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TeRRItoria

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List of acronyms / abbreviations used in this document

ACT – American College of Thessaloniki
AUTH – Aristotle University of Thessaloniki
CERTH – Centre for Research and Technology - Hellas
EFTA – European Free Trade Association
EIS – European Innovation Scoreboard
GDP – Gross Domestic product
ICT – Information& Communication Technologies
NUTS – Nomenclature of territorial units for statistics
OP – Operational Programme
PCT – Patent Cooperation Treaty
RCM – Region of Central Macedonia
R&D – Research & Development
ROP – Regional Operational Programmes
RII – Regional Innovation Index
RIS – Regional Innovation Scoreboard
RIS3 – Research and Innovation Strategies for Smart Specialization
RTA – Revealed Technological Advantage
RTDI – Research, Technological Development and Innovation
SMEs – Small medium Enterprises
NOK – Norwegian Kroner
R&I – Research and Innovation
NTNU – Norwegian University of Science and Technology
NTH – Norwegian Technical University
NMCC – Norwegian Mass Customization Cluster
iNam – Innovation in Namdalen
FI – Fosen Innovation
SIVA – Selskapet for industrivekst (Association for Industrial Growth)
RDA – Regional Development Agency
Q4 – quadruple helix
TT – Technology transfer
EDP – Entrepreneurial Discovery Process
PDL – Projects Development Lab
EC – European Commission
DG - Directorate-General
NE – North-East
LAG – Local Action Group
SCI – Sites of Community Importance
Ce-Mont – Centre for Mountain Economy
PhD – Doctor of Philosophy
MA – Managing Authority
JRC – Joint Research Centre
TRL – Technology Readiness Level

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Executive Summary

This document contains the results of the mapping process of the Research & Innovation ecosystems in the 5 territories where the transformative experiments of TeRRItoria project will be carried out. The results present the analyses of the state-of-the-art based on available resources (such as S3 online platform, Regional ecosystem scoreboard and European Cluster Collaboration Platform, various documents, etc.) for each experimental region. For each territory coherent picture of the current status of their structure, demographics and local R&I actors has been drawn. The current focus of research and innovation in the context of smart specializations for each of the territories is presented. The analyses pinpoint areas of importance in the scope of Responsible Research and Innovation (RRI). Furthermore, the main factors contributing to the strengths and weaknesses as well as emerging opportunities and threats (SWOT analysis) of the 5 R&I ecosystems and territories has been included. The performed analyses will be used to aid in the next phase of the project – starting with the design of the transformative experiments (WP4).

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Introduction

This document is deliverable D2.3 "Mapping R&I ecosystems" of Work Package 2 (WP2) of the TeRRItoria project "Territorial Responsible Research and Innovation Through the involvement of local R&I actors" (Coordination and support action GA n. 824565), funded by the European Commission under H2020-SwafS-2018-1, and coordinated by the European Science Foundation.

This deliverable is the result of **Task 2.3 – *State of the art analysis on regional R&I ecosystems*** (led by ESF) and is structured in three chapters. The **introduction** outlining the objectives of TeRRItoria project, WP2 and Task 2.3; **Results** containing the methodology and reports provided by partnering organizations that performed the analyses; and **Summary** concluding the obtained results.

The vision of the TeRRItoria project is to tackle a double challenge: to bring RRI at the forefront of the debate for developing local and regional R&I capacities; and to use RRI as a springboard for broadening the number of stakeholders involved in the process, for enhancing the regional research and innovation strategies under the framework of S3. The overall objective of the project is to experiment with the adoption of Responsible Research and Innovation (RRI) approach in European regional and territorial R&I systems. TeRRItoria is based on the idea that RRI approaches, policies and practices, developed so far at the level of research institutions, may be adapted to that of regional and territorial governance. Thus, the project will contribute to developing what can be called "Territorial RRI" by performing a set of transformative experiments in five European selected territories – four regions and one municipality.
TeRRItoria is led by the European Science Foundation (ESF) and responds to the Topic "Supporting the development of territorial Responsible Research and Innovation" of the Call "Science with and for Society", included in the H2020 WP 2018-2019. Proposals under this topic are intended to contribute to the strategic orientation of "Building the territorial dimension of SwafS partnerships" (SO3). The project is structured in nine work packages and in three different and consecutive strands; **Analytic**, **Reflexive** and **Pro-active** Strand. WP2, in which Task 2.3 and D2.3 are included in, belongs to the Analytical Strand, which provides a set of organised information maps for supporting the design of the five experiments.

The goal of WP2 (led by AEC Fund) is to map 5 territories where the transformative experiments will be developed in order to gather all the needed information that would be used for designing the experiments. Task 2.1 led by ARC Fund, has provided the necessary tools (deliverable D2.1) for the mapping process performed in Task 2.2 (led by ARC Fund) and Task 2.3 (led by ESF). While Task 2.2 focuses on mapping of territorial milieux, the objective of Task 2.3 is a state-of-the-art analysis on regional R&I ecosystems. The task leader is ESF and the analyses of the R&I ecosystems of the 5 experimental territories was performed by partners: RCM, ART-ER, TRONDELAG, ADR Nord-Est and Gabrovo.

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Results

This section contains reports of the state-of-the-art analyses of the 5 experimental territories on the basis of tools developed in Task 2.1 (deliverable D2.1). The analyses were done by the 5 territorial organizations involved in the project (RCM, ART-ER, TRONDELAG, ADR Nord-Est, Gabrovo) on the basis of the available sources and their tacit knowledge.

The reports are structured around following aspects:

1) Organisation: provides an overview of the regional/municipal organisation that will develop the transformative experiments and of its role in the governance of the regional/municipal R&I ecosystem.
2) Context: provides an analysis of the main feature characterising the Regions/City context such as geography, population, employment, education, economy, productive sectors, R&I, etc.
3) Actors: provides an overview of the main actors already involved in R&I ecosystem such as research actors, incubators, network, etc.
4) RIS3 policy: provides an overview of the state of Smart Specialisation Strategy in the Region/City, including the specialisation areas, the implementation status, the role of specialisation in Regional/Municipal R&I system, etc. Other R&I regional/municipal governance actions can be mentioned as well.
5) Factors: on the basis of previous analysis, the main strength and weakness factors as well as emerging opportunities and threats (SWOT analysis) will be highlighted and summarised.

The 5 state-of-the-art analyses are based on the following features:

- *Knowledge management based*: the documents were developed collecting the information and knowledge already available in different sources, including reports, papers, statistics and databases, but also the tacit knowledge of the sub-task leader (regional/municipal partners)
- *Self-tailored*: the regional/municipal R&I systems are very different for dimension, organisation, traditions and history; for this reason, each document was tailored on the context that it describes.
- *Self-reflection oriented*: the information collected and reported in the documents taking into account that the “State of the art” is a way to prepare the reflection on the basis of evidences rather than on pre-constituted opinions.

The design (WP4) and implementation (WP5) of the transformative experiments requires complete picture of the research and innovation ecosystem of the territory. The reports presented here serve this very purpose. Firstly, by setting up the structure and background of the territories it helps to draw an image of needs and opportunities contained therein. Secondly, they expand on those needs by showing relevant R&I actors and S3 policies’ focus. Lastly, they summarize the findings in a comprehensive SWOT analyses. The latter 2 points are of particular interest for the design and implementation of the transformative experiments, since they contain main actors that will be involved as well as the main focus of the changes.

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Central Macedonia

Organisational mission and vision

The Region of Central Macedonia is a public body of local Governance of second degree (NUTS 2). The region has a population of 1,875,000 inhabitants, representing 17 percent of the country's total population and produces 17 percent of the GDP (second highest contribution after 37,7% of the region of Attica)[1]. It is the largest Greek region in size and the second largest in population. It is comprised of 7 regional units: Chalkidiki, Imathia, Kilkis, Pella, Pieria, Serres, and Thessaloniki. The Capital of the Region is Thessaloniki.

The mission of the Region is to promote the financial development, competitiveness and extroversion of our businesses, protection of the environment and public health, protection and promotion of cultural heritage and the improvement of the living standards of the two million people that live in it. The vision of our region is to be the friendliest region in Greece for Investments, Innovation, and Entrepreneurship[2].

The Region's strategy is focusing on:

- Supporting competitiveness, extroversion, internationalization of business efforts and linking the Region's innovative efforts with global markets.
- Creating an effective innovation ecosystem.
- Producing new knowledge in the most dynamic sectors of the economy.
- Promoting networking of organizations, development of synergies and effective exploitation of the knowledge generated by the economy of the Region and the international economy.
- Maintaining and strengthening the Human Capital of the Region.

This vision has led the Region of Central Macedonia to be awarded the 'European Entrepreneurial Region for 2018' by the European Committee of the Regions.

Organisational structure

The regional administration is structured at a central and regional level. According to its structure, all the relative Regional Units organisationally belong to the central administration which is seated in Thessaloniki.

The Central Administration of the Region of Central Macedonia is structured as follows:

a. Office of the Governor of the Region
b. Office of the Deputy-Governors of the Region
c. Directorate General of Development Planning, Environment and Infrastructures
d. Directorate General of Internal Operations
e. Directorate General of Regional Agricultural Economy and Veterinary
f. Directorate General of Development
g. Directorate General of Transport and Communications
h. Directorate General of Public Health and Social Welfare.

Organisational role in R&I system

The Region of Central Macedonia and more specifically, the Directorate of Innovation and Entrepreneurship Support was designated on March 28, 2018, as the Monitoring and Evaluation Agency of the RIS3 Strategy in the specific region. It is a directorate created by the rearrangement of the RCM internal structure on January 1, 2017 and operates directly under the Regional Governor. Its main function is to deal with all issues that have to do with entrepreneurship and innovation.

[1] http://www.innovage-project.eu/partner/region-central-macedonia
[2] http://www.pkm.gov.gr/

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The directorate has an Innovation Support Department, which is responsible for promoting innovation and bolstering research and development. Furthermore, it aims at linking Business with Universities (domestic and foreign) and helping create business and collaborative groups. All actors involved in implementing RIS3 (e.g. ROP Managing Authority, Managing Authority of European Territorial Cooperation Programs, National Authorities, Institutional Bodies of the World Trade Organization, etc.) take part in this endeavour as well.

Relevant ongoing projects

Online S3 (https://www.onlines3.eu/)

In the context of Online S3 project, an e-policy platform has been developed, augmented with a toolbox of applications and online services, able to assist national and regional authorities in the EU to elaborate their smart specialisation agenda. New and innovative technologies, tools and services (which are in line with the methodological steps proposed by the European Commission) have been investigated, developed and tested by the project. The goal of the program is for authorities, researchers and leading IT labs and companies in the 4 pilots, namely in 4 countries (Greece, Scotland, The Netherlands, Spain) to be able to use the solutions to support the advancement of knowledge-based policy advice. Consequently, a framework is developed by the Online S3 project, that grants access to further data and documentation (statistics, case studies, description of methodological tools), as well as operational tools required to support undertaking the methodological tasks in an online, ready to use and freely available way. The Cloud-based and social media platform that Online S3 assembles shall test the degree to which RIS3 meet the smart, sustainable and inclusive growth expectations of this new industrial policy. This shall use web content mining, retrieval, and natural language processing.

One of the key elements of Online S3 success is effective community engagement. This element is addressed by informing people about potential benefits from participating actively in region-wide technology-based innovation processes, engaging a large community of actors, encouraging interdisciplinary collaboration and incorporating early knowledge sharing processes, as well as leveraging a host of alternative crowdsourcing tools overall maximizing the benefits that can emerge from participatory innovation.

Geography

The Region of Central Macedonia is the second largest Greek region, located in central northern Greece, in the historical area of ancient Macedonia. It is the gate of Greece to Europe, connected with networks of transportation, communication, and energy with international importance. Thessaloniki is the capital of the Region having a dynamic role as a metropolis of the Balkan peninsula. Thessaloniki is a strong political, economic and industrial centre in northern Greece. The commercial port of Thessaloniki is important for the development of the region. The "Makedonia" international airport is the second largest airport in Greece serving over 5 million passengers annually.

The diversity and high value environmental and cultural tourism resources of Central Macedonia, such as the high quality coasts and beaches especially in Halkidiki and Pieria, the mythical and historical mount Olympus and Mount Athos, the Christian, Byzantine, newest and modern cultural heritage of Thessaloniki, the rich ecosystems of lakes and rivers, uplands and mountainous areas of natural beauty, the museums and archaeological sites of Dion - Vergina – Pella – Amphipolis, have set the Region of Central Macedonia amongst the most important tourism destinations in Europe and worldwide.

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GENERAL INFORMATION[3]:
Country: Greece
Capital: Thessaloniki
Regional Governor: Apostolos Tzitzikostas
Area: Total 18,811 km^2 (7,263 sq. mi)
Population (2018): Total 1 875 996
Density: 100/km^2 (260/sq. mi)
ISO 3166 code GR-B

REGIONAL UNITS & CAPITAL CITIES:

- Imathia-Veria (102 km distance to Airport "Makedonia" SKG)
- Thessaloniki -Thessaloniki (17 km distance from the Centre of the city to Thessaloniki Airport "Makedonia" SKG)
- Kilkis - Kilkis (68.1 km distance to Thessaloniki Airport "Makedonia" SKG)
- Pella - Edessa (110 km distance to Thessaloniki I Airport "Makedonia" SKG)
- Pieria - Katerini (101 km distance to Thessaloniki Airport "Makedonia" SKG)
- Serres- Serres (102 km distance to Thessaloniki Airport "Makedonia" SKG)
- Halkidiki - Polygyros (52.3 km distance to Thessaloniki Airport "Makedonia" SKG)

Demography and society

There are substantial differences in regional demographic patterns across the European Union (EU) from overpopulated, lively metropolises with youthful inhabitants to more remote, rural regions that are defined by shrinking population numbers and poor access to a range of services.
Demographic developments have the potential to influence regional economic performance, resource consumption and other environmental pressures. In recent decades, many of the EU Member States have been defined by an increasing pattern of population concentration, as people move from rural areas towards large cities. There has been considerable policy interest in the blurring of borders between urban centres and their adjacent regions, as low-density suburban developments have social, economic and environmental implications.
Most population projections indicate that the EU's population will continue to age as a result of consistently low levels of fertility and extended longevity. Although migration can play an important role in the population dynamics within many of the EU Member States, it is unlikely that it can reverse the ongoing trend of population ageing. The social and economic consequences associated with population ageing are likely to have profound implications both nationally and regionally, for example, impacting the capacity of governments to raise tax revenue, balance their own finances, or provide adequate pensions and healthcare services.
Statistics on regional demography are one of the few areas where detailed NUTS level 3 data are collected and published for each of the EU Member States, EFTA and candidate countries. The demographic characteristics of a given territory are the cumulative result of a range of demographic events: live births, deaths, emigration and immigration.

