.300	36.100	38.000	39.000	39.900	40.300	43.200
EU 27	26.600	27.500	28.200	29.300	30.300	31.300	29.900	32.300

Table no. 7. GDP per capita/ Purchasing Power Standard (PPS), in EU, Denmark and Region Southern Denmark, year 2000. Source: Eurostat

The Danish business environment is well developed and the World Bank has ranked Denmark 4th out of 190 countries in its latest Doing Business ranking, one position lower compared to the previous edition, but still the best-ranking country in Europe. Denmark's strengths include a highly skilled and multilingual workforce, a flexible labour market, modern infrastructure (telecommunications, transportation, etc.) and attractive tax incentives for companies.

Companies distribution

Denmark has 322.965 companies (in 2020). Since 2015, the number of companies has increased by 8%. 99,75 % of the companies are SMEs.

In Region South Denmark, 91% of the companies in the region are microenterprises, having below 10 employees.

In Region South Denmark, 91% of the companies in the region are microenterprises, having below 10 employees.

Purchasing power adjusted GDP per capita							
Year	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**
Total no. Companies	61.069	59.900	61.871	62.387	62.779	63.203	63.455
Index total companies	100	98	101	102	103	103	104
Micro < 10 employees	56.568	55.286	57.226	57.621	57.835	58.252	58.476
Small < 50 employees	3675	3770	3779	3872	4003	4030	4067
Medium <250 employees	699	714	730	762	799	776	771
> 250 Employees	127	130	136	132	142	145	141
Total SME Companies	60.942	59.770	61.735	62.255	62.637	63.058	63.314
Percentage SME	99,79%	99,78%	99,78%	99,79%	99,77%	99,77%	99,78%

Table no. 8. Distribution of companies in Southern Denmark Region Source: Statistic Denmark table (GF8)

Trade and transport, industry and construction sector are the three largest sectors, totalling 77 % of the employment in the region. The table below shows the business structure year 2020 measured by the number of employees in the private sector.

Employment distribution in business Structure private sector Region Southern of Denmark		
Business sector	Full-time employees	% share
Agriculture, forestry and fishing	11.751	5%
Industry, raw material extraction and utilities	71.465	28%
Building and construction	29.323	12%
Trade and transport etc.	92.058	37%
Information and communication	8.390	3%
Financing and insurance	7.612	3%
Property trading and rental	4.867	2%
Business service	26.193	10%
Total	**251.659**	**100%**

Table no. 9. Distribution of the number of company employees in Southern Denmark by sectors of activity, year 2020; Source: Statistic Denmark table (DB07 10-grp)

New companies

In general, the proportion of new businesses to Region Southern Denmark has been very volatile since 2014. Above all, the proportion of new businesses grew in Denmark, as the statistics show below.

New Companies							
	2014	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**
Denmark	31.089	29.911	34.116	33.839	33.295	33.930	34.779
Index Denmark	100	96	110	109	107	109	112
Region South Denmark	5.454	5.067	5.982	5.776	5.713	5.783	6.173
Index Region South Denmark	100	93	118	97	99	101	107

Table no. 10. Evolution of companies birth in Denmark and Southern Denmark, 2014-2020; Source: Statistic Denmark table GF8

Innovative companies

Overall, 45% of the Danish companies in the region introduced new products or business processes in the period 2018-2020, at a lower rate than the national average (48%). Process innovation is widespread, as 39% of the companies have implemented, while 22% have carried out product innovation.

Innovative companies %	Denmark	Region South Denmark
Type of innovation	48%	45%
Product innovation	25%	22%
Process innovation	43%	39%

Table no. 11. Rate of the innovative companies in Denmark and Southern Region, 2018-2020; Source: Statistic Denmark

R&D tax deduction for commercial research

To support research and make Denmark attractive, in 2008 Denmark introduced an R & D tax deduction of 101.5 per cent. The R & D tax deduction is today a permanent R&D tax deduction of 130% with a maximum of DKK 50 million. The purpose is to promote commercial research and to accelerate green investments. In addition, if R&D costs result in tax losses, companies are entitled to a cash reimbursement of 22% of losses related to those costs – up to a maximum tax value of DKK 25 million. Also, companies are entitled to a full deduction of patents and know-how in the year of an acquisition[242] [243]

6.5.4. Private funding

Denmark's Export and Investment Fund publishes the report "From startup to scaleup". The report provides a status of the capital market for Danish entrepreneurs and growth companies. Highlights from the status report of 2021-2022H1 on the Danish capital markets are[244]:

Early Stage

- *More than EUR 40 million in public grants in i 2021*
- *Record-breaking activity amongst Danish Business Angels in 2021, the activity is expected to fall slightly in 2022*

Venture

- Danish companies raised almost EUR 2 billion in 2021, but the activity has slowed down in 2022H1.
- *Consistently a high number of funding rounds of more than EUR 13 million, and high activity amongst international investors in 2022H1*

242. The Ministry of Finance
243. Invest in Denmark - Denmark a global leader in green patents
244. Status report of 2021-2022H1, paige 5, Denmark's Export and Investment Fund

Buyout

- *Extraordinary investment activity in 2021 with 52 investments in Danish companies, 2022H1 have slowed down with 12 investments*
- *Overweight of international investors on the Danish market in 2021, with an almost 50/50 split in 2022H1.*

Loan Financing

- *Continuous high interest for Vaekstfondens loan products after the phasing out of the relief packages from the Danish government.*
- *Danish financial institutions have increased their loan balance to business in 2022H1, and at the same time tightened the credit standards for SMEs*

IPOs

- *With 25 public listings on Nasdaq and Spotlight the activity was record-breaking in 2021*
- *The high activity in 2021 was replaced by a full stop of activity in 2022H1 with no new IPOs*

6.5.5. Foreign direct investments

Demark is traditionally a net investor as the graph below shows the total amount of inflow and outflow investments in Denmark from 2015-2021. Investments are mostly oriented towards finance and insurance, business services, wholesale and retail trade, manufacturing, real estate and information and communication.

In the index year 2015 and until the year 2021, inward foreign investment in Denmark has increased by 53% from DKK 610 billion to DKK 936 billion. Overall, FDI has increased by approx. 11% on average per year. with the biggest increases in the years 2015-2019. Almost 90 % of all inward investments in Denmark come from EU countries (46%) and the USA (40%). Asian countries hold 8 % of the inward investments in Denmark. Outflow investments have since the index year 2015 until the year 2021 been steadily increasing from DKK 1125 to DKK 1797 billion. An increase of 59 %.

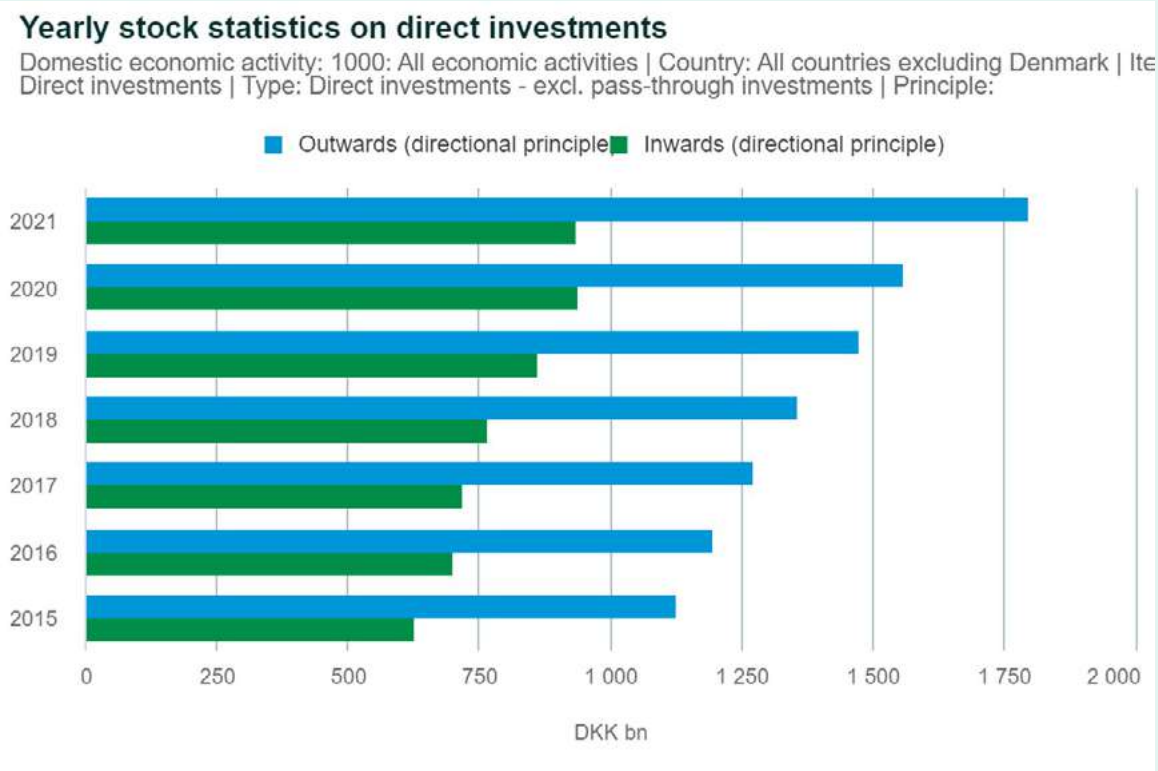
Danish Act on Foreign Investment Screening