[3] http://verymacedonia.gr/central-macedonia/

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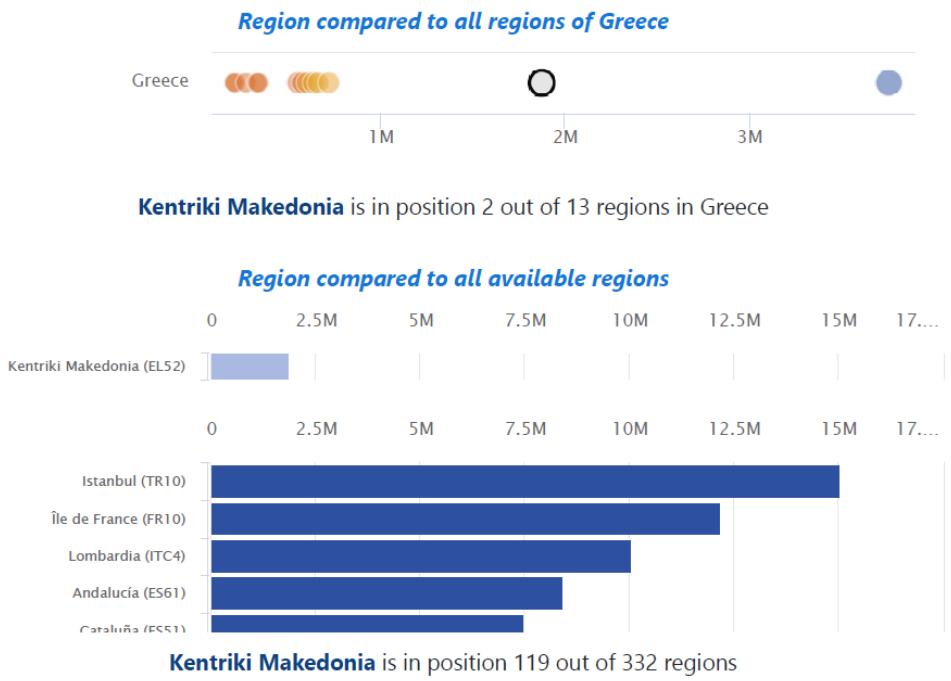

Figure GR. 1 Population (2018): 1,875,996 inhabitants.[4]

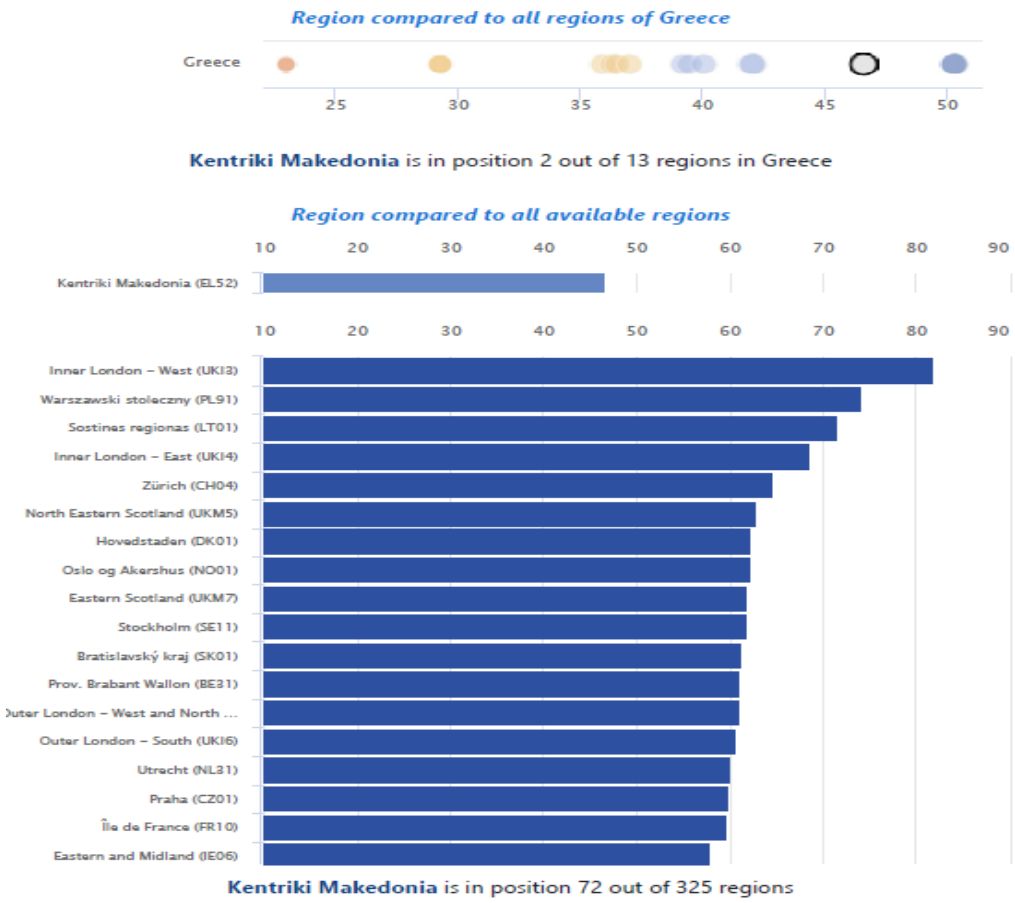

Figure GR. 2 Tertiary educational attainment (ages of 30-34), 2017 [4]

[4] https://ec.europa.eu/eurostat

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The Figure GR. 1 depict the population in millions of inhabitants of the Region of Central Macedonia (RCM) or "Kentriki Makedonia" (EL52) in the year 2018 compared to all regions in Greece and to all available regions in the EU. In the first case RCM is the 2nd largest region with 1,875,996 inhabitants, while in the second is in position 119 out of 332 regions

The Figure GR. 2 represent the tertiary educational attainment between the ages of 30 to 34 in the year 2017. The RCM or Kentriki Makedonia holds the second position in Greece, whereas hold the position 72 in tertiary attainments in the EU.

Economy and Labour

A well-functioning labour market with a highly qualified workforce that can rapidly acquire new skills is increasingly seen as a prerequisite for delivering a dynamic and competitive economy. Statistics for analysing labour market developments are used by European Union (EU) policymakers, for example, to monitor the Europe 2020 strategy or to respond to the requirements of the EU's economic and monetary policy. As well as being of concern to governments and policymakers, labour markets are also paramount to personal development, as employment opportunities provide a means, among others, of gaining independence, financial security and a sense of belonging. While the EU promotes the labour market integration of all members of society, some groups continue to be subject to discrimination (underrepresented or excluded).

Under its priority of ensuring a deeper and fairer economic and monetary union, the EU seeks to deliver more job opportunities and better living standards by combining fairness and democratic accountability. The European pillar of social rights is designed to guarantee effective citizen rights, by ensuring: equal opportunities and access to labour markets; fair working conditions; social protection and inclusion. This initiative is based on 20 underlying principles. At the same time, the EU has been working on a range of other initiatives, such as measures promoting work-life balance (minimum standards of parental/care leave, designed to encourage more men to take-up out-of-work responsibilities) or new ways of providing adequate social security cover for the self-employed and people who work in the gig economy.

This unit analyses EU economy and labour markets, providing an overview of regional employment and unemployment. Eurostat compiles and publishes labour market statistics for EU regions, the individual EU Member States, as well as the EU‑28 aggregate; in addition, data are also available for several EFTA and candidate countries; subnational statistics are presented for NUTS level 2 regions and by degree of urbanisation. In 2017, the EU‑28 population was composed of 380.2 million persons aged 15‑74 years. The economically active population — otherwise referred to as the labour force — accounted for 245.8 million people of this age, while there were 134.4 million who were economically inactive (in other words, they were neither employed nor unemployed); this latter cohort is largely composed of students, pensioners and people caring for other family members, but also includes volunteers and people unable to work because of disability. The EU‑28 labour force aged 15‑74 years is made-up of people in work (employed persons; 227.0 million) and people who are not working, but actively seeking and available for work (unemployed persons; 18.8 million).[5]

[5] https://ec.europa.eu/eurostat/documents/3217494/9309359/KS-EI-18-001-EN-N.pdf/0b8d8b94-541d-4d0c-b6a4-31a1f9939a75

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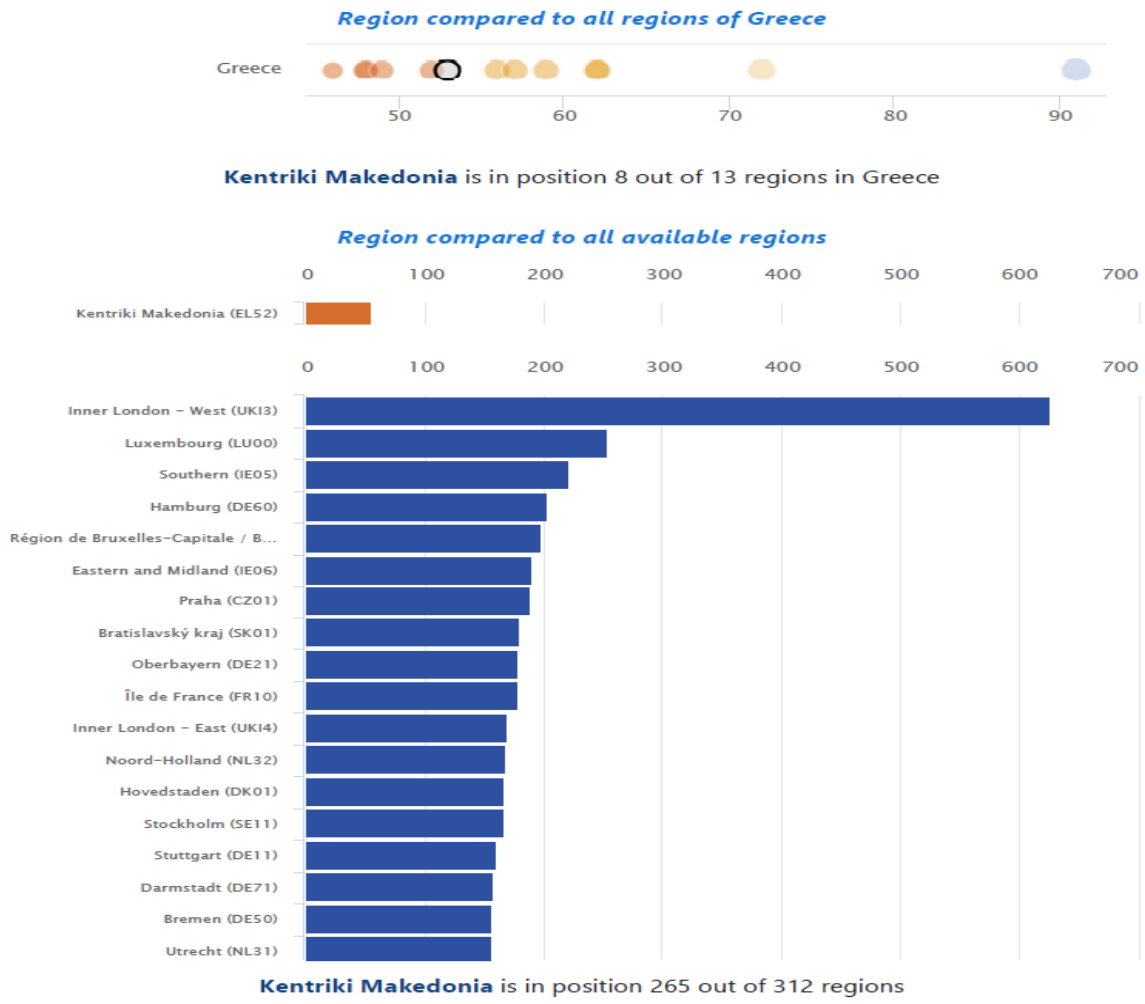

Figure GR. 3 GDP per inhabitant in PPS (% of EU-28 avg.), 2017 53 % (p)[4]

The Figure GR. 3 represent the GDP per inhabitant in PPS (% of EU-28 avg.) of the region of Central Macedonia correlated to all the other regions in Greece and to all available regions in the EU. Namely, the GDP per inhabitant is 53%, which constitutes RCM the 8th region in Greece and 265th in the EU.

Variable	Unit	2010	2011	2012	2013	2014	2015
Economically active population	Thousand	818.60	803.10	793.70	786.20	783.30	801.10
Employment (15-64)	Thousand	705.70	643.30	584.60	547.70	557.10	591.10

Table GR. 1 Labour market & Economically active population[6]

The Table GR. 1 contains information about the labour market and the economically active population in the region of Central Macedonia. We can observe that in year 2010, 705,700 residents between the ages of 15 and 65, out of 816,600-the economically active population- were employed. The lowest

[6] http://www.s3platform.eu/

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number of people in work was recorded in the year 2013 with 547,700 out of 786,200, while in the next year there is a slight increase of almost 10, 000 job vacancies. On the other hand, the amount of people that are economically active was lower by 3,000. Finally, in 2015 both figures rose significantly with 591,100 working out of 801,100.

Variable	Unit	2010	2011	2012	2013	2014	2015
Unemployment (20-64)	Thousand	111	156.8	206.3	233.8	222.3	207.7

Table GR. 2 Unemployment (20-64)[6]

The Table GR. 2 documents the unemployment in the region of Central Macedonia for people with ages between 20 and 64 during the years 2010 to 2015. The unemployment total was 111,000 in 2010 whereas increased gradually the next years and in 2013 the amount was 233, 800. Things started to look up the next year with a drop of 11,000 and in 2015 a further decrease of 15,000. Source: Online S3 report

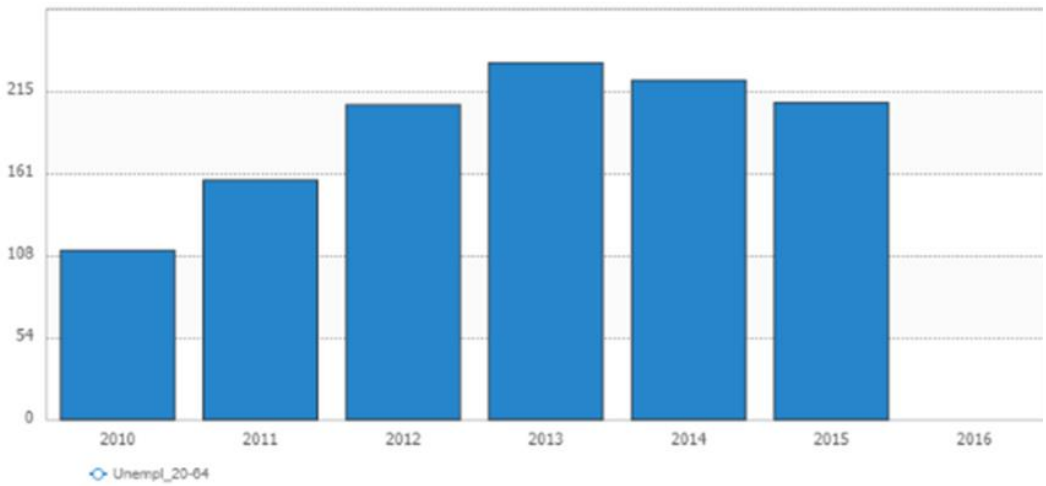

Figure GR. 4 Unemployment in Central Macedonia for population aged 20-64 (2010-2015)[6]

Growth rate of employment per sector (%)	2014
Accommodation and food service activities	20.30
Administrative and support service activities	-20.30
Construction	19.80
Electricity, gas, steam and air conditioning supply	18.30
Information and communication	-7.20
Manufacturing	-1.40
Mining and quarrying	12.40
Professional, scientific and technical activities	5.40
Real estate activities	68.60
Transportation and storage	14.10
Water supply; sewerage, waste management and remediation activities	-0.60
Wholesale and retail trade; repair of motor vehicles and motorcycles	2.60

Table GR. 3 Growth rate of employment.[6]

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In the Table GR. 3 we can observe the rate of growth in employment per industrial sector in the year 2014. The sector with the highest growth rate seems to be the real estate activities with 68.6% and the lowest growth rate the administrative and support service activities with a negative 20.3%.

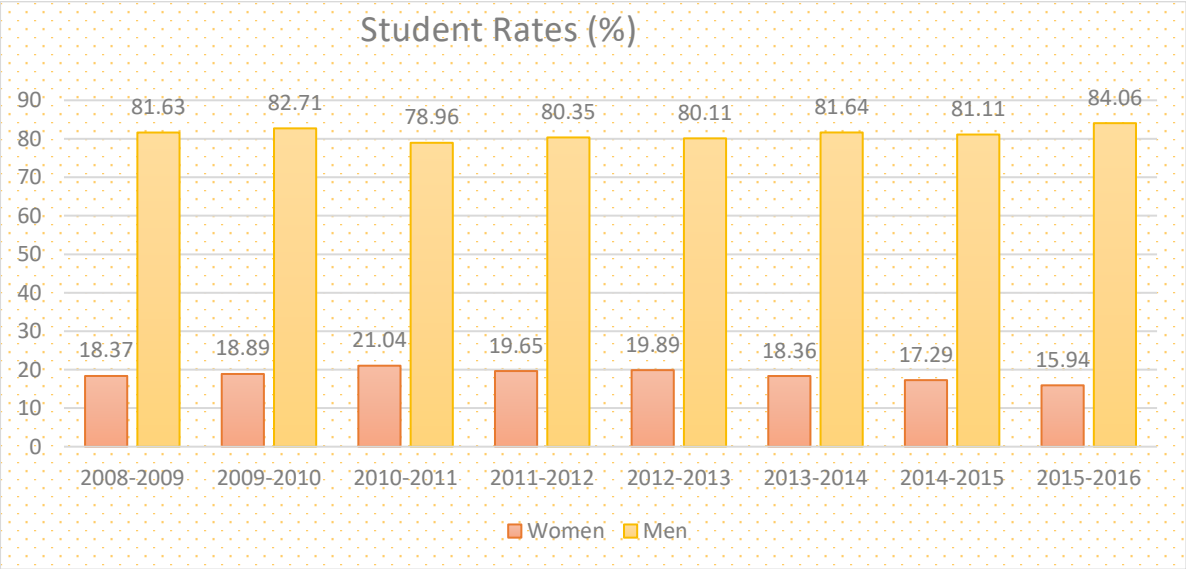

Figure GR. 5 Student rates in the School of Education. Department of Early Childhood Education of the National and Kapodistrian University of Athens

The Figure GR. 5 displays the student rates in the School of Education, Department of Early Childhood Education of the National and Kapodistrian University of Athens over the years, starting from 2008. We can easily take notice that throughout the years the male students tend to choose the Department of Early Childhood Education[7]

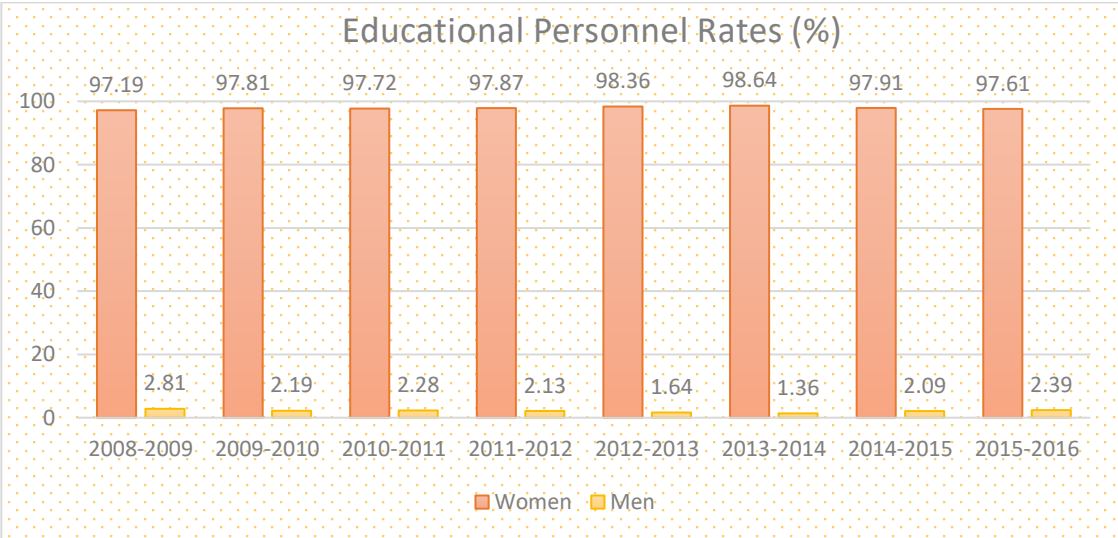

Figure GR. 6 Educational personnel rates in public high schools by gender in Greece.