The Danish Parliament adopted in 2021 the bill ACT no. 842 of 10/05/2021 for a so-called i*nvestment screening* act introduced by the Danish Minister for Industry, Business and Financial Affairs.[245] This constitutes an entirely new regime in Danish legislation, as thus far foreign direct investment in Denmark has been subject to very limited regulation. The Investment Screening Act must also be seen in the light of the EU regulation on the coordination of national investment screening schemes, which entered into force in October 2020. The purpose of the Investment Screening Act is to prevent foreign direct investments and special financial agreements from posing a threat to national security or public order in Denmark.

245. Business in Denmark: Screening of investments in Danish companies

The Investment Screening Act covers foreign direct investments in Denmark. Foreign direct investment means the acquisition of control or significant influence in a company or entity domiciled in Denmark by direct or indirect possession of or control over ownership shares or voting rights in the company or equivalent control by other means, including the purchase of assets and long-term loans. Foreign direct investments also include investments when establishing a new company in Denmark in a particularly sensitive sector, where corresponding control or significant influence is achieved.

In the index year 2015 and until the year 2021, inward foreign investment in Denmark has increased by 53% from DKK 610 billion to DKK 936 billion. Overall, FDI has increased by approx. 11% on average per year. with the biggest increases in the years 2015-2019. Almost 90% of all inward investments in Denmark come from EU countries (46%) and the USA (40%). Asian countries hold 8 % of the inward investments in Denmark. Outflow investments have since the index year 2015 until the year 2021 been steadily increasing from DKK 1125 to DKK 1797 billion, an increase of 59%.



6.5.6. Education environment

In general Denmark is high on indicators in the category "Human resources" in the European Innovation Scoreboard (EIS). The table below shows the highest completed education of the population in Southern Denmark.

Region South Denmark								
	2014	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**
Vocational education	293.128	290.351	290.351	285.026	282.092	277.783	273.216	270.737
Short further education	37.851	38.763	39.900	40.590	41.518	42.176	42.234	42.823
Intermediate higher education	117.968	120.657	123.154	124.719	126.503	128.594	129.970	132.185
Bachelor's programmes	11.453	12.012	11.968	12.062	12.487	12.666	13.358	13.452
Master's programmes	39.073	41.522	44.588	46.952	49.621	52.319	54.003	56.787
PhD & research programs	2.627	2.900	3.204	3.382	3.595	3.808	4.004	4.280

Table no. 12. Evolution of highest completed education of the population in Southern Denmark, 2014-2021; Source: Statistic Denmark table HFUDD11

Southern Danish University of Denmark (SDU) is the only university in the region. The university covers the region with four faculties spread across the region in the cities of Odense, Kolding, Esbjerg, Sonderborg and also one faculty located in the city of the Slagelse in the region of Zeland. Odense is the headquarters of SDU and have 27,000 students, almost 20% of whom are from abroad, and more than 3,800 employees[246].

Other Educational Institutions Region of Denmark Southern

In addition to SDU, the region of Southern Denmark also has other important educational institutions. The Design School of Kolding holds educations at university level; Bachelor, Master and PhD programs in design areas such as fashion, accessory, textile, communication design[247].

And there are two University Colleges. The University College South Denmark with first-cycle bachelor degrees in the field of Educational Sciences, Health Sciences, Social Sciences and Communication Sciences[248]. And UCL University College with schools in 5 different cities. It offers academy and professional bachelor programs, within Business and Technology, Education and Social Sciences and Health Sciences[249].

246. SDU - University of Southern Denmark
247. Design School of Kolding
248. University College South Denmark
249. UCL University College

Finally, the region also has two business academies. The International Business Academy (IBA) in Kolding which offer programs at professional bachelor and master's levels, within areas such as finance, sales and marketing, communication, technology and web, production and management. And Business Academy Southwest[250] with academy profession and professional bachelor degree programs within computer science, software development, data science, building construction, finance, design and business.

6.5.7. Research & Innovation

SDU Research & Innovation Organisation (SDU RIO)

SDU is one the five patent-active universities in Denmark. SDU RIO[251] is the TTO office of the region. The organization supports matchmaking and collaboration between research, education, the business community and the public sector. The specialists in the organization support the development of innovation projects with project management, business development and questions about commercial and legal matters as well as about opportunities or research funding.

Since 2015, the effort on technology transfer at SDU has yielded a return on 25 spinout companies. In the years from 2015, the number of spinout companies has been between 3-5 companies each year.

The development in the number of registered patents from SDU has developed steadily from 2014-2018 with 35-43 patent applications per year. year. In the years 2019 and 2021, the greatest declines have been experienced, to 24 and 28 patents respectively, which corresponds to 30-40 patents compared to the year 2014.

Since the year 2014-2021, SDU Rio has made 5-13 intellectual property agreements per year. In the years 2017 and 2018, the lowest number was 5 and the highest in 2021 with 13.

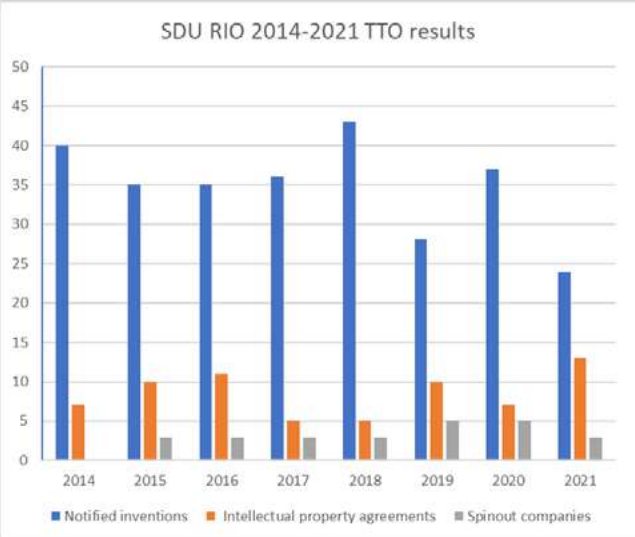


Fig. no. 61. Employment distribution in business Structure private sector SDU RIO TTO results. Source: SDU RIO 2021 annual report

250. Business Academy Southwest
251. SDU RIO

6.5.8. Public authorities - innovation and digitalization

Since 2001, digitization of the public sector in Denmark has been driven by close and committed cooperation between the state, the municipalities and the regions. This applies particularly to areas where it is necessary and appropriate to create transversal solutions, for example for digital communication, which today happens with digital mail.

This has made Denmark one of the countries in the world with the most digital public sector. Among other things, Denmark has received top positions when the EU Commission has ranked which countries in the Digital Economy and Society Index (DESI) have the strongest digital starting point, as well as placing us at the top of the UN's ranking of countries with the most digital public administration. Since 2018-2022, Denmark and Finland have alternated each year for first place in the DESI index[252] .

A number of solutions that stem from the joint public digitization strategies are now a natural part of Danes' everyday life. These include, among other things, ***NemID*** and ***MitID***, which citizens and businesses use to securely identify themselves online, as well as joint cross-national portals within e.g. health companies' contact with public authorities.

Digital Post and mandatory digital self-service have changed the authorities' communication with citizens and businesses. In 2016, the public authorities sent a total of 112 million Digital Post messages for citizens and businesses. In 2021, public authorities sent more than 227 million Digital Post messages.

The joint public digitization strategy 2016-2020 focused on, among other things, better data sharing between the authorities, coherent user journeys across solutions, higher information security and the development of new and future-proof versions of Digital Post, NemID (MitID) and NemLog-in.

6.5.9. Conclusions - SWOT Analysis

Denmark has a strong decentralized Business Support System at all levels with an open innovation mindset that will collaborate across value chains in private-public collaborations on the development of solutions.

In Denmark, there are highly specialized companies and national clusters within all 4 sectors in the Boost project. The national clusters in Denmark have a wide network with contact with companies and experience from innovation projects within environmental technology, energy technology, life Science and welfare technology, advanced production - Industry 4.0, robot and drone technology.