The Figure GR. 6 illustrates the educational personnel rates in public high schools per gender all over Greece from 2008 to 2016. We can take notice that there is a huge difference in the percentage rate between the two genders, throughout the whole period (2008-2016). [7]

[7] http://www.isotita.gr/wp-content/uploads/2018/05/Observatory-16th-e-bulletin-Women-in-Education-Decision-making-positions.pdf

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The conclusion that can be draught comparing the Figure GR. 5 and Figure GR. 6 is that although more men are pursuing studies in the early Childhood Education women tend to cover more places as educational personnel in the end.

Sectoral structure

Main productive sectors in the region

The Table 2.4 demonstrates the main productive sectors in the region (GR12), according to the Online S3 report, for the year 2011. It showcases the size, specialisation and focus of each one the of the sectors. Some of the largest Production Sectors in the Region are Tobacco (5.11%), Farming and animal husbandry (2.46%), Apparel (1.97%) and Agricultural products (1.38%). [8]

Code	Region	Year	Sector	Observatory star rating	Note	Size (%)	Specialisation (%)	Focus (%)
GR12	Kentriki Makedonia	2011	Aerospace	0	a 2006	0	0	0
GR12	Kentriki Makedonia	2011	Agricultural products	2	a 2006	1.37	2.98	1.56
GR12	Kentriki Makedonia	2011	Apparel	2	a 2006	1.98	4.32	2.66
GR12	Kentriki Makedonia	2011	Automotive	0	a 2006	0.03	0.07	0.09
GR12	Kentriki Makedonia	2011	Biotech	0	a 2006	0.17	0.37	0.02
GR12	Kentriki Makedonia	2011	Building fixtures, equipment and services	0	a 2006	0.36	0.79	0.91
GR12	Kentriki Makedonia	2011	Business services	0	a 2006	0.17	0.37	1.54
GR12	Kentriki Makedonia	2011	Chemical products	0	a 2006	0.17	0.37	0.17
GR12	Kentriki Makedonia	2011	Construction	1	a 2006	0.5	1.1	4.33
GR12	Kentriki Makedonia	2011	Construction materials	0	a 2006	0.55	1.21	0.27
GR12	Kentriki Makedonia	2011	Distribution	0	a 2006	0.43	0.94	1.25
GR12	Kentriki Makedonia	2011	Education and knowledge creation	0	a 2006	0.31	0.67	1.19
GR12	Kentriki Makedonia	2011	Entertainment	0	a 2006	0.27	0.59	0.4
GR12	Kentriki Makedonia	2011	Farming and animal husbandry	3	a 2006	2.46	5.37	3.07
GR12	Kentriki Makedonia	2011	Financial services	0	a 2006	0.3	0.65	2.12
GR12	Kentriki Makedonia	2011	Footwear	0	a 2006	0.52	1.13	0.2
GR12	Kentriki Makedonia	2011	Furniture	0	a 2006	0.78	1.71	0.84
GR12	Kentriki Makedonia	2011	Heavy Machinery	0	a 2006	0.23	0.5	0.25
GR12	Kentriki Makedonia	2011	Instruments	0	a 2006	0	0	0
GR12	Kentriki Makedonia	2011	IT	0	a 2006	0.07	0.15	0.14
GR12	Kentriki Makedonia	2011	Jewellery and precious metals	0	a 2006	0.9	1.96	0.16
GR12	Kentriki Makedonia	2011	Leather products	0	a 2006	0.82	1.79	0.12
GR12	Kentriki Makedonia	2011	Lighting and electrical equipment	0	a 2006	0.22	0.49	0.11
GR12	Kentriki Makedonia	2011	Maritime	0	a 2006	0.85	1.86	0.49
GR12	Kentriki Makedonia	2011	Media and publishing	0	a 2006	0.26	0.56	0.63
GR12	Kentriki Makedonia	2011	Medical devices	0	a 2006	0.2	0.43	0.12
GR12	Kentriki Makedonia	2011	Metal manufacturing	0	a 2006	0.26	0.56	1.12
GR12	Kentriki Makedonia	2011	Oil and gas	0	a 2006	0.48	1.05	0.14
GR12	Kentriki Makedonia	2011	Paper products	0	a 2006	0.4	0.87	0.67
GR12	Kentriki Makedonia	2011	Pharmaceuticals	0	a 2006	0.19	0.42	0.17
GR12	Kentriki Makedonia	2011	Plastics	0	a 2006	0.13	0.29	0.14
GR12	Kentriki Makedonia	2011	Power generation and transmission	0	a 2006	0.7	0.15	0.02
GR12	Kentriki Makedonia	2011	Processed food	1	a 2006	0.71	1.55	3.88
GR12	Kentriki Makedonia	2011	Production technology	0	a 2006	0.16	0.36	0.32
GR12	Kentriki Makedonia	2011	Sporting, recreational and children's goods				0	0
GR12	Kentriki Makedonia	2011	Stone quarries	0	a 2006	1.26	2.75	0.13
GR12	Kentriki Makedonia	2011	Telecom	0	a 2006	0.28	0.6	0.59
GR12	Kentriki Makedonia	2011	Textiles	0	a 2006	0.91	1.98	0.95
GR12	Kentriki Makedonia	2011	Tobacco	2	a 2006	5.11	11.16	0.79
GR12	Kentriki Makedonia	2011	Tourism and hospitality	0	a 2006	0.39	0.84	1.49
GR12	Kentriki Makedonia	2011	Transportation and logistics	0	a 2006	0.25	0.54	1.57

Table GR. 4 Main productive sectors in Central Macedonia Region.[6]

[8] We used the specific report that was the most comprehensive and inclusive according to our opinion, but unfortunately was from few years ago.

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Figure GR. 7 Main Productive sectors in the region.[6] [9]

As shown in Figure GR. 7, manufacturing of food products seems to be a sector that has a big number of working people, a high percentage of GDP and exports in the region and also its scientific knowledge can also boost other correlated sectors like manufacturing of chemicals, pharmaceuticals and machinery and equipment.

[9] Location quotient (LQ) is a valuable way of quantifying how concentrated a particular industry, cluster, occupation, or demographic group is in a region as compared to the nation. It can reveal what makes a particular region "unique" in comparison to the national average.

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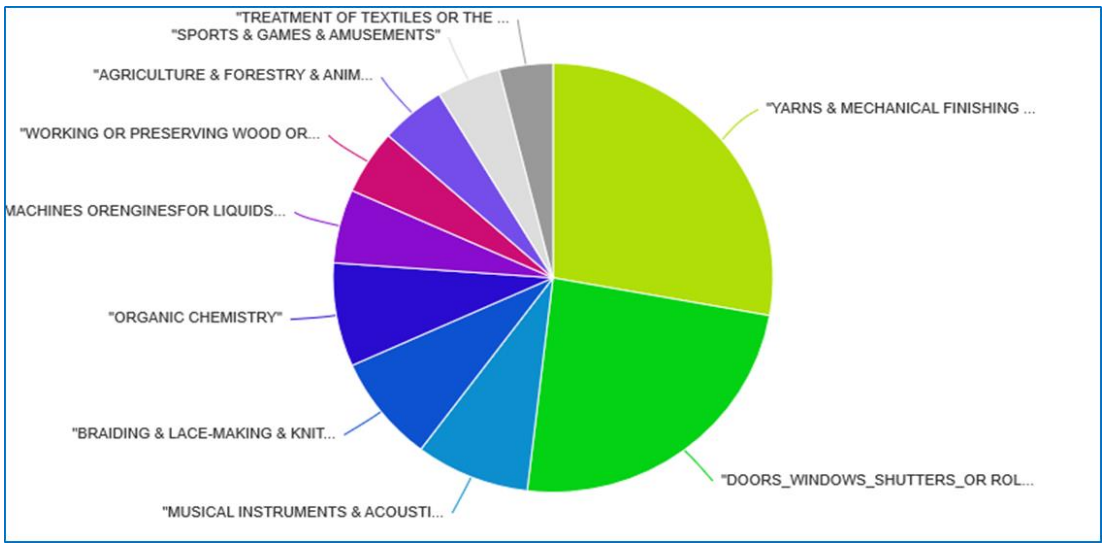
Enterprise characteristics

Report on Region's Specialisation (Region: EL12 - KENTRIKI MAKEDONIA)



Revealed Technological Advantage (top-10):

- **Technology:** YARNS & MECHANICAL FINISHING OF YARNS OR ROPES & | **RTA Index:** 29.52
- **Technology:** DOORS_WINDOWS_SHUTTERS_OR ROLLER BLINDS_IN GENERA | **RTA Index:** 25.52
- **Technology:** MUSICAL INSTRUMENTS & ACOUSTICS | **RTA Index:** 8.89
- **Technology:** BRAIDING & LACE-MAKING & KNITTING & TRIMMINGS & N | **RTA Index:** 8.54
- **Technology:** ORGANIC CHEMISTRY | **RTA Index:** 8.29
- **Technology:** MACHINES ORENGINESFOR LIQUIDS & WIND_SPRING_OR WE | **RTA Index:** 5.90
- **Technology:** WORKING OR PRESERVING WOOD OR SIMILARMATERIAL & N | **RTA Index:** 5.17
- **Technology:** AGRICULTURE & FORESTRY & ANIMAL HUSBANDRY & HUNTI | **RTA Index:** 5.10
- **Technology:** SPORTS & GAMES & AMUSEMENTS | **RTA Index:** 5.01
- **Technology:** TREATMENT OF TEXTILES OR THE LIKE & LAUNDERING & | **RTA Index:** 4.18

Figure GR. 8 Region's Specialization Index.[6]

The technological specialisation of the selected regions is calculated using the Revealed Technological Advantage (*RTA*) index[10]. The RTA index is calculated only for regions that have at least 300 patents during the period of analysis (2006 - 2016), a threshold that indicates a relatively strong inventive activity in the region. The RTA index ranges from zero to infinity, where zero indicates that the region has no patent activity in a technology and thus it is fully de-specialised in that technology, while a value one shows that the patenting activity of an area in one technology "t" is exactly equal to the weight that this technology has on the patenting activity at the EU27 area. A value greater than one in a specific technology indicates that area is relatively specialised in this technology. Our application displays for each region results only for the first ten technologies with the highest RTA.

[10] The RTA Index was used due to its efficiency regarding the Region's Specialisation

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Innovation system

The Region of Central Macedonia or Kentriki Makedonia (EL52) is a moderate innovator. Over time, performance has increased over time (21.3%). The strong increase in 2018 is largely explained by improved performance on the indicators using Community Innovation Statistics (CIS) data. *Innovators*, Linkages, and *Employment Impacts* are the strongest innovation dimensions.

	Data	Normalised score	Relative to	
			EL	EU
Tertiary education	46.6	0.580	110	126
Lifelong learning	4.0	0.103	87	33
International scientific co-publications	726	0.480	102	84
Most-cited scientific publications	0.093	0.451	107	83
R&D expenditures public sector	0.62	0.535	104	94
R&D expenditures business sector	0.21	0.207	66	35
Non-R&D innovation expenditures	±	0.746	±	±
Product/process innovations	±	0.637	±	±
Marketing/ org. innovations	±	0.641	±	±
SMEs innovating in-house	±	0.644	±	±
Innovative SMEs collaborating	±	0.788	±	±
Public-private co-publications	7.1	0.170	82	42
PCT patent applications	1.36	0.092	80	22
Trademark applications	4.63	0.325	109	73
Design applications	2.43	0.360	152	73
Employment MHT manuf./KIS services	8.8	0.235	80	47
Sales new-to-market/firm innovations	±	0.761	±	±
Average score	--	0.456	--	--
Country EIS-RIS correction factor	--	*0.846*	--	--
Regional Innovation Index 2019	--	0.386	--	--
RII 2019 (same year)	--	--	105.9	79.4
RII 2019 (cf. to EU 2011)	--	--	--	83.1
Regional Innovation Index 2011	--	0.287	--	--
RII 2011 (same year)	--	--	100.7	61.8
RII - change between 2011 and 2019	--	21.3	--	--

± Relative-to-EU scores are not shown as these would allow recalculating confidential regional CIS data.

Table GR. 5 Normalized Scores per Indicator compared to Greece and the EU[11]

The Table GR. 5 depicts the normalised scores per indicator and relative results compared to Greece and the EU. Moreover, the table shows the Regional Innovation Index (RII) in 2019 in comparison to that of Greece and the EU in 2019, compared to the RRI of 2011 and performance change over time between the years 2011 and 2019.[11]

[11] http://www.gsrt.gr/News/Files/New112124/Regional%20profiles%20Greece.pdf

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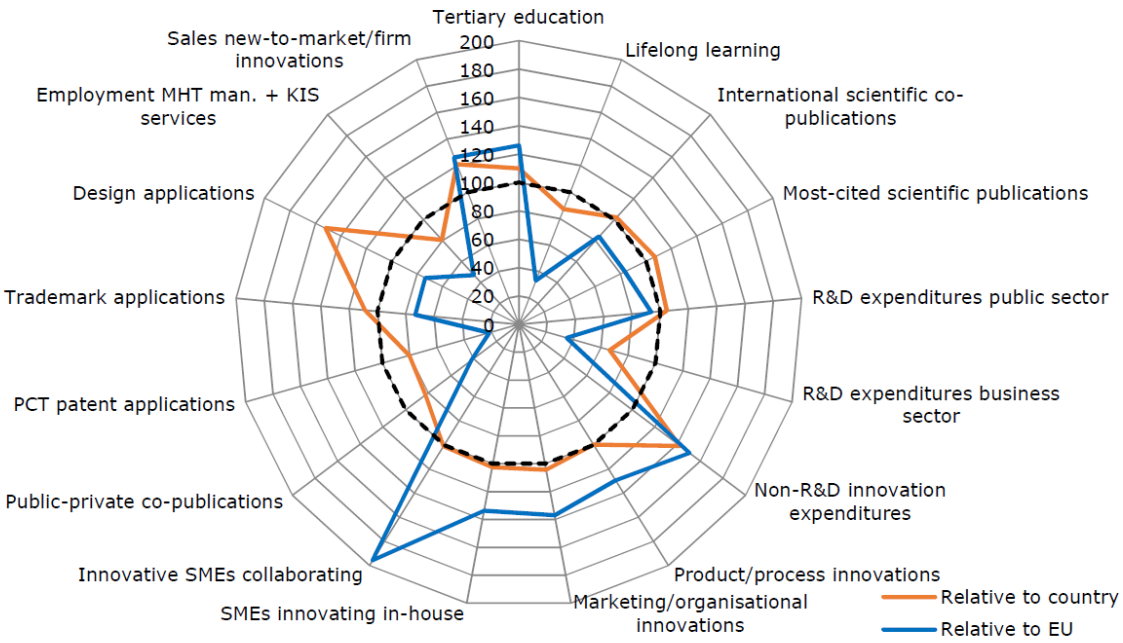

Figure GR. 9 Radar graph[11]

The graph in Figure GR. 9 shows relative strengths compared to Greece (orange line) and the Eu (blue line), indicating relative strong points such as Innovative SMEs collaborating and weaknesses such as PCT patent applications.

Region	2010	2011	2012	2013	2014	2015	2016	2017	2018
EL12 – Kentriki Makedonia	32.30	34.10	34.30	33.20	33.20	34.40	36.20	36.60	37.10

Table GR. 6 Human Resources in Science and Technology[6]

The Table GR. 6 displays the representation of Human Resources in science and technology from 2010 till 2018. There is a steady growth in the number of Human Resources throughout this period, with an exception of 2 years.

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ΔΕ ¦ NATIONAL PATENTS	2010	2011	2012	2013	2014	2015	Σύνολο ¦ Sum
ΕΛΛΑΔΑ ¦ GREECE	733	727	626	697	651	549	3983
ΓΑΛΛΙΑ ¦ FRANCE		1	1	1			3
ΓΕΡΜΑΝΙΑ ¦ GERMANY	2	2	1				5
ΗΝΩΜΕΝΟ ΒΑΣΙΛΕΙΟ ¦ UNITED KINGDOM	1	1	2	1	8	9	22
ΙΣΠΑΝΙΑ ¦ SPAIN		1		1			2
ΙΤΑΛΙΑ ¦ ITALY	2	2	1	2			7
ΣΚΑΝΔΙΝΑΒΙΚΕΣ ΧΩΡΕΣ ¦ SCANDINAVIAN COUNTRIES	1	2	1	2	3	3	12
ΒΑΛΚΑΝΙΚΕΣ ΧΩΡΕΣ ¦ BALKAN COUNTRIES	1		2	1			4
ΛΟΙΠΕΣ ΧΩΡΕΣ ΕΡΣ ¦ OTHER EPC COUNTRIES	4	5	5	3	1	7	25
ΗΠΑ ¦ USA		3	10	4	4	2	23
ΚΙΝΑ ¦ CHINA			1				1
ΡΩΣΙΑ ¦ RUSSIA FEDERATION			2			1	3
ΛΟΙΠΕΣ ΧΩΡΕΣ ¦ OTHER COUNTRIES	1			3			4
ΛΟΙΠΕΣ ΧΩΡΕΣ ΑΣΙΑΣ ¦ OTHER ASIAN COUNTRIES	4	3	4	1	3	1	16
ΛΟΙΠΕΣ ΧΩΡΕΣ ΗΠΑ ¦ OTHER USA COUNTRIES					1		1
Σύνολο ¦ Sum	749	747	656	716	671	572	4111

Table GR. 7 Patent fillings by type, year of filling and origin[12]

The Table GR. 7 presents the number filed by type, year of filing, and origin of the patent during the years 2010 to 2015, as they have been recorded by the Hellenic Industrial Property Organisation-OBI. The sum of patents recorded during that period are 4,111.

Knowledge organization

Type	Name	Website
University	Aristotle University of Thessaloniki (AUTH)	https://www.auth.gr/en
University	University of Macedonia (UoM)	https://www.uom.gr/en
University	Alexander Technological Educational Institute of Thessaloniki (ATEITH)	https://www.teithe.gr/
University	T.E.I. of Central Macedonia	http://www.teicm.gr/index.php?lang=en
University	International Hellenic University	https://www.ihu.edu.gr/
University	American College of Thessaloniki (ACT)	https://www.act.edu/
University	American Farm School	https://www.afs.edu.gr/

[12] Hellenic Industrial Property Organisation-OBI - https://www.obi.gr/OBI/Portals/0/ImagesAndFiles/Files/2015_Annual_report_activities_dr08.pdf

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University Transfer Office	Urenio Research Unit	www.urenio.org
Cultural Center	British Council	https://www.britishcouncil.gr/en/contact/thessaloniki
Learning Institute	NOUS Institute of Digital Learning & Communication	http://i-nous.org/
Living Lab	Thessaloniki Active and Healthy Ageing Living Lab (Thess-AHALL)	https://enoll.org/network/living-labs/?livinglab=thessaloniki-active-and-healthy-ageing-living-lab-thess-ahall

Table GR. 8 Overview of the main research and knowledge organizations present in the Region of Central Macedonia

The Main Research and Knowledge Organisations in the region of Central Macedonia, currently, are recorded to be 20 % of the actors, 70% of which are Universities.

Research & Innovation Infrastructures

Type	Name	Website
Organisation-Digital Innovation Hub	OK THESS	https://okthess.gr/el/
Platform/group for start-ups	Open Coffee	http://opencoffee.gr/
Regional Agency	Federation of Industries of Northern Greece (FING)	www.sbbe.gr
Research Institute	Centre for Research and Technology Hellas (CERTH)	https://www.certh.gr/
Research Institute	National Agricultural Research Foundation (NAGREF)	http://www.nagref.gr/
Research Institute	Forest Research Institute	https://www.fri.gr/index.php/en
Research Institute	Greek Center of biotopes-wetlands (GBWC)	http://www.ekby.gr/
Science Centre-Technology Museum	Technology Museum NOESIS	https://www.noesis.edu.gr/?lang=en
Spin-off company	INTELSPACE Innovation Technologies S.A. (a spin-off company of URENIO)	https://www.intelspace.eu/

Table GR. 9 Research and Innovation Infrastructures.

The Research and Innovation Infrastructures of the region, as reported in the present (Table GR. 9), are comprised of four Research Institutes, an Organisation-Digital Innovation Hub, a Spin-off company, a Science Centre-Technology Museum, a Platform/group for start-ups and a Regional Agency.

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Clusters and Incubator

Type	Name	Website
Research Organisation	Centre For Research &Technology Hellas/Apt	apt.cperi.certh.gr
Research Organisation	Centre For Research &Technology Hellas/Iti	www.iti.gr
Research Organisation	Centre For Research & Technology Hellas/Hit	http://www.imet.gr/Default.aspx?tabid=41&language=en-US#&slider1=7
SME	ESTIA Consulting & Engineering SA	www.estiaconsulting.gr
SME	Spanos Technologies Ike	www.spanos-group.com
SME	Engaia Renewable Energy Systems Sa	www.engaia.gr
SME	Draxis Environmental Sa	www.draxis.gr
SME	Chimar Hellas Sa	www.chimar-hellas.com
Larger Company	Hellenic Petroleum Renewable Energy Sources Sa	www.elperes.gr
SME	Compucon Sa	www.compucon.gr
SME	Thermi Ae	www.thermokoitida.gr
SME	Eviex Oe	
SME	G.Samaras Sa Medical Gas Systems	www.gsamaras.gr
SME	Atlantis Engineering Sa	www.atlantis-engineering.eu
	Clean Energy Ltd	http://www.cleanenergy.com.gr/en

Table GR. 10 Clusters

The percentage of Clusters over the total actors is 32%, 20% of which are Research Organisations and 67% are the SMEs.

Type	Name	Website
Incubator	Thermi S.A.	http://www.thermi-group.com/en/
Incubator	i4G (Incubation for Growth) S.A. - Euroconsultants Group of Companies	www.i4g.gr
Incubator (Science Park)	Technopolis Thessaloniki's S.A. - High Technology Business Park	www.technopolis.gr
Incubator (Science Park)	Thessaloniki Technology Park	www.thestep.gr

Table GR. 11 Incubators

In the region there are 4 significant Incubators in total Thermi S.A, i4G (Incubation for Growth) S.A. - Euroconsultants Group of Companies, Technopolis Thessaloniki's S.A. - High Technology Business Park, Thessaloniki Technology Park.

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Other institutional players

Type	Name	Website
Chamber	Chamber of Commerce and Industry Thessaloniki (TCCI)	https://www.ebeth.gr/en
Chamber	Thessaloniki Chamber of Small and Medium Sized Industries	https://www.gtp.gr/TDirectoryDetails.asp?id=66703
Civil Company	Cultural Society of the Entrepreneurs of Northern Greece	https://www.peebe.gr/
Civil Company	KEPA - Centre for Business and Cultural Development	https://e-kepa.gr/
NGO	Association of Female Entrepreneurs of Greece	https://www.sege.gr/
NGO	Ergani | Center for the Support of Employment and Entrepreneurship of Women	https://www.ergani.gr/en
NGO	Afixis - Transforming Education	https://afixis.org/
Organisation (Exports Sector)	SEVE - Greek Exporters Association	https://www.seve.gr/en/
Organisation (Training Services)	CEDEFOP	http://www.cedefop.europa.eu/
Organisation (Transportation Technologies & Supply chain)	Egnatia Odos	http://www.egnatia.eu/page/
Organisation (Technology Transfer)	Praxi/Help forward network	http://praxinetwork.gr/en/
Regional Agency	Federation of Industries of Northern Greece (FING)	www.sbbe.gr

Table GR. 12 Other Institutional players

In the Table GR. 12 were recorded other significant institutional players such as Chambers, NGOs, Organisations etc., which represent a 25% of the total actors.

Governance system

STAKEHOLDERS & CONSENSUS AROUND S3

Governance policies can facilitate or hamper the implementation of Smart Specialisation Strategies. Generally, governance models involve national and regional level actors, are interactive and are regionally driven based on a consensus decision-making mechanism. There is a strong focus on creating (new) structures, mostly around 3 levels:

- A dedicated Steering Group/Steering Committee or Management team
- A Knowledge Leadership Group, or Mirror Group, and
- Thematic or project-specific Working Groups.

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Main Strategies

For the 2014-2020 programming period, the Greek regions were asked to draw up a development programme taking into account the strategic visions and goals of "Europe 2020", the National Reform Programme, and the Memoranda of Economic Policy. Regions are invited to promote the knowledge society and upgrade their education system, improve their competitiveness by accelerating the integration the global economic environment, strengthen research, technological development and innovation, improve access and use of information and communication technologies, halt and then reverse the indicators of unemployment, develop the productive sectors, endogenous capacities for investment financing and attraction of foreign direct investment.

At the regional level, the RIS3 Strategy of the Region of Central Macedonia, which is endorsed and approved by a large number of stakeholders, may offer a basis for defining vision and objectives. Central Macedonia should aspire and promote an open and innovative region, characterised by:

- Excellence and extroversion: the pursuit of excellence and targeting exports of products and services are the cornerstones of any initiative and investment.
- Exploitation of comparative advantages though specialisation: moving from horizontal initiatives and investments towards initiatives and investments that support selected technologies and developmental options.
- Exploiting the capabilities of human resources and the high concentration of research and technology in academic and research centres.

Priority areas specialisation

Priorities – Sectors of High Regional Interest

In Region of Central Macedonia, 4 regional specialisation sectors have been identified, participating decisively in Gross Added Value of the region, employing a significant number of workers, maintaining critical mass and exhibiting intrinsic dynamics and extroversion. The sectors are designated as “Champion Sectors” of the Region and are the following:

CHAMPION SECTORS

A) AGRO-FOOD
B) CONSTRUCTION MATERIALS
C) TEXTILE & CLOTHING
D) TOURISM

Respectively, another 4 technological sectors have been identified, with a particularly decisive role in the activation of the advantages of the economy of the Region towards innovation, competitiveness, and extroversion. The technological sectors act as catalysts for absorbing innovation, identified as “Horizontal Support Sectors” and are the following:

HORIZONTAL SUPPORT SECTORS

I. INFORMATION AND COMMUNICATION TECHNOLOGIES (ICT)
II. ENERGY TECHNOLOGIES
III. ENVIRONMENTAL TECHNOLOGIES
IV. TRANSPORT AND LOGISTICS TECHNOLOGIES

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CHAMPION SECTORS

A) AGRO-FOOD

Documentation:

Regional specialization sector (primary sector and food manufacturing), a critical mass of businesses, primary production of a considerable range of high-quality products, export orientation, significant employment rate, remarkable research production, developmental opportunities

Policy basis:

Strengthening RTD in the agri-food sector and increasing competitiveness and entrepreneurship is a recognized strategic goal of RCM.

Innovation Resources:

Diachronically scientific expertise of the Region of Central Macedonia compared to the national level in the fields of Agriculture, Chemistry and Veterinary, specialized scientific fields such as Agricultural Engineering. The significant participation of enterprises in RTD projects of General Secretariat for Research and Technology (GSRT)

Goals:

- Production and utilization of new knowledge in the food industry for the enhancement of local products and the development of new specialized food for special population categories and specific uses,
- Maintenance and strengthening of human resources and skills innovation in the food industry,
- Support of the agri-food businesses towards internationalization, the creation of national and international partnerships,
- Networking of stakeholders, institutions, etc. professional support of innovative entrepreneurship and diffusion of results of researches and technological development.

B) CONSTRUCTION MATERIALS

Documentation:

Regional specialization sector, a critical mass of businesses, export orientation, technological challenges concerning energy and environment

Policy basis:

Strengthening RTD in construction material sector and the competitiveness and entrepreneurship of manufacturing is a recognized strategic goal of RCM.

Innovation Resources:

Ability to use new materials and horizontal IT technologies, energy and environmental efficiency, production, and organizational innovation.

Goals:

- Strengthening of the interconnection of research infrastructures (especially those specialized in KET's), further connecting them with industry and public sector, focusing on the technological requirements of the sector.
- Encourage the development of private research and innovation, strengthening innovative and extrovert enterprises, business creation which will come from the field of scientific research, the attraction of venture capital and knowledge-intensive investment, develop demonstration projects mainly from businesses.

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- Curbing the brain drain by creating jobs, both in businesses and research organizations, improve researcher mobility, participate in international networks, train human resources to respond to the needs of private sector aiming to increase employment of researchers in business, utilization of scientists / researchers' network that currently live and work abroad and reward renowned and young researchers.

C) TEXTILE & CLOTHING SECTOR

Documentation:

Traditionally important sector for the Region in terms of employment, third in export size, linked with the primary production (cotton) technological opportunities (new materials) and non-technological innovation, (design).

Policy basis:

Strengthening the competitiveness and the transformation of traditional manufacturing sectors is a recognized strategic goal of RCM.

Innovation Resources:

Ability to use the technology of new materials and technologies horizontal IT, energy and environmental efficiency, design and organizational innovation, especially in the supply chain management and just-in-time production.

Goals:

- Utilization of new knowledge in the textile and clothing industry and the creation of new specialized high value-added products,
- Support textile and clothing industry enterprises to internationalize their operation, develop partnerships and incorporate them into international value chains,
- Strengthening of human resources and innovation skills in textile and clothing sector,
- Networking of stakeholders, institutions, etc. professional support of innovative entrepreneurship and diffusion of results of researches and technological development.

D) TOURISM SECTOR

Documentation:

Rich natural resources, cultural heritage, accessibility, positive development trends of the sector, the intrinsic growth potential of alternative tourism, the potential for organizational innovation.

Policy basis:

Strengthening the competitiveness and the entrepreneurship is a recognized strategic goal of RCM.

Innovation Resources:

Ability to exploit new innovative tools and horizontal IT technology, energy, and environmental efficiency, strengthening collaborative and organizational innovation.

Goals:

- Coordination of agencies and businesses on Marketing issues and supplement of total the regional and/or local product (New Content, Destination Management Systems (DMS) and the corresponding institutional structure (DMO), social media, branding, etc.)
- Improvement of competitiveness and increase of the surplus value of the total tourism product through networking, new technologies (ICTs - Content Management / Future internet, Automation, Augmented Reality technologies), certifications, organizational innovation, etc.

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- Improvement of the environmental footprint through the use of energy-saving technologies, water-saving technologies, intelligent transportation, "intelligent buildings" technology exploitation, use of "green" materials, etc.
- Strengthening collaborative innovation and interconnection with other sector areas of regional interest, (Culture, Health, Sports, Food and agriculture, local crafts, Transportation, Education, Retail, design services, etc.)

HORIZONTAL SUPPORT SECTORS

I. INFORMATION AND COMMUNICATION TECHNOLOGIES (ICT)

Documentation:

A critical mass of businesses, inherent nature of innovation, export orientation, opportunities for exploitation of new digital tools, strong research base, horizontal technologies applicable throughout the economy.

Policy basis:

Recognized horizontal support sector with the existence of a critical mass businesses in the RCM in specialized areas of knowledge, primarily in the provision of services and software regarding general business processes to enhance both the enterprise's and the sector's competitiveness and entrepreneurship.

Innovation Resources:

There is a very strong research base and a significant investment in RTDI in the ICT sector in RCM, according to data from the GSRT, in terms of quantity of business, the overall project budgets, and equity leverage.

Goals:

- Recognition of the multi-level significance of ICT for the support and development of other sectors of interest of the region, but also as tools for solving technological and non-technological challenges of the Champion Sectors.
- Development and exploitation of technological research tools and creation of knowledge-diffusion structures.
- Coordination of agencies and businesses to support individual sectors towards upgrading services and new products provision issues.
- Strengthening of collaborative innovation and interface with other sectors of regional interest.

II. ENERGY TECHNOLOGIES

Documentation:

The crucial role of energy in all economic activities, large energy-saving potential, key position of the region regarding international power lines, considerable RES resources, potential the prospect of using fossil wealth of the country, consistent with other value chains, remarkable research production of international range.

Policy basis:

Promotion of energy efficiency, renewable energy and reducing CO_2 are strategic goals of RCM.

Innovation Resources:

Considerable research output discrimination at an international level, promotion of modern models of financing energy-improving investments.

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Goals:

- Use of energy technologies on a large scale in manufacturing, services (with emphasis on tourism), transport, construction, etc.
- Support research institutes and businesses involved in energy technologies to internationalize their operations
- Active and effective networking of stakeholders, dissemination of the results of energy technologies
- Strengthening of human resources and innovation skills of the sector

III. ENVIRONMENTAL TECHNOLOGIES

Documentation:

The potential use of environmental technologies in all economic activities, significant margins for improvement of the environmental management of the public and private sector, support of the sustainable development objectives, a crucial role in the exploitation of comparative advantages of the Region (primary production, food manufacturing, and tourism)

Policy basis:

Environmental protection and sustainable development are a strategic goal of RCM.