The green transition and digitization are strong focal point in R & D system and Business Support system. For the BOOST project there many opportunities to establish partnerships with organizations in Danish innovation ecosystem in the sectors of the BOOST project. Innovation of the four BOOST sectors is high on the Danish Innovation Agenda.

252. DESI

Learning points for Danish companies are on the development and application of advanced production methods and the digitization of processes. Companies in the Southern Denmark Region experience growth with the attraction of qualified labor to industries with capabilities to support the green transition and digital transformation. The lack of attracting qualified labor is a treat for growth and development in Danish companies.

STRENGTHS	WEAKNESSES
● Strong decentralized business promotion system at national, regional, and municipal level supporting companies and R & D ● Highly skilled GTS institutes with strong capabilities within BOOST 4 focus areas. The GTS institutes can support companies and R & D with test, demonstration, and development facilities. ● A significant focus on research areas in the Danish ● R&D innovation system which moves the green transition and develops solutions within health and welfare technology. There is a high interest for the BOOST project's 4 areas in the R & D innovation system. As well as the areas which are high on the agenda of a wide range of stakeholders - private companies and public sector at many levels outside the R & D innovation. ● Strong open innovation collaboration between national clusters, companies and with knowledge and education environments and public actors, who supports the acceleration in the development of Danish companies' solutions and R & D. ● Easy to do business in Denmark with high digitised public systems, which make the contact with public authorities easy and fast support the speed of operations in Danish companies ● Strong national and EU funding programs supporting the BOOST projects focal 4 areas. ● Region Southern Denmark is broadly covered with industries, companies and public actors that support the development of Boost 4 main areas. ● Region Southern Denmark is strong in Energy and cleantech and offshore, large manufacturing industry, strong capabilities in robot and drone technology, welfare technologies, health innovation, with support opportunities from a strong decentralized business support system to do facilitation and the attraction of stakeholders from Region Southern Denmark. And a direct and easy access collaboration with the R & D innovation system to SDU RIO in the TTO system.	● Workforce. Danish companies' access to qualified labor relevant qualifications, attracting, and retaining highly qualified foreign workers and increasing companies' social inclusion. ● Lack of capacity and resources for innovation in SME companies ● Lack of knowledge about circular economy and green transition in SME companies for innovation on green business models ● Lack of knowledge about benefits in SME companies from participation in national R & D projects and innovation projects through EU programs ● Low degree of digitization in one out of three production companies in South Jutland, which in the long term may challenge competitiveness. ● The level of education in South Jutland is lower than the rest of Denmark. Only 26 per cent of the workforce has a higher education against 33 per cent. nationally, and 30 per cent are unskilled. ● Lack of entrepreneurial companies to drive growth in the green transition and innovate with new products.

OPPORTUNITIES	THREATS
● The BOOST project's 4 areas are on the agenda of a wide range of stakeholders - private companies and in the public sector at many levels. ● The need for a green transition to a more climate-neutral business life is a significant trend in all sectors the Boost project embraces. Denmark has companies and institutions that will support with solutions for a green transition ● Opportunities for development project funding within the BOOST project's 4 main areas from national and EU funding. Like in national programs. MUDP, EUDP and GUDP state development and demonstration programs, which support the development, testing and demonstration of new environmental and energy technology solutions as well as green projects within the food industry. And from the many different programs by the Investment fund Denmark. ● Strengthen the collaboration with SME companies and national clusters in innovation projects on the development and exploitation of circular business opportunities and transformation across value chains in BOOST 4 main areas with actors from partner countries in the BOOST project ● Support companies with programs that strengthen competence development, that strengthen knowledge and skills in the green transition and circular economy among the companies' management and employees. ● Establish projects in BOOST which strengthen companies' digital level through development projects within advanced digital technologies 3D printer technology, robotics, Big Data analyses, IoT ● Improve SME companies' opportunities for collaborative relationships within research and development with foreign companies, knowledge and educational institutions that give the companies access to international value chains or new knowledge like for instance in a BOOST project setup.	● Increasing demand for and competition in the world for the highly qualified and specialised workforce ● The abilities to attract and retain highly qualified foreign labour and the training of the workforce with recruitment challenges in Denmark. ● Trade conflicts. England is one of Denmark's local markets. Brexit has presented challenges for Danish exports.