Innovation Resources:

Considerable research production and potentiality of businesses' dynamics development in the environmental management field for the exploitation of comparative advantages of the Region (primary production, food manufacturing, and tourism)

Goals:

- Dissemination and enhancement of environmental technologies in all economic activities, with an emphasis on tourism
- Support research institutes and businesses involved in environmental technologies to internationalize their activities
- Active and effective networking of stakeholders, dissemination of the results of energy technologies
- Strengthening of human resources and innovation skills of the sector

IV. TRANSPORT AND LOGISTICS TECHNOLOGIES

Documentation:

The region is situated in a key location, with remarkable, significant transnational transport infrastructure, existing (but discredited) vehicle production capacity, emphasis on costs reduction and transport intramodality.

Policy basis:

Promotion of smart, sustainable and intermodal transport is a strategic goal of RCM.

Innovation Resources:

Considerable research production, potential synergies development with entrepreneurship

Goals:

- The enhancement of transport and logistics technologies in entrepreneurship and exploitation of synergies with energy and tourism sectors

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- Support research institutions and businesses involved in transport technologies to internationalize their operations
- The active and effective networking of stakeholders, dissemination of the results of transport and logistics technologies
- The strengthening of human resources and innovation skills of the sector

Implementation status

The Region of Central Macedonia is implanting today various RIS3 actions. So far, the Regional Authority has been able to monitor and evaluate a number of indicators easily identified by the 1.4 online S3 tool that is Legal and Administrative Framework.

Specialisation

It has been specified the entire budget for Axes 1, 2 and 3 of the Operating Programme (€ 127 million)

Calls

Calls amounting to € 111.2 million have been published concerning:

Priority Axis 01 - Strengthening Research, Technological Development, and Innovation

- Strengthening Public Research Infrastructures (€ 12 million)
- Innovation Ecosystem Support Facility (€ 1.4 million)

Priority Axis 02 - Improving the access, use, and quality of Information and Communication Technologies

- Technology vouchers for SMEs (€ 3.1 million)
- Development of upgrading of Information and Communication Technologies provided by Public Bodies (€ 4.8 million)
- Strengthening Investment Plans to produce advanced Information and Communication Technologies products and services (€ 4.9 million)
- Collaborative formations to promote innovation in local entrepreneurship (€ 4 million)
- Strengthening the Establishment and Operation of New Tourist Media (€ 20 million) (ex OPANEK)

Priority Axis 03 - Improving the competitiveness of Small and Medium-Sized Enterprises

- Modernization of existing micro, small and medium-sized enterprises of trade and services (€ 12 million)
- Establishment and modernization of existing micro, small and medium-sized manufacturing and tourism enterprises (€ 52 million)
- Collaborative formations to promote innovation in local entrepreneurship (€ 4 million)
- Strengthening the Establishment and Operation of New Tourist Media (€ 20 million) (ex OPANEK)

Monitoring and Evaluation system

The Directorate of Innovation and Entrepreneurship Support was designated on March 28, 2018, as the Monitoring and Evaluation Agency of the RIS3 Strategy in the Region of Central Macedonia. It has an Innovation Support Department, which is responsible for promoting innovation and bolstering research and development, linking business with Universities (domestic and foreign) and helping to create business and collaborative group. All actors involved in implementing RIS3 (e.g. ROP Managing Authority, Managing Authority of European Territorial Cooperation Programs, National Authorities, Institutional Bodies of the World Trade Organization, etc.) are also involved in Monitoring and Evaluation.

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The pinnacle of the intervention is the creation of the *One-Stop Liaison Office* for innovation and entrepreneurship within the regional ecosystem of Central Macedonia, which will provide an opportunity for the interconnection of research entities and producers of innovation with enterprises, boosting the competitiveness of products produced in the region. The aim of the Office is to provide information on the implementation of RIS3 interventions, both to the RIS3 Coordination and Management structures, as well as to strategic decision-making parties and structures (Regional Governor, CEEP, ERCS, GSRT, etc.). At the same time, it will portray a crucial role as a one-stop liaison office among the Industry, the Academia, the Public Administration and the Civil Society.

Figure GR. 10 One-Stop Liaison Office[13] [14]

Factors

Strengths:	**Weaknesses:**
• A geographical location with strategic importance in South-East Europe, in combination with the region's participation in the field of entrepreneurship in S.E. Europe • Considerable primary sector • Strong presence in the foods and drinks sector, as well as in the clothing, textile and building material industry • Tourism; strong tourist destinations worldwide and a link between tourism and other fields of development (agro-food sector, local commerce, culture, religion-tradition, etc.) • Important infrastructures, transportation, and energy networks (transportation networks of transnational importance) • Regional enterprises proceed to outward-looking actions out of the sole scope of their own organization in the field of export trade • Educational and cultural infrastructures for offering educational services to students from all-over South-East Europe • A dynamic network of enterprises (with knowledge-intensive activities) based in Thessaloniki, accompanied by the proper facilities	• A non-equal development of regional units (Thessaloniki is seen as the centre of economic developments) • Signs of stagnation at the basic indexes of productivity and specialisation of the region's processing industries • No intense employment and a low/ medium technological intensity • According to the RCI report, the regional economy is not competitive at the European level and at the indexes of technological readiness and labour market • When considering the added value of tourism products, the region's performance in tourism can still be considered low (in spite of the workforce) • Insufficient brand name in the agricultural sector • Low performance in technology transfer (according to European standards) • Lack of clear scientific policies for scientific research and technology transfer • Limited scientific cooperation with institutions of universal prestige

[13] http://www.pkm.gov.gr/default.aspx?lang=el-GR&page=35&pressid=19347
[14] For more information contact onestopshop@pkm.gov.gr

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for their proper functioning (e.g. science parks, incubators) • A large scope of active scientific fields • Excellent scientific teams in the region, in accordance with the European criteria (e.g. AUTH, CERTH) • Considerable performance -when compared to the region's size- in competitive, European works of research and technological development • Thessaloniki as a junction of science over the region, with influence on neighboring regions as well (e.g. Thessaly, Western Macedonia) • Several new enterprises in the field of Information & Communication Technologies (founded after 2011), getting involved in new fields as well • Thessaloniki (as a metropolitan area) can constitute the proper environment for open innovation, thanks to its demographic elements	• In RCM there are fewer investments in the field of Information & Communication Technologies (compared to other geographical regions) • Not a considerable presence in the field of telecommunications • Lack of broadband infrastructures in relation to the goals set for 2020
Opportunities: • Positive actions towards the development of tourism in Greece (based on the changes noticed during 2010-2013) • Constant search for new, specialized forms of tourism and corresponding products • The Common Agricultural Policy is motivated to contribute to the agricultural development • Tendencies towards the increase of exports in various markets, mainly the ones of South-East Europe • Potentials to reshape the textile and clothing industries by integrating the latest technological innovations • Building materials responding to the environmental and energy standards (this field generally stands out in southeast Europe) • Citizens in domestic and industrial spaces are sensitized towards energy saving • Development of the "green" market and reinforcement of an environmental-friendly conscience • Increase in young people's mobility in southeast Europe for studies • Promotion of the concept "Rail Dardanelles", according to which Thessaloniki is the main junction for the proposed network of ports and commercial railways in Northern Greece • Potentials for stable funding of the research team, through the new programming period (Horizon 2020)	**Threats:** • Difficult economic environment, instability in the financial sector, weak demand and a weak private consumption at a national level • Further reduction of subsidies (and of income) at the primary sector due to the new Common Agricultural Policy • Negative environment for promoting entrepreneurship (legislation, bureaucracy, taxation, access to cheap funding) • The macro-economic environment puts at risk the state funding of research (new positions for researchers, infrastructures, and equipment) • Withdrawal of the workforce, as a reaction to the high rates of unemployment among young people in the region • RCM's opportunities for differentiation are limited due to the competition with other European regions having the same or similar characteristics • Funding R&I actions require public funding and an increase in private investments • Competition from neighboring countries regarding the development of outsourced Information & Communication Technologies applications

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• The new legislative framework for reformations in academic institutions, regarding research policies, technology transfer and contribution to regional development • Research teams applying the Smart Specialization Strategy (S3), based on the needs of the regional economy • The field of Information & Communication Technologies seems to be resisting the current crisis and can, therefore, better invest to R&I • Small and non-specialized IT markets in neighboring regions	

RCM has a critical mass of research centers, academic structures and centers of excellence. More specifically, it has three Universities (Aristotle of Thessaloniki, Macedonia, International),a major public research center (CERTH), university and public research laboratories, bio diagnostic research centers of excellence, advanced production systems for petrochemical processes, energy and environmental technologies, information processing rias, virtual reality, transport safety, etc.

Research institutes are almost entirely public, such as the institutes of Chemical Process Engineering, Informatics and Telematics, Transport, Agro-biotechnology, Solid Fuels Technology and Applications of the National Research and Technological Development Center, forensic science and research centers, universities , the Institute for Forest Research and Cereals, the URENIO Urban and Regional Innovation Research Unit and the Thess-AHALL, the Living Lab for Active and Healthy Ageing
Intermediaries include institutions such as the Thessaloniki Technological Park, the Alexandria Innovation Zone of Thessaloniki, the ACT Innovation Redistribution Center, the Hellenic Technology Transfer Center, the European Business Innovation Center in Serres. Intermediaries also include business incubators (i4G New Incubator, THERMI Incubator, Technological Park Incubator, Technopolis Thessaloniki). It can also include the Liaison Offices of educational and research institutes, namely the universities of Macedonia and Aristotle, the TEI of Thessaloniki and Serres and the National RTD Center.

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Emilia Romagna – ART-ER

Organisation mission and vision

Since May 1st, 2019, ASTER has become ART-ER | Attractiveness Research Territory[15], the Emilia-Romagna Joint Stock Consortium that was born from the merger with ERVET, to foster the region's sustainable growth by developing innovation and knowledge, attractiveness and internationalisation of the region.

The Research and Innovation Division promotes industrial research as the main drive for sustainable economic development and collaborates with company associations to develop joint research and corporate strategies and actions, facilities and services for industrial research, and the enhancement of human capital working in those areas. It coordinates the regional innovation ecosystem, that includes the Emilia-Romagna High Technology Network, Technopoles, business Incubators, Clust-ERs and Start-ups, and also operates through the local S3-Smart Specialisation Strategies AREAS as meeting places set up to foster the relationship between young people and the most innovative employment networks.

The RI Division aims at an open innovation model, where businesses, start-ups, researchers and associations discuss and share experiences and models of action, have access to the same resources and have the opportunity to orient their activities towards the objective of generating innovative and impactful solutions for the whole ecosystem, to make Emilia-Romagna an open, inclusive and attractive region.

The vision is to make the Emilia-Romagna Region innovative and competitive, inclusive and sustainable, creative and open to the World, by promoting innovation for the development of the territory and its businesses, enhancing its excellent research resources, the qualified employment of its talents and the well-being of its residents.

The mission is to build the Regional Innovation System by launching shared actions, projects and collaborations for integrated innovation of Industry, Human Capital, Society and Territory, intervening on the Growth and Competitiveness, Talent and Entrepreneurship, Cohesion and Participation.

Organisation structure

ART-ER main shareholder is the Emilia-Romagna Regional Government. The rest of the share is owned by the 6 regional universities, the National research centres located in the region, the Regional Union of the Chambers of Commerce and other local representatives.

The human resources are made up of 190 engineers, economists, humanists in two divisions, which are in turn divided into different units according to the following scheme:

- Units of the Sustainable Territorial Development Division
    - Territorial Development and Attractiveness
    - Economic Development and Environment
    - Structural Funds
    - EU Territorial Cooperation and Social Innovation
    - Infrastructures for Development

[15] *Emilia-Romagna Regional Act number 1/2018*

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- Units of the Research and Innovation Division
    - Innovation in Enterprises
    - Start-ups
    - Europe and Internationalisation
    - Finance and IPR
    - Infrastructures
    - High Technology Network and Thematic Units
    - Technopoles and Territory Attractiveness
    - Skills for Innovation

Organisation role in R&I system

ART-ER's mission is focused on 4 domains, each involving different activities in the regional context of R&I:

- Territorial development:
    - Technical support for the development of research infrastructures
    - Ensuring the quality of infrastructures for communication, mobility and production of goods and services
    - Monitoring of the construction and public works sectors
    - Collaboration with local institutions for the sustainable development of cities and territories
    - Monitoring and evaluation of the results of regional policies
- Attractiveness:
    - Territorial marketing
    - Promotion of investments in Emilia-Romagna
    - Attraction of talents
    - Technical assistance activities for Regional Operational Program
- Innovation and knowledge:
    - Coordination of the Innovation Ecosystem
    - Open Innovation actions
    - Enhancement of human capital and support to Research results exploitation
    - Support to business boosting for start-ups and companies
- Internationalisation:
    - Holds strong international relationships
    - Supports the regional government in policy planning on International Relations activities
    - Supports the internationalisation of the Research System
    - Implements programs of European Territorial Cooperation
    - Informs and disseminates activities on European programmes and support for building partnerships and projects

ART-ER is at the core of a widespread network of infrastructures and communities:

- 10 TECHNOPOLES, infrastructures hosting and organizing activities and services for industrial research, experimental development and technology transfer

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- 7 "CLUST-ERs", communities of public and private bodies that share ideas, skills, tools, and resources to support the competitiveness of the most important productive systems in Emilia-Romagna. (504 associates, 227 businesses, 202 research centres, 34 training bodies)[16].

In 2015 the Emilia-Romagna Region set a base in Silicon Valley through ART-ER to support start-ups and SMEs in their internationalization process and in their approach to the Silicon Valley Mindset. Results:

- 20% of companies raised funds (in EU or US)
- 20% of companies were selected for acceleration programs
- 50% of companies are still carrying on relations with partners or customers in the US
- 70% of companies changed their business model significantly

ART-ER is also supporting the Regional Government concerning Big Data and related topics in the creation of the so-called Data Valley, helping to:

- Enhance existing infrastructures for economic and social purposes
- Create a favourable environment for the development of a digital economy
- Be a reference point in terms of infrastructure, skills and institutions at national and international level

Some examples of this activity are the creation of the use of European, National and Regional investments for Digital Economy and Big Data Infrastructures to create a Big Data Technopole, hosting the European Centre for Medium-Range Weather Forecasts, and the International Foundation on Big Data and Artificial Intelligence for Human Development.

Relevant ongoing projects

The two main projects related to Territoria themes which ART-ER has been participating are two Horizon-2020 projects: INCLUSIVE-Smart and adaptive interfaces for inclusive work environment[17], a project in the framework of modern manufacturing aiming at developing a new concept of interaction between the user and the machines in which the behaviour of the automation system adapts to human operator capabilities; and SCHIP-Social Challenges Innovation Platforms[18], aiming at creating a marketplace where actual social challenges can meet powerful and innovative solutions.

There are anyway other related projects/ activities touching the Territoria focus.

[16] https://www.retealtatecnologia.it/en/clust-er
[17] http://www.inclusive-project.eu/
[18] https://www.socialchallenges.eu/en-GB/community/4

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Geography

Figure IT. 1 Location of the Emilia-Romagna region.

Emilia-Romagna is located in the North-East of Italy[19], within the Italian most productive area[20]. Its area of 22,453 km^2 corresponds to 7.5% of the national surface. Nearly half of the region (48%) consists of plains, while 27% is hilly and 25% mountainous. The mountains stretch for more than 300 km from the north to the southeast, with three peaks above 2,000 meters. The plain was formed by the gradual retreat of the sea from the Po basin and by the detritus deposited by the rivers. Almost entirely, marshland in ancient times, its history is characterized by the hard work of its people to reclaim and reshape the land in order to achieve a better standard of living. All the rivers rise locally in the Apennines except for the Po river, which has its source in the Alps in Piedmont region and follows the northern border of Emilia–Romagna for 263 km[21].

With an efficient network of infrastructures and its strategic geographical position, Emilia-Romagna is an important commercial hub well linked to all Italian cities and the main European cities. Indeed, its geographic position enables Emilia-Romagna to act as a link between northern and southern Italy, and between the Adriatic and Mediterranean regions and Central and Northern Europe.

Regional railway network covers 48.8 Km per 1,000 km^2. The rail network within in the regional boundaries consists of 1,400 km of route[22]. The most important rail route is the axis connecting Milan, Bologna, Florence, Rome, Naples, which is served by both high-speed and traditional trains.

[19] https://www.istat.it/en/
[20] https://ec.europa.eu/growth/tools-databases/regional-innovation-monitor/base-profile/emilia-romagna
[21] https://ec.europa.eu/growth/tools-databases/regional-innovation-monitor/base-profile/emilia-romagna
[22] http://www.investinemiliaromagna.eu/en/index.asp

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Figure IT. 2 Regional system of motorways and railway.

The most important motorways in Emilia-Romagna are: A1 (Milan-Naples), A13 (Bologna-Padua), A14 (Bologna-Taranto), A15 (Parma-La Spezia), A21 (Turin-Piacenza-Brescia), A22 (Modena-BrennerPass). These infrastructures are integrated with a dense and widespread network of national roads in the whole territory. The main junctions are Bologna (A1, A13, A14), Modena (A1, A22), Parma (A1, A15) and Piacenza (A1, A21). These are crossed by two or more highways offering a valuable connection to both northern and southern Italy and to the main highways' connection to central and northern Europe as well. Regional highways cover 25.7 Km per 1,000 km2, a value slightly higher than the Italian average (22 km)[22].

Ravenna port is the most important one in the Emilia-Romagna region. It is the leader nationwide for raw materials movement in the ceramics, cereals, fertilizers and flour-based products sectors. It is completed by the system of internal ports located on the Po river waterways.

In Emilia-Romagna there are three airports for civil transport, namely "Guglielmo Marconi" International Airport (IA) in Bologna, "Giuseppe Verdi" IA in Parma and "Federico Fellini" IA in Rimini. Bologna airport is by far the largest with more than 8.5 million passengers in 2018 and a steady growth trend (+3.8% compared to 2017)[23].

Demography and society[24]

In Emilia-Romagna there currently 333 municipalities (on a decreasing trend due to an ongoing process of aggregation to reduce fragmentation), grouped in 9 administrative areas (Provinces and Metropolitan City - NUTS3 level). Emilia-Romagna during its history developed as a 'metropolitan region' with a system of medium sized cities (thirteen municipalities have a population over 50,000 inhabitants) aligned along the "Via Emilia" and the coastal north-south axes. Bologna, the regional capital city, is the largest town, with a population of 386,663 inhabitants (with a metropolitan area of around 1 million), followed by other provincial capitals: Parma (191,734 inhab.), Modena (184,973 inhab.), Reggio Emilia (171,520 inhab.), Ravenna (159,669 inhab.), Rimini (148,527 inhab.), Ferrara (133,478 inhab.), Forlì (118,181 inhab.), Piacenza (102,490 inhab.), Cesena (96,937 inhab.). Around them a network of small and medium size urban areas are functionally integrated within an efficient system of social and economic infrastructures, which keeps together a dense network of manufacturing and service enterprises.

[23] https://www.bologna-airport.it/en/the-company/company-profile/key-figures/?idC=62363
[24] https://www.istat.it/en/

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Bologna is the seat of the Regional Government, and of the most important service infrastructure in the region, including the largest university (University of Bologna), the greatest concentration of public research institutes (CNR, ENEA, INFN, etc.), the largest international airport, the most important trade centre with international leading fairs, etc.

Bologna is outstanding in the rank of Italian cities as one of the most developed, richest and attractive cities. It ranks first in the Smart City Index 2019[25] and first in the Global Talent Competitiveness Index (47th at global level)[26].

All cities have a rich history going back to the Roman age and an impressive wealth of artistic heritage. Emilia-Romagna is home to three UNESCO World Heritage sites (Ferrara and Po Delta, Ravenna and Modena) and seven cultural heritages including Bologna declared "City of Music", Parma "city of Gastronomy", and two recently recognised Man and the Biosphere (MaB) reserves.

Emilia-Romagna has a population of about 4.4 million inhabitants (2018)[24], which has been rather stable in the last few years, after a couple of decades of moderate growth. The ageing process is in a quite advanced stage, although mitigated in the last fifteen years by strong immigration flows from other Italian regions and from abroad, that were concentrated in the younger age groups, sustaining the recovery of the birth rate.

The population density is around 198 inhabitants per km^2, just below the national average and far above the EU level. Nevertheless, the population is not equally distributed, but is concentrated in urban areas along the Via Emilia and in the coastal area. The population density in highest in the plain (288 inhab./km^2), in line with the regional average in the hill area (198), and lowest in the mountainous portion of the region (33), which has been suffering a sharp depopulation trend in the last 70 years[24].

Economy and labour

According to Eurostat statistics, regional GDP has been of 154 billion € in 2016, the GDP per capita PPS is equal to 35,300 €, one of the highest in Italy, after Lombardy (region of Milan, Italian financial pole) and some small autonomous and highly subsidized Alpine regions and provinces.

The Emilia-Romagna model relies on the two pillars of a competitive economy and an inclusive and cohesive labour market. Before the 2007-2008 the regional labour market was close to the full employment situation (unemployment rate at 3%) and attracted a high number of workers from outside the region. But in 2008 and 2009 Emilia-Romagna economy was deeply affected by the global economic crisis. Unemployment rate sharply increased from 3.2% to 4.8%, export fell by about 25% and regional GDP fell by 5.3%. After some difficult years, since 2014 employment is growing again, and exports are largely higher than 2008.

In fact, in 2016 the employment rate in Emilia-Romagna was 68.4%, the same level of 2005 and not that far from the peak touched in 2008 (above 70%), corresponding to 1.908 million people employed. For the age class 20-64 the rate is 73% -below the Europe 2020 target (75% in 2020)- two points higher that the European average. The rate is higher (66.2% against 65.3%) also for female employment.[27]

[25] https://digitale.regione.emilia-romagna.it/notizie/2019/gennaio/smart-city-index-di-ey
[26] Bruno Lanvin, Paul Evans, 2018, "The Global Talent Competitiveness Index 2018"
[27] https://ec.europa.eu/eurostat/home?

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The activity rate in the region has been growing in the last years up to 64.2% in 2016 (people 15-74 years), second in Italy only to the Autonomous Province of Bolzano and converging to the EU28 level (64.4%).

Emilia-Romagna economic system is open and integrated in the global market. With 25,000 exporting companies, it is the leading Italian region for export value per capita and the third for total exports. The regional production system is highly export-oriented: regional exports amount around to 30 billion € (ISTAT, 2018) that represent 16% of GDP. The value of export per capita is equal to about 6,800 €.

Emilia-Romagna is one of the most attractive Italian regions for flows of foreign investment, and the performance is expected to improve with the implementation of the new Regional Law on Investment Promotion (Reg. Law n.14/2014). The region is a strategic location for Foreign Direct Investment, as confirmed by the "European Cities & Regions of the Future 2016/17" report released by the Financial Times FDI division, that included Emilia-Romagna in the Top 10 rankings 'Southern European Regions' and 'Large European Regions – FDI Strategy'[24].

Sectoral structure

The regional productive system is diversified but has a strong manufacturing core, both compared to Italian and European average, and a clear tourist vocation in the coastal area. Within the manufacturing industry, the most important sectors of specialisations are machinery and equipment (specialisation index compared to EU above 2 both in terms or local units and persons employed) and other fabricated metal products, manufacture of wearing apparel and leather and related products, manufacture of other non-metallic mineral products (ceramics and tiles).

The main strength of the industry system can be identified in its considerable vocation to learn, innovate and co-operate. Nowadays, traditional light industry sectors account for less than 30% of employment in manufacturing, whereas the mechanical engineering and motor industries contribute to over 50% of regional employment and exports[22]. The most important industries in which Emilia-Romagna has a long-lasting tradition are: agriculture & food, motor industry, industrial mechanics, building & construction, fashion (clothing, shoes and leather) and furniture. At the same time, there are a number of emerging sectors such as the health industry, biotechnologies, genomics, ICT and nanotechnologies.

Enterprise characteristics

There are 385,000 enterprises (Unioncamere Emilia-Romagna, 2018[28]) located in the region. Like in the rest of the country, the majority of enterprises has less than ten employees. A large number of companies (about 46,000[28]) belong to manufacturing industry. Manufacturing plays the leading role for the whole regional economy. It is concentrated on some powerful clusters, apparently belonging to traditional sectors, but able to activate medium and medium-high technology activities and high innovation capabilities. The most relevant group of industries are linked to mechanical engineering and automotive. We can list: sport cars and motorcycles, agricultural machines, shipbuilding and offshore, industrial automation and robotics, various industrial sectors equipment (food processing and packaging, wood processing, ceramics, etc...), sensoristics and precision farming, medical equipment. Other powerful clusters are agri-food, construction materials and technologies,

[28] https://www.ucer.camcom.it/

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biomedical industries and fashion. Tourism and entertainment industries are very important in the coastal area. Cultural and gastronomic tourism is increasing in the last years.

Sectors that need to be reinforced are ICT and creative industries, still not enough developed and competitive. The service sectors in general is characterized by low productivity.

Almost 95% of active companies are micro enterprises with less than 10 people employed; 4.68% employs between 10 and 49 people and another 0.57 up to 249. Overall SMEs represents the 99.89% of the regional productive structure, employing 76.23% of the total. In many sectors SMEs are not isolated but belong to cluster networks, forming the so called well known "industrial districts" that have been a distinguished feature of the Emilia-Romagna development model of the post second World War era. The most important industrial districts are located in the provinces of Bologna (automatic and packaging machinery, motorcycle and automotive industries), Parma (food industry and food processing machinery), Modena (automotive, textiles, ceramic tiles and biomedical industries) and Reggio Emilia (agricultural machinery and mechatronics), however also other provinces have productive specializations.

There are only 417 enterprises with more than 250 employees, corresponding to 0.11% of the total, but they ensure 23.77% of employment. The region hosts the headquarters of several leading firms in agri-food (i.e. Barilla, Parmalat, …), in manufacturing (Datalogic, Ducati, Ferrari, G.D., IMA, Lamborghini, Marchesini, Marposs, Sidel, Technogym, Chiesi, …), utilities (Hera), construction (Bonatti, Pizzarotti, Trevi Group, …), service and finance (Banca Popolare dell'Emilia-Romagna, Unipol, Coop Alleanza 3.0, Yoox, …) and plants of worldwide multinational companies (Amazon, CNH Industrial, Philip Morris, etc.)[22] [24].

Innovation system

According to the last edition (2019) of the Regional Competitiveness Index[29], Emilia-Romagna ranks 162th on 268 positions, below the EU average with a total score of -0,18, but third among Italian regions (Lombardia is 146th and Trento 157th).

Scores are negative in all three sub-indexes (basic, efficiency, innovation) but they are very different across the 12 pillars that compose the indexes. In particular, the regional performance stands out the European average about 'market size' (measured by the amount of GDP, regional population and available income of households), 'infrastructure' and 'health'.

At the opposite side, the region is penalised by national general factors, i.e. in the 'institutions' pillar (political stability, national accounts, efficacy and transparency of government, corruption perception, efficiency of justice, ease of doing business), 'higher education and lifelong learning' and 'technological readiness' based on accessibility and use of internet by households and companies. Scores are more in line with the European average about innovation and business sophistication.

With regard to the Regional Innovation Scoreboard[30], Emilia-Romagna is part of the "moderate innovators" group. At the national level the Region is ranked second with a score of 89.1, a better performance than other regions such as Lombardy and Veneto, and behind Friuli Venezia Giulia. This

[29] https://ec.europa.eu/regional_policy/en/information/publications/working-papers/2019/the-european-regional-competitiveness-index-2019
[30] https://ec.europa.eu/growth/industry/innovation/facts-figures/regional_en

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is the only Italian region to reach the status of "Strong Innovator". The region shows, together with eight other Italian regions, a double-digit increase: its score increased by 11.1% in the last 7 years.

The best results, both with respect to the European and national average, are achieved in the indicators regarding:

- application of patents
- brands and designs
- SMEs that innovate in-house
- SMEs that innovate product and process
- Companies' expenditure in research and development

The Emilia-Romagna regional innovation system is well positioned within the national context and shows good performance in the European landscape for several indicators. The region has the highest number of R&D personnel and graduates in science and technology per inhabitant among the Italian regions. There is a high propensity to patent and to create innovative firms (second region in Italy per number of innovative start-ups, and fourth per academic spin-off companies).

However, there are a number of bottlenecks and drawbacks especially compared to other advanced EU regions, as highlighted by the Regional Competitiveness Index and the Regional Innovation Scoreboard commented above.

In Emilia-Romagna there were almost 32,000 people employed in R&D activities in 2015, corresponding to 7.2% of employed in R&D every 1,000 inhabitants. R&D expenditure in Emilia-Romagna amounts to € 2,682 billion (2015). The level has improved by over 27% compared to 2011[22].

Insights about the area of research excellence in the regional system emerged from the studies commissioned by the National Government to help Regions in the elaboration of their S3 documents. The study analyses the performance of regional universities (Bologna, Ferrara, Modena e Reggio Emilia, Parma) at global level in the most important subject areas, using bibliometric data produced by the Global Research Benchmarking project (www.researchbenchmarking.org).

The report concludes that:

- Regional universities have a good coverage of all subject areas analysed;
- There are excellence peaks in four areas: Mathematics and Information Sciences, Physicals, Chemistry, Medical Sciences, Industrial and Computer Engineering, with more than two subject each in the world top 10% rank and several subjects in the world top 30% rank;
- Good performance is registered also in Biology, Agriculture and Veterinary Sciences, Civil Engineering and Architecture, with more than one subject in the world top 30% rank

As for technological development, the regional system has a good performance in terms of patent propensity and specialisation (share of registered EPO patents well above the EU average) in food industry (baking, meat processing, etc.), tobacco and cigarettes, sport and amusement, industrial machinery and equipment, packaging, mechanical engineering niches.

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Knowledge organisation

The research sector in Emilia-Romagna relies on a wide set of technical and scientific resources and competencies, well-known both nationally and internationally.

The region counts six universities with more than 150,000 enrolled students[31], a well-established tradition -University of Bologna, founded in 1008, is considered the oldest university in the world- and reputation. There are four public universities in the region (Bologna, Ferrara, Modena e Reggio Emilia, Parma), plus branches of the Milan Technical University (Politecnico di Milano) and of the University Cattolica del Sacro Cuore, in Piacenza. Moreover, in Bologna a foreign campus of the Johns Hopkins Universities is also present, and several higher education institutions specialized on several topics, with some excellences, for example on Arts and Music[32] [33].

The region hosts also well-known national research centres:

- CNR – National Research Council[34] - is the public national institute for scientific and technological research. In Emilia-Romagna, CNR is characterised by a strong specialisation in technologies related to Environment, Chemistry, Microelectronics, Materials and Nanotechnologies. Its 13 Institutes in the region employ more than 800 technicians and researchers, spread through numerous laboratories and research centres in the region, with its biggest Research Area in Bologna.
- ENEA – The National Agency for New Technologies, Energy and Environment[35] – works on renewable energies, placing energetic issues in the broader context of research and innovation for sustainable development. ENEA promotes and develops research activities and technological innovation, also through prototyping and industrialization of productions, favouring their exploitation in the productive sectors. The Centre also supplies public and private bodies with services and researches related to energy, environment and technological innovation.
- INFM – The national Institute for Physics of Matter[36] – is a Public Research Institution operating at national level that carries out fundamental and applied research on the physical properties of atomic, molecular and condensed material systems. Established in 1994 as independent body, it was incorporated in CNR in 2003.
- CNAF-INFN – the National Centre for ICT of the Italian Institute of Nuclear Physics[37] - involved in the development of Grid middleware and of the Grid infrastructure in the international framework, and since 2003 hosting the Italian Tier-1 for the high-energy physics experiments at the Large Hadron Collider in Geneva. CNAF represents a key computing facility for many other astro-particle and neutrino-physics experiments, and one of the most important centres for distributed calculus in Italy.
- INAF –The National Institute for Astrophysics[38]- is a non-profit and state-funded Italian research institute whose activities are mainly devoted to astronomy and astrophysics. It was

[31] https://www.cineca.it/en
[32] https://emiliaromagnatalentieinnovazione.aster.it/
[33] http://ustat.miur.it/dati/didattica/emilia-romagna/afam
[34] https://www.cnr.it/en
[35] http://www.enea.it/en
[36] http://www.cnr.it/sitocnr/IlCNR/Organizzazione/RiformadelCNR/EnticonfluitiCNR/Infm.html
[37] http://home.infn.it/en/
[38] http://www.inaf.it/en?set_language=en

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established in 2005 and promotes, implements and coordinates all research, divulgation and educational activities in its fields.

- In addition, other significant organisations must be mentioned, including:
- IOR – Rizzoli Orthopaedic medical and Technology research[39]
- CINECA – the Inter-University Consortium for Automatic Computing of North-Eastern Italy[31]
- CNIT - the National Inter- University Consortium for Telecommunications[40]
- CMR – Centre for Regenerative Medicine "Stefano Ferrari[41].

Research & innovation infrastructures

Over the course of more than a decade, the Regional Authority, in partnership with universities and research bodies in the region, has created and developed the Regional High Technology Network. The Network currently includes 96 facilities, comprising 82 industrial research laboratories and 14 innovation centres[42].

The industrial research laboratories are either public or private facilities mainly engaged in industrial research, as well as the disclosure and transfer of the results of such research for use by business. In recent years, the first group of laboratories set up between 2004 and 2008 by universities and research centres has been joined by private research laboratories with exactly the same aims.

The laboratories are facilities mainly engaged in industrial research, development of the results of applied research and exploitation of such results. Their main activities concern:

- implementation of collaborative research projects with businesses in order to develop new prototypes or demonstrators, also through joint allocation of public grants;
- technological consultancy and partnership for businesses or outsourcing industrial exploitation of know-how and patents;
- research and innovation services for businesses, including the use of available scientific instruments;
- generation of manufacturing or research and technological spin-offs.

Out of the 82 laboratories of the Network, 44 are facilities sponsored by regional universities and research establishments[42]. In most cases these are organised as interdepartmental centres or in-house facilities of the organisations they belong to. In other cases, the laboratories have formed a consortium whose members include also private businesses and other institutions.

The other 38 laboratories are privately run, their main object being research and development for businesses. Several of these laboratories are the result of academic spin-offs.