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- Regional Innovation Scoreboard
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- **DESI**

7.2. National Sources:

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- Strategies:
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  - Smart Specialisation Strategy of the North-West Region 2021-2027
  - Digital Transformation Strategy of Cluj-Napoca
  - North-West Regional Development Plan 2021-2027
  - Romania's Startup Ecosystem Strategy

7.2.2. Bulgaria:

- National statistics:

  - European Semester Country Report - Bulgaria
  - National Statistical Institute
  - INFOSTAT information system of NSI
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- Strategies:

  - Integrated territorial development strategy on North East Planning Region 2021-2027
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7.2.3. Spain:

- National statistics:
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- Strategies:
  - Agenda of towns and cities of Catalonia 2050
  - Catalan Clusters Policy
  - Defence Technology and Innovation Strategy
  - Digitisation Strategy for the Agri-Food and Forestry Sector and the Rural Environment
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  - Estonian Research 2022
  - Innovation
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  - Invest Estonia

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  - Product development and innovation
  - Applied research program
  - Innovation and Development Vouchers
- Others:
  - Organisation of Research and Development Act
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7.2.5. Denmark:

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  - S3-Strategies Denmark 2014-2020
  - Danish Ministry of Climate, Energy and Utilities
  - Agency for Digital Government
  - Business Academy Southwest
  - Business in Denmark
  - Center for Knowledge based Innovation
  - Cluster Excellence Denmark
  - Confederation of Danish Industry
  - DACOB
  - Danish Association of Research and Technology Organization (GTS Association)
  - Danish Business Authority
  - Danish Export Association
  - Danish National Bank
  - Danish National Research Foundation
  - Danish Regions
  - Danish Universities
  - Denmark´s Export Credit Agency
  - Design School of Kolding
  - Independent Research Fund Denmark
  - Innovation Centre Denmark
  - Innovation Fund Denmark
  - Invest in Denmark
  - Local Government Denmark (KL)
  - Ministry of Food, Agriculture and Fisheries of Denmark (GUDP)
  - Ministry of Foreign Affairs
  - Ministry of Industry, Business and Financial Affairs
  - Municipality Vejle Kommune
  - ProjectZero Sonderborg
  - Region of Southern Denmark
  - Regional Business Hub of Funen

- Regional Business Hub of Southern Jutland
- Regional Business Hubs in Denmark
- Southern Danish University of Denmark (SDU)
- Statistic Denmark
- Study in Denmark
- The Inventor Advisory Service
- The Danish Agency for Higher Education and Science
- The Health Innovation Center of Southern Denmark
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- University College South Denmark
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  - Strategy: 'A Green and Sustainable World'
  - The Climate Act 2020
  - The Danish National Strategy for Cyber and Information Security
  - The National Strategy for Artificial Intelligence
  - Vejle's Municipality Climate Action Plan
  - Vejle's Resilience Strategy

8. Acronyms & Abbreviations

8.1. Acronyms Romania:

ADAR - Agency for the Digital Agenda of Romania
AEPRO - Association for Electronic Payments in Romania
CCCDI - Advisory Board for Research, Development & Innovation
CCSI - Committee for Coordination of Smart Specialisation
CIIC - Civic Innovation and Imagination Center
CNCS - National Council for Scientific Research
CNECSDTI - National Council for Ethics in Scientific Research, Technological Development and Innovation
CNPSTI – The National Council for Science, Technology and Innovation Policy
CNTTI - National Council for Technology Transfer and Innovation
CRIC - Romanian Committee for Research Infrastructures
DIH - Digital Innovation Hub
EIS – European Innovation Scoreboard
EU – European Union
HEI - Higher Education Institution
ICT - Information Communications Technology
IFA - Institute of Atomic Physics
INCD - National R&D Institutes
IUDS - Integrated Urban Development Strategy
JRC – Joint Research Centre
MCID – Ministry of Research, Innovation and Digitization
MDRAP - Ministry of Development, Public Work and Administration
MEF – Ministry of European Funds
MER – Ministry of Education and Research
NEPS - National Electronic Payment System
NRIS - National Research and Innovation Strategy
PNCDI – Plan for Research, Development and Innovation
RA – Romanian Academy
R&D – Research and Development
R&I – Research and Innovation
RCI - European Regional Competitiveness Index
RDA – Regional Development Agency
RDI – Research, Development and Innovation
RIS – Regional Innovation Scoreboard
ROSA - Romanian Space Agency
RP – Regional Programme
S3 – Smart Specialisation Strategy
SME – Small Medium Enterprises
SNCDI - National Strategy for Research Development and Innovation 2014-2020

SNCISI – National Strategy for Research, Innovation and Smart Specialisation
STP - Science and Technology Park
UEFISCDI – Executive Agency for Higher Education, Research, Development and Innovation Funding.