The 14 innovation centres are facilities sponsored by businesses, universities, research organisations, other public and private bodies and local authorities; they are organisations whose aim is to promote innovation and the transfer of know-how and technological skills to the economic system.

[39] http://www.ior.it/en/curarsi-al-rizzoli
[40] https://www.cnit.it/en/
[41] http://www.cmr.unimore.it/en/homepage-2/
[42] https://www.retealtatecnologia.it/en

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In order to join the Network, laboratories and centres have to obtain a specific official accreditation from the Emilia-Romagna Regional Authority based on a procedure that verifies a certain level of activity carried out on behalf of businesses and the possession of the organisational and managerial skills which demonstrate their ability to conduct research and technology transfer activities suited to the requirements of the economic system.

Therefore, the Network does not represent the entire research capacity that universities and research establishments can provide but is restricted to those facilities engaged in research activities aimed at business and organised according to accreditation requirements.

Clusters and incubators

The traditional structure of the regional productive system emerged after the second world war and is known in the economic literature as the "emilian model" based on a number of industrial districts localised in small territorial areas and specialised in one or few merceological sectors. That model has evolved in the last couple of decades: traditional clusters are more and more evolving towards region wide (and beyond) and open multi-sector value chains (see below S3 description).

The nature and the role of existing cluster organisations and innovation centres has evolved consequently, also stimulated by regional policies. Today they are part of or connected to the regional High Technology Network, and in many cases the innovation centres cover the specific needs of their local areas. They offer technology-transfer and innovative-business start-up services such as:

- organisation of technology disclosure and demonstration activities;
- technology check-up and assessment for businesses;
- technical support to businesses for the development of research and technological innovation projects and activities;
- identification of and matching with technology partners and building of research and innovation networks;
- provision of technical services for technological innovation;
- seeking sponsorship/support and assistance for the implementation of research and innovation projects.

The Network is located within Technopoles, a network of 10 infrastructures located in 20 locations throughout the Emilia-Romagna region, hosting and organizing activities and services for industrial research, experimental development and technology transfer. Technopoles are home to the industrial research Laboratories of the Emilia-Romagna High Technology Network equipped with state-of-the-art research tools and staff dedicated to activities and services designed to meet companies' needs, favouring also their national and international outreach. They include service facilities for dissemination, demonstration and information activities as well as premises and facilities to host private research laboratories, innovative companies, and spin-offs. Their final aim is to promote the matching between companies and researchers and access to cutting-edge scientific equipment by narrowing the gap between research supply and demand.

In 2017 there was another important change in the research and innovation governance model: the foundation of "Clust-ER" Associations[42]. These are communities of public and private bodies (research centres, businesses, training bodies) that share ideas, skills, tools, and resources to support the competitiveness of the most important production systems in Emilia-Romagna. It is a competitiveness

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that no longer relies on the ability of individual research centres or businesses to operate on the global market, but increasingly on the ability of the entire local system to be innovative and attractive.

In these Clust-ERs, research laboratories and centres for innovation belonging to the High Technology Network team up with the business system and the higher education system to make up the interdisciplinary critical mass necessary to multiply opportunities and develop strategic projects with a high regional impact.

With Clust-ER Associations, the regional industrial research and innovation system aims to achieve greater integration and to better place itself on the international stage to:

- maximise the opportunities for participating in European programmes and international research and innovation networks;
- forge synergies and set up coordinated and stable networks and connections with other public/private agglomerations operating in the same sectors at national and European level;
- encourage and support the development and creation of initiatives in higher education and the development of human resources;
- support and encourage the development of new research infrastructure in the general interest of the Emilia-Romagna region.

Joining a Clust-ER means contributing to strengthening the region's research and innovation system, encouraging a more effective interaction between laboratories and businesses through:

- developing joint projects within the context of collaborative research;
- implementing system actions aimed at encouraging the sharing of resources and infrastructure between research systems and businesses: projects for sharing equipment and infrastructure, the development of joint labs as well as pilot and demonstrative installations;
- promoting shared actions for the valorisation of research results and transfer of knowledge;
- promoting higher education actions.

Clust-ERs are recognised Associations, formed in accordance with articles 14-42 of the Italian Civil Code. The following types of persons may join Clust-ERs:

a. Industrial research laboratories and centres for innovation accredited by the Emilia-Romagna Region;
b. Businesses, innovative start-ups;
c. Consortiums and corporate networks;
d. Higher Technical Institute Foundations and training bodies accredited by the Emilia-Romagna Region, along with persons operating in the higher education and higher technical education sectors;
e. Other bodies and institutions operating in the field of innovation.

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The articulation of Clust-ERs is based on Regional RIS3's priorities. So, there are 7 independent (but linked) associations:

- Agri-food
- Building and constructions
- Mechatronics and motoristics
- Health and wellbeing industries
- Cultural and creative industries
- Services innovation
- Energy and sustainable development

Other institutional players

Other than Universities with a mission including both education and research, the Regional Government has promoted in the last decade the consolidation of a network of education and vocational training established in liaison with social partners, based on inter-institutional cooperation and integration between training providers and enterprises, subdivided into four branches:

- Education and Vocational Training (EaVT)[43] that provides students with a new job-oriented training offer that allows them to achieve vocational qualifications in a three-year-long course;
- Polytechnic Network[44] that provides training and learning opportunities based on the enhancement of vocational, technical, scientific and technological culture, through the integration of different education providers and enterprises. It includes the new Higher Technical Institutes providing specialised higher education programmes at ISCED5 level;
- Higher education, research and international mobility[45] offering specialised training, research grants, doctoral grants and measures to support the start-up of research based innovative firms;
- Employment and skills[46], including measures to support people moving into jobs, upgrade workers' skills and promote organizational and manufacturing innovation of businesses.

Governance system

The regional innovation ecosystem aims to make innovation a process based on collective and ongoing dynamics, not just individual ones. Together with Emilia-Romagna Region, the Universities, research institutions, and business organizations have committed themselves to this goal, with many local authorities that wanted to make a significant contribution to this regional action. This system, to be considered neither closed nor exhaustive, is based on the following main protagonists.

- First of all, the historical and basic institutions of research and knowledge of our region: the 4 Universities (Bologna, Modena and Reggio Emilia, Ferrara and Parma) with the various branches located in the territory, plus the Piacenza offices of the Polytechnic and of the Cattolica from Milan; the national research institutes located in Emilia-Romagna (CNR, ENEA,

[43] https://www.regione.emilia-romagna.it/en/education-system/vocational-education-and-training
[44] https://www.regione.emilia-romagna.it/en/education-system/polytechnic-network
[45] https://www.regione.emilia-romagna.it/en/education-system/higher-education-and-research
[46] https://www.regione.emilia-romagna.it/en/education-system/employment-and-skills

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INAF, INFN, INFM, INGV), as well as bodies of technical and scientific excellence, such as the CINECA in the calculation and the Rizzoli Orthopaedic Institute in the medical field.

- The pivot of the innovation system, wanted by the Region, is the Regional Network of High Technology, coordinated by ART-ER (the regional consortium with universities and research institutes) and made up of industrial research laboratories and centres for innovation: a network of structures capable of intercepting and recombining key enabling technologies, in order to produce technological solutions that can be applied at an industrial level, to take on organizational configurations suitable for carrying out collaborative research with companies, technological consultancy, use of equipment, marketing of research results.

- A regional network of "Technopoles" is gradually being consolidated, that is to say of industrial research infrastructures and technology transfer located in all the main cities and near the university and scientific centres, in which many of the protagonists listed above can have a territorial reference point for developing its own relationships and towards which further entrepreneurial and institutional subjects with innovation and employment can be attracted. Technopoles, in essence, ensures the territorial presence of the High Technology Network, but they also act as multipliers of development and innovation paths. Within the Technopoles there are therefore concentrated industrial research and technological transfer structures, information services and for the meeting between researchers and companies, spaces for new research or high-tech companies and for further private laboratories. The network of Technopoles is flanked by an even wider network of incubators and business promotion structures linked and coordinated at the regional level through the EmiliaRomagnaStartUp[47] portal, committed to supporting the growth of companies in the high technology and creativity sectors.

- Alongside the research and technology transfer system based on resources and research structures, over the last decade, with the resources of the Social Fund, a network of services for young undergraduates and graduates has been created to support them in an entrepreneurial journey or approaching the world of work with research grants aimed at developing innovation projects.

- Crucial, as one of the glues of the system, is the regional training infrastructure, and in particular the Polytechnic Network for non-academic tertiary specialist training, centred on Higher Technical Institutes.

- We must also consider the significant number of companies engaged in research and development in the territory (leading companies and small and medium-sized dynamic and technologically specialized companies) and smaller companies able to understand the technological opportunities and market and to realize innovations and become highly specialized, even when not able to independently develop a real function.

This system takes shape with the networks and collaborative relationships that have been established between the aforementioned subjects, increasingly structural and continuous, capable of fuelling the expansion of a community of technicians and researchers engaged in innovation, to generate

[47] http://www.emiliaromagnastartup.it/en

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attractiveness for further entrepreneurial and technical resources, to increase production and exports thanks to a greater intensity of innovation processes.

Main strategies

The regional strategy about research and innovation policy is the Research and Innovation Smart Specialization Strategy (RIS3)[48]. In Emilia-Romagna the RIS3 is based on five elements:

1. Structural strengthening of the regional system, through the increase of investments, improvement of efficiency of research and technological innovation activities, strengthening of value chains with better management of the service components, diversification;
2. Technology foresight, through the identification of the middle term trajectories to guide the research and innovation efforts and to better anticipate and meet technological and societal trends;
3. Entrepreneurial discovery and cross fertilization, based on a mapping and networking process of regional resources and niches of excellences;
4. Participative governance involving policy makers and stakeholders to share objectives and make public and private actions converge;
5. Better integration with national and European policies and programmes.

RIS3 contributes to the consolidation of the regional innovation ecosystem, highly integrated, dynamic and attractive for investments, business and talents, able to promote both the innovation of mature sectors and creative destruction sustaining new sectors with high potential.

The design of the strategy with a set of priorities and the identification of specialisation areas (in terms of integrated value chains) and thematic orientation (in terms of technological priorities) ensure both concentration of efforts and technological diversification.

The selection of a limited number of well-defined technological priority items within the process of entrepreneurial discovery is aimed at ensuring the concentration and the convergence of public and private research and innovation efforts. This happens through a twofold mechanism:

- Direct effect or demand side - The coherence with the S3 technological thematic orientations are one of the criteria for eligibility of research and innovation projects supported by ERDF OP Priority Axis 1 (see details below) and by Measure 16 of the EAFRD OP concerning the European Innovation Partnership (EIP) Operation Groups[49]. Therefore, only projects coherent with at least one S3 topic are being supported;
- Indirect effect or supply side - Through the ERDF OP and other regional measures support to research infrastructure in Technopoles and research projects by the laboratories of the High-Technology Network in S3 related technological area, the S3 strategy promote the accumulation of critical mass in a limited number of domains. The consequent specialisation of RIIs improve their excellence and visibility in those domains, and in turn attract additional investments through the market. In other words, the creation of regional excellence poles in a technological domain, makes it easier to drive the attention of SMEs and market investors because of higher availability, better information and knowledge spill overs.

[48] http://fesr.regione.emilia-romagna.it/s3
[49] http://agricoltura.regione.emilia-romagna.it/psr-2014-2020

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The smart specialization strategy recognises the necessity to ensure adequate openness of the regional innovation ecosystem both from the side of research and productive system, also in the sectors of regional strength and specialisation. Therefore, the strategy encourages knowledge contributions also by national and international research organisations, supporting the regional RDI processes.

The objective has been translated in the open calls within the ERDF operational programme that ensure financial support to firms engaged in collaborative research initiative with research centres located outside Emilia-Romagna.

In addition, the regional Government actively promotes the involvement of the regional system in national and international clusters and networks in domains coherent with the S3. Currently the region is involved in the following initiatives:

- Emilia-Romagna is strongly involved in the initiative for the setup and development of National Technology Clusters (NTC) promoted by the Ministry for Education and Research (MIUR) with a Decree of 2012. NTC are multi-stakeholder networks grouping key national players in a given sector, to generate permanent dialogue platforms between public-private aggregations and companies in line with the priorities set out by the European Research Framework Programme "Horizon 2020." Today they represent important intermediary infrastructures for encouraging cooperation between public-private research in innovation and technology development, for rebuilding national policies in strategic sectors and for encouraging the smart specialization of territories. Emilia-Romagna Region, through ASTER, is present in the Coordination and Management Body of 6 Clusters (out of 12 clusters created), namely: Smart Factory (as hosting region), Green Chemistry, Life Sciences, Agri-food (co-president), Technologies for Smart Communities, Mobility, Made in Italy, Blue Growth, Energy, Technologies for Cultural Heritage;
- Emilia Romagna is engaged in the Knowledge and Innovation Community on Climate (Climate-KIC) since its very beginning. Moreover, it is also engaged in the EIT Raw Materials KIC;
- The Regional Authority, through ASTER, in member of the European Regions Research and Innovation Network (ERRIN), founded in 2001 to support regional research and innovation capacity building by facilitating regional collaboration and partnerships and the open and rapid exchange of knowledge in a context of trust and confidence;
- ASTER is member of the EBN, a network of 160 quality-certified EU|BICs (business and innovation centres, incubators, accelerators and other support organisations) and 100 Associate Members that support the development and growth of innovative entrepreneurs, start-ups and SMEs.

The regional RIS3 document[50] contains a specific section dedicated to the relationships with other Italian and European regions. The Regional Government is committed to build partnerships with regions with technological and productive complementarities with the objective to develop common actions, also through the European Territorial Cooperation (ETC) opportunities.

[50] http://fesr.regione.emilia-romagna.it/s3/c008_fondi_ris3er_gen2017_web.pdf/@@download/file/C008_fondi_ris3er_gen2017_web.pdf

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Emilia-Romagna is founding member of the Vanguard Initiative that groups 29 regions across Europe with a strong political commitment to use their smart specialisation strategy to boost new growth through bottom-up entrepreneurial innovation and industrial renewal in European priority areas (http://www.s3vanguardinitiative.eu/).

The Vanguard Initiative seeks to lead by example in developing interregional cooperation and multi-level governance for supporting clusters and regional eco-systems to focus on smart specialisations in priority areas for transforming and emerging industries. Vanguard regions want to build synergies and complementarities among smart specialisation strategies to boost world-class clusters and cluster networks, in particular through pilots and large-scale demonstrators.

The Regional Administration is also actively involved in the activities of the Smart Specialization Platform developed by the Joint Research Centre (JRC) (http://s3platform.jrc.ec.europa.eu/home). It took part in the peer review process during the initial design stage of S3 in European regions, and in the Peer eXchange & Learning (PXL) activity for strategy implementation. In Bologna it hosted the first PXL workshop on monitoring smart specialisation.

The Region participates to the S3 Thematic Platforms aimed at fostering interregional cooperation based on S3 matching priorities. In particular Emilia-Romagna participates directly to Industrial Modernisation and Agri-Food platforms, co-leading the SmartFood theme on Traceability and Big Data.

Priority areas specialization

The overall strategy is based on the shared vision of the challenges for the future development of Emilia-Romagna region. Two broad challenges are identified:

- The capacity to reinforce the competitiveness of regional production in the global market through technological and organizational innovation, mitigating the downward pressure on production costs and salaries, and improving attractiveness for qualified human capital;
- The ability to develop new markets and to foster a renewed internal demand, contributing to the evolution of the socio-economic model incorporating the mainstreams represented by the knowledge economy, the information society, the sustainable development and wellbeing.

Four strategic priorities have been identified for the strategy:

A. To increase the competitiveness of Emilia-Romagna businesses, strengthening the innovative capacity of regional traditional and competitive production systems;
B. To support emerging specialisation areas, developing high growth potential production systems and fostering social innovation;
C. To steer change, increasing the regional system's capacity to respond to the societal challenges for sustainable development, healthy and active living, and information society (drivers of change);
D. To develop services of excellence, reinforcing the leading role of services for the production system ("servitization") through ICT, advanced logistics, high knowledge activities.

Priority A and B are vertical priorities leading to the identification of the specialization areas, while priorities C and D are intended as horizontal priorities intercepting the whole regional ecosystem.

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The regional strategy aimed at the definition of the focus areas in a way to maximize the systemic impact at regional level. Instead of focusing on single specialization niches, the strategy focuses on more integrated specialization areas which represents the basic vocations of regional economy and identity, or which have a high potential to lead economic change with an eye to the drivers of change in the wider European and global context.

Five specialization areas are selected and defined:

- Agri-food (priority A, see above) including agriculture and breeding, food industry, input industries (chemical containers, agricultural mechanics, mechanical food and packaging, etc.) and specialised services (logistics and distribution, professional services);
- Construction (priority A) based on ceramics and bricks and building, but including also extractive activities, utilities, machinery for construction ceramic and wood, engineering, fixtures, logistics and architecture services;
- Mechatronics and Automotive (priority A) focused on cars and motorcycles, boat and other transport, robotics and automation, hydro-hydraulic precision mechanics, engine design, electro medical, software engineering;
- Health and Wellness industries (priority B), including biomedical and prosthetic segments, electro medical, disabilities, bioinformatics and health informatics, all health services, but also wellness equipment and fitness;
- Cultural and Creative industries (priority B), ranging from cultural heritage, show entertainment and amusement parks, to audio-video publishing, software, games, with impact on fashion and furniture industries and tourism.