8.2. Acronyms DK:

AAU - Aalborg University
AU - Aarhus University
CIMT - Center for Innovative Medical Technology
DACOB - Danish Local, Regional and Research Co-Op Brussels
DANRO -Danish EU Research Liaison Office
DESI - Digital Economy and Society Index
DNRF - Danish National Research Foundation
DTU - Technical University of Denmark
EIS – European Innovation Scoreboard
EU – European Union
FDI -Foreign Direct Investment
GDP -Gross Domestic Product
GTS - Government Technological Service Institutes
HRST-Human Resources in Science & Technology
IBA Kolding - International Business Academy Kolding
ICT - Information Communications Technology
IFD - Innovation Fund Denmark
KL -Local Government Denmark
KU - Copenhagen University
LSP - Large Structure Production
NATO - North Atlantic Treaty Organization
NUTS Region - Nomenclature of territorial units for statistics
OUH - Odense University Hospital
PPS -Purchasing Power Standard
R&D-Research and Development
RCI - European Regional Competitiveness Index
REACT-EU- Recovery assistance for cohesion and the territories of Europe
RIS – Regional Innovation Scoreboard
S3 – Smart Specialisation Strategy
SDU - Southern University of Denmark
SDU RIO - Southern University of Denmark Research & Innovation Organisation
SME - Small Medium Enterprise
TTO - Technology Transfer Offices
UN - United Nations

8.3. Acronyms Catalunya:

AEBAN - Association of Business Angels networks
AEI (1) - State Investigation Agency
AEI (2) - Innovative Business Association
ASCRI - Asociación Española de Capital, Crecimiento e Inversión
CACTI- Science, Technology and Innovation Advisory Council
CDTI - Centre for the Development of Industrial Technology
CPCTI- Council for Science, Technology and Innovation Policy
EBITDA - Earnings Before Interest, Taxes, Depreciation, and Amortization
EDC - European Data Cooperative
EECTI - Spanish Strategy for Science, Technology and Innovation
EU – European Union
FECYT- Spanish Foundation for Science and Technology
FEDER - European Regional Development Fund
FEPIME- Federació d'Empresaris de la Petita i Mitjana Empresa de Catalunya
GDP – gross domestic product
IBEX 35 - The IBEX 35 is the benchmark stock market index of the Bolsa de Madrid, Spain's principal stock exchange.
ICT - Information and Communications Technology
ISCIII- Instituto de Salud Carlos III
LCTI- Law on Science Technology and Innovation
MCIN - Ministry of Science and Innovation
MDO - Opportunity Discovery Mechanism
RCI - European Regional Competitiveness Index
RIS – Regional Innovation Scoreboard
S3 – Smart Specialisation Strategy
SME - Small and medium-sized enterprises

8.4. Acronyms Estonia:

EIS – European Innovation Scoreboard
EU – European Union
RCI - European Regional Competitiveness Index
RIS – Regional Innovation Scoreboard
S3 – Smart Specialisation Strategy

8.4. Acronyms Bulgaria:

000s - thousands
3S - Smart Specialization Strategy
5G/6G - 6G (sixth-generation wireless) is the successor to 5G cellular technology
AA- Agricultural Academy
ABLE - Association of Bulgarian Leaders and Entrepreneurs

BAS - Bulgarian Academy of Sciences
BESCO - Bulgarian Startup Association
BGN - Bulgarian lev
BNSF - The Bulgarian National Science Fund
BSHC - Bulgarian Ship Hydrodynamics Centre
BSHTPV - The Black Sea High-tech Park - Varna
BSMEPA - Bulgarian Small and Medium Enterprises Promotion Agency
CEE - Central and Eastern Europe
CLaDA BG - E-Infrastructure for Bulgarian Language and Cultural Heritage
CLEAN&CIRCLE - Centre of Competence "Clean Technologies for Sustainable Environment – Water, Waste, Energy for Circular Economy"
CoE - Centres of excellence and competence
CoC - Centres of competence
CPSBB - Center for Plant Systems Biology and Biotechnology
DESI - Digital Economy and Society Index
DIHs - Digital Innovation Hubs
DNA - Digital National Alliance
EC - European Commission
EFCs - Entrepreneurial Framework Conditions
EGDI - UN e-Government Development Index
EIF - European Investment Fund
EIS – European Innovation Scoreboard
ESA - European Space Agency
ESFRI - European Strategy Forum on Research Infrastructures
ESHER - Energy Storage and Hydrogen Energetics
ESS - European Social Survey for Bulgaria
EU – European Union
EURO ARGO – MASRI - Infrastructure for Sustainable Development of Marine Research and Participation in the European Infrastructure (EURO ARGO) – MASRI
EUROBIOIMAGING - Center for Contemporary Microscopy for Fundamental and Applied Research in Biology, Medicine and Biotechnology
FDI – Financial Direct Investment
FDIs - Foreign direct investments
FNH-RI BUL - Research Infrastructure for Food, Nutrition and Health, Linked to Bulgaria's Participation in the Pan-European Infrastructure FNH-RI
FMFIB - Fund manager of financial instruments in Bulgaria
GDP - Gross domestic product
GEM Global entrepreneurship monitor
GBARD - Government budget allocations for R&D
GERD - total intramural r&d expenditure
GCAP - Green City Action Plan
GUF - General University Funds
GVA - Gross value added
HEIs - Higher Education Institutions

HEPHAESTUS - Extreme Coherent Light in the Mid-IR and X-Ray Area as a Laboratory Infrastructure
Heritage BG - Center of Excellence
HITMOBIL - Centre of Competence “Technologies and Systems for Generating, Storing and Consumption of Clean Energy”
ICT - information and communications technology
IMO - International Maritime Organization
IO - Institute of Oceanology
IT - Information technology
ITS - Intelligent Transport Systems
IMEECT - Centre of Competence “Intelligent mechatronic, eco and energy-saving systems and technologies”
INFRAACT - Research Infrastructure for Cell Technologies in Biomedicine
INFRAMAT - Distributed Infrastructure from Centers for the Production and Research of New Materials and Their Applications, As Well As for the Preservation, Access and e-Storage of Artefacts (Archaeological and Folklore)
IPA - Investment Promotion Act
IS3 - Innovation Strategy for Smart Specialization
ISIS - “Innovation Strategy for Smart Specialization 2014-2020”
ITER - Research in the area of thermonuclear synthesis
JINR - Joint Institute for Nuclear Research
KID 2008 - Code for classification of economic activities of the National Statistical Institute
LAM - Laboratory of Aerospace Mechatronics
LEs - Large enterprises
LLL - Life Long Learning
ME - Ministry of Economy
MIG - Ministry of Innovation and Growth
MIRACLE - Center of Competence “Mechatronics and Clean Technologies”
NACE Rev.2 - statistical classification of economic activities in the European Community
NCBP - National Center for Biomedical Photonics
NCTR - National Center for Territorial Development
NER - North Eastern Region (Severoiztochen)
NGOs - Non-governmental organizations
NIF - National Innovation Fund
NIS - National Innovation Strategy
NRRP – National Recovery and Resilience Plan
NSNI - National Research Council
NSI - National statistical institute
NER - North East Region
OP SESG - Operational Programme “Science and Education for Smart Growth”
PE - Private equity
PERIMED - Center of Competence “Personalized Innovative Medicine”
PLANTHEALTH - Diagnostics and Technology Center for Plant Health
PPS - purchasing power standards
QUASAR - Center of Competence “Quantum Communication, Intelligent Security Systems and Risk

Management”
R&D - Research and development
R&I - Research and Innovation
RACIO - Regional astronomical center for research and education
RAPIV - Regional Agency for Entrepreneurship and Innovations - Varna
RCI - European Regional Competitiveness Index
RDI - Research, Development and Innovation
RES -Renewable Energy Systems
RIMU-Varna - Research Institute at the Medical University of Varna
RIS – Regional Innovation Scoreboard
RINA - National Infrastructure for Research and Innovation in Agriculture and Food
RRM - Recovery and Resilience Mechanism
SCAI - Institute for Scientific Research in Computed Science and Artificial Intelligence
SEE - South Eastern Europe
SHARE - Study on Health, Aging and Retirement in Europe
SMEs - Small And Medium Enterprises
STI - Science, technology and innovation
STP - Science and Technology Parks
SU - Institute for Scientific Research in Computed Science and Artificial Intelligence
TFA - Tangible fixed assets
UN - United Nations
UNDP- United Nations Development Program
VC - Venture capital
TFA - Tangible fixed assets