The entrepreneurial discovery process identified specific technological topics towards which orient projects and investment in the framework of the above set of priorities, matching with KETs and digital technologies. These topics are grouped in 19 thematic orientations matched with vertical and horizontal priorities as depicted in the table below.

The design of priorities and specialisation areas promote knowledge spillover and technological diversification. Specialisation areas are conceived as large and multisectoral value chains, underlying the mutual correlation of innovation across different stages of the value chains and different segments of proximity.

The five identified specialisation areas, rather than being mutually exclusive, are partially overlapping and open to cross fertilization (i.e. the packaging industry is part of three value chains: mechatronic, agri-food and health with tight relationships also with the construction industry). This is partly the result of the actual specialization of the regional productive system concentrated in machinery and equipment industries, but it also reflects the specific willingness of the Regional policy maker.

The strategy explicitly recognises that sectoral borders are redefined also by the impact of Key Enabling Technologies with the emergence of cross-cutting areas like biomaterials, green chemistry, digital technologies, renewable energy, etc. A specific map with contamination across domains has been developed within S3, suggesting also future technological topics to develop.

Moreover, the two specialisation areas of the Priority B (Health and Wellness industries; Cultural and Creative industries) have been included for their potential spillovers in more traditional sectors or less

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affected by technological innovation (hospital and health institutions, third sector, cultural institutions, tourism, furniture, textile and fashion).

Implementation status

According to the S3 monitoring system, at the end of April 2019 about 7,000 projects have started for the implementation of the strategy with more than € 1,280 million committed. The total investment amounts to more than 2,700 millions (from Emilia-Romagna RIS3 monitoring system:

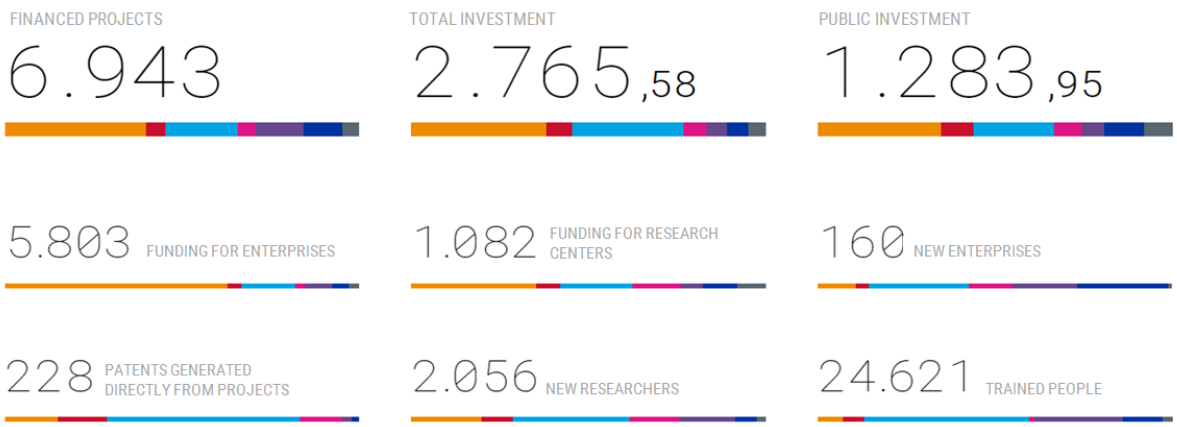

Figure IT. 3 Emilia-Romagna RIS3 Monitoring system homepage[51].

The ERDF OP contains a priority axis dedicated to "Research and Innovation" aimed at strengthening the regional network for industrial research and technology transfer. The measures supported by this axis are aimed at increasing businesses' capacity to introduce new solutions and products, including through collaborations with research partners, promoting innovation pathways in strategic areas of the regional production system, strengthening the research of the High-Tech Network, facilitating the use of innovation laboratories and centres.

The policy mix designed to support the implementation of the RIS3 encompasses both core actions - focused on research and innovation- and complementary actions, reinforcing leveraging the overall impact.

Expected result	Beneficiaries	Instruments
Strengthening regional system for industrial research	Laboratories within the High Technology Network (HTN)	Open calls for grant
Strengthening research activities in innovative enterprises	Single enterprises or group of SMEs	Open calls for grant
Supporting innovative startups	Knowledge intensive and creative startups (< 5 years)	Open calls for grant

[51] http://www.regione.emilia-romagna.it/s3-monitoraggio/

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Promoting advanced services and ICT diffusion	SMEs	Open calls for grant
Urban Labs for open innovation	Local Authorities, in-house organisations, PPP, RIIs	Negotiated grant

Table IT. 1 RIS3 policy mix.

Complementary and collateral actions stated in the RIS3 document are the following:

- Support to industrial development projects and attraction of investment from outside the region (as foreseen by a specific Regional Law);
- Support to competitiveness and innovation in primary sector ad agri-food (by EAFRD);
- Human capital (supported by ESF);
- Promotion of internalisation and export propensity;
- High quality tourism promotion;
- Interregional cooperation;
- Knowledge base for better policy making.

The total amount of resources that can be counted for the implementation of the strategy, considering ERDF, EARDF, ESF, other regional, national and EU resources, and private co-financing is around € 2.5 billion over the 2014-2020 period. This target was exceeded in January 2019[50].

Monitoring and evaluation system

The S3 monitoring system aims to provide useful data for measuring the implementation of the strategy and the results achieved, in order to make any necessary corrective actions. Specifically, the monitoring has four objectives, for each of which is defined a different family of indicators:

- Measuring the level of implementation of policies and related actions undertaken. It is a question of measuring the output of regional policies in terms of operations done (approved projects, allowed investments, provided contributions, beneficiaries funded, job created, researchers trained, etc.). For this goal we are defined appropriate **OUTPUT INDICATORS**, which are articulated on the basis of the S3's priorities. The primary reporting units are each financed operation, regardless of its nature and the number of beneficiaries. An operation can be a research project, a contribution to an investment, a non-repayable funding, a credit for a start-up, a higher-education master, an infrastructure construction, etc.
- Measuring the changes taking place in production systems compared to the S3 objectives. The strategy identifies the trajectories of change, represented by the priorities A, B, C and D. The aim of the monitoring system is to verify whether these expected changes are taking place, their direction and intensity. Therefore, it is to identify the **INDICATORS OF CHANGE**, able to measure, and not to interpret or define the causes, the changes detectable in the directions identified by S3. This type of indicators is divided into two types:
    - Type 1: **INDICATORS OF SPECIALISATION**, which measure the level of specialisation of the five regional production systems in relation to the 19 thematic guidelines (OT) identified by S3. These indicators are mainly based on intermediate results

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(production of European patents, research grants, cooperative enterprises-research laboratories contracts) of the innovation process. Additional information to be considered are the creation of start-up and the presence of innovative SMEs, although it is not always possible to associate a company with a specific thematic focus.

  - Type 2: **INDICATORS OF TRANSITION**, which objective of measuring the direction and intensity of the expected change in production systems to the technological objectives contained in the strategy. Such indicators may have different characteristics depending on the production systems.

- Measuring the degree of effectiveness of the strategy against objectives, namely the achievement of results consistent with the desired change objectives. The **RESULT INDICATORS** are already identified at the level of individual programs that help to implement the S3. A selection of these indicators, consistent with the priorities of the strategy, is borrowed in the S3 monitoring system, with its target approved by the Region.
- Providing an evolutionary framework of the competitiveness of the regional economy, with particular attention to issues of research and innovation. For this purpose, we used **CONTEXT INDICATORS**, recovering most of those already available from official statistical sources, or, if necessary, integrated with ad hoc analysis at the level of supply chain-production system.

Factors

Briefly, the region seems to be an integrated, systemic and dynamic reality, where multiple actors, highly inclined to innovation, play. The main limitations are in organizational and managerial terms. Moreover, this strong attitude to collaborate and interact, even between public and private, collides with bureaucratic or regulatory obstacles. In particular, the main limits concern the strengthening of the subjects' ability to exploit and enhance the innovative potential and to build a more effective partnership to achieve innovations with a high innovative and occupational impact.

Strength:	**Weaknesses:**
• An industrial system strongly integrated around a few areas of specialization, highly articulated internally horizontally and vertically • A high specialized agricultural system, oriented to quality products • High specialization and attention to product and process innovation by companies • Growing collaborative relationships between innovative companies and research facilities • A widespread research system, quite integrated with the production system • High propensity to export	• Low managerial level of companies to face international competition • Institutional rigidity of research organizations • Low presence of scientific structures of international excellence • Low attractiveness for "talents" • Growth difficulties for innovative and creative start-ups • Poor competitiveness and weak role of services • Poor integration capacity between agricultural productive realities • Unstructured presence on international markets

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Opportunities: ● Need to face new challenges in terms of change ● Great technological opportunities ● Expansion of international markets ● High demand for new advanced and collective needs	**Threats:** ● National and European macroeconomic and institutional framework ● National deflationary policies and related social consequences, on welfare, on local finance, on internal demand ● An extreme international competition "from below" and "from above" ● International financial instability ● Rapid climatic transformations

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Trøndelag

The main Norwegian region participating in TeRRItoria is the County of Trøndelag, which is represented by Trøndelag County Council. Within Trøndelag we have selected two smaller regions that will be involved in the TeRRItoria transformative experiment: The regions around the towns of Røros and Namsos. These are represented through central R&I actors in their respective region, called business gardens. In this report we focus on the region of Trøndelag but we have added information on the business gardens and their context where necessary.

Organization mission and vision

Trøndelag county council is part of the three-tiered governance system in Norway. Located between the national and the municipal level, it has a number of clearly defined responsibilities. While the term county (fylke) denotes the geographical area, the County Council (fylkeskommune) is the democratically elected body, that provides different public welfare services. Trøndelag County Council provides upper secondary education, dental health services and public transportation. It is also in charge of most of the public roads, a variety of cultural activities, environmental issues, and to facilitate economic growth and development including planning guidance. The latter responsibility is most relevant for TeRRItoria.

Organization structure

The County Council is the supreme political body of the county, making decisions on important matters and matters of principle. The County Council appoints a County Mayor. The County Executive Board (fylkesutvalget) is concerned with matters relating to finance and planning. It also prepares matters for the County Council. The board is elected by the County Council among its members.
The administration is situated both in the cities of Trondheim and Steinkjer. The administration is led by the Chief County Executive. The main departments in the County Administration are called:

- Finance and Digital Development
- Education
- Culture and Public Health
- Transport
- Planning and Businesses

The department of Planning and Business will lead the regional TeRRItorial experiment. Main public instruments used in the County Council's economic development work are:

- regional plans
- regional development funding
- public procurement, and
- coordination of the various actors constituting the innovation system.

Organization role in R&I system

The County Council's support for regional economic development is mainly performed through creation of the regional development plan and provision of funding and support for processes related to realizing the plan objectives. Moreover, the Council facilitates development processes through establishing meeting arenas, knowledge, networking, public communication, and similar initiatives. It is responsible the whole of the county, which includes bridging gaps between centrally located actors and actors in remote districts.

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Relevant ongoing projects

The County Council provides a broad variety of services to R&I actors in the region. For TeRRItoria the role as knowledge broker is most relevant, which is performed through involvement in major research initiatives, projects and centres. A typical contribution to research is to establish contact with pilots and research cases, which benefits both research partners and the participating stakeholders. For instance, the new buildings of the Heimdal Higher Secondary School, which is operated by the Council, were one of the pilot projects in the Norwegian Research Centre on Zero Emission Buildings, demonstrating the feasibility of creating a zero emission balance between CO_2 emissions connected to the construction and operation of the building and renewable energy produced on-site over the building's life-time. Other specific projects and activities relevant to TeRRItoria will be described more in depth in the section on "actors" below.

Geography [52]

Trøndelag county spreads over 41.000 km2 and is divided in an urban centre around the city of Trondheim, the third largest city in Norway, sub-centres around smaller cities, and very remote regions. It has a long coastline and mountainous regions, but there is also a considerable amount of agricultural land.

Demography and society [52]

Trøndelag has an overall population of 450.000, with large differences in population density: the city of Trondheim has 565 inhabitants/km2, while Røyrvik, the most remote municipality, has 0.3 inhabitants/km2. Overall, the population dynamic is positive, although again with large regional differences. Urban areas are net-receivers including immigration from outside Norway and more remote regions struggle to keep young and qualified individuals from moving.

Economy and labour [52]

The county has 229.098 employees, average unemployment is around 1.8 percent. Trondheim, which is host to the headquarters of Norway's largest private research institution (Sintef) and the main campuses of Norway's largest university (NTNU) and has a marked inflow of highly qualified workforce, whereas other regions are characterized by the lack of qualified work force.

Sectoral structure[53]

Trøndelag has complete agricultural, forestry and marine value chains. Furthermore, the region has international and national research and scientific communities as well as established networks and economic clusters. Trøndelag has long traditions when it comes to harvesting marine species, but the region has gradually become known as a leading centre for modern industrial salmon production. The opportunities for value creation and growth which exist in the production and sale of premium seafood have contributed to significant value creation and employment along the coast. Trøndelag produces around 300,000 tons of salmon per annum, or just over 20% of national production. Around 95% of this production is exported to markets worldwide. In addition to salmon, other fish and shellfish from Trøndelag are exported to the same markets. There is still a considerable potential for growth in the marine areas of Trøndelag.

Trøndelag accounts for approx. 20% of the total Norwegian food production and the county transports considerable amounts of food to other parts of the country. Protecting cultivated and cultivable land

[52]Trøndelag I tall 2018, https://www.trondelagfylke.no/contentassets/e16be67854b24953b0c2918e12c6d060/trondelag-i-tall-2018--29okt.pdf

[53] Kunnskapsgrunnlag for verdiskaping i Trøndelag, TFoU-rapport 2017:10, https://tfou.no/wp-content/uploads/2017/08/tfou-rapport-2017-10.pdf

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is essential for maintaining the county's production potential. Trøndelag has about 25% of Norway's certified organic farmland and almost 40% of the country's certified organic dairy cows. Given this scale, Trøndelag has an important role in the development of organic farming and efficient processing of the food. There is an increasing demand for organic products and the Trøndelag region has the potential to gain a significant share of this growth in the years ahead. The forestry industry in Trøndelag has favourable conditions with access to markets, complete value chains for processing, raw materials and, not least, networks at both regional and municipal level. Trøndelag has a large wood-based industry. In addition to the heavy wood processing and sawmill industry, the county has a diversity of small and medium-sized businesses specialising in further processing of the wood.
Forestry makes a positive contribution towards achieving the climate goals. The forest's carbon storage in Trøndelag equates to 160 million tonnes of CO_2. A steadily increasing proportion of carbon may be stored through increased use of wood in various constructions and buildings. Trøndelag has an ambitious forest cluster in Innovation Norway's ARENA-program and its work on the renewal and development of the sector is of major interest both regionally and nationally. Trøndelag has long traditions in mining. The annual turnover for the mineral industry is dominated by stone construction materials, industrial minerals and natural stone, with the first mentioned clearly the largest.
The industry includes many small businesses with low turnover. The potential for mineral extraction must be seen in a long-term perspective, and realising this potential is dependent on several factors, including price, availability and infrastructure, access to capital, competence and national framework conditions.

Enterprise characteristics [52]

92% of the enterprises in Trøndelag have less than ten employees. There are in total 35 larger enterprises with more than 250 employees (excluding the public sector). The value creation in Trøndelag was 201.7 billion NOK (ca 20 billion Euro) in 2017, which constitutes ca 880.000 NOK (88.000 Euro) per employee. Between 2008-2017, Trøndelag had a growth in gross domestic product (volume measure at constant market prices) of 23,8%, compared to Norway that at an average had a growth of 14,9% (oil production excluded). As for the rest of Norway, the largest contributors to the gross domestic product are knowledge intensive and service industries (e.g. health services, construction and real estate, energy). For these companies, Trøndelag is the second most attractive region in Norway (behind the Norwegian capital Oslo), mainly because of the proximity to the headquarters of NTNU and Sintef.

Knowledge organisation

Universities, research institutes and technological companies are key suppliers of knowledge and labour/expertise, while the scope and size of these organizations make them an important industry. The strong presences of the Norwegian University of Science and Technology (NTNU) and the research institute SINTEF with their world-leading scientific communities, and NORD University with its strong entrepreneurial expertise and decentralised structure, represents one of the region's biggest advantages. These institutions are of great significance concerning the development of specific industries, new companies in the form of start-ups and spin-offs, and the development of new products and services.
NTNU[54] is a university with an international focus, with headquarters and main campuses in Trondheim, and after the fusion with university colleges in 2018 with two additional and smaller campuses outside the Trøndelag region (Ålesund and Gjøvik). NTNU has a main profile in science and technology, a variety of programs of professional study, and academic breadth that also includes the humanities, social sciences, economics, medicine, health sciences, educational science, architecture,

[54] https://www.ntnu.edu/about

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entrepreneurship, art disciplines and artistic activities. NTNU has approximately 42.000 students and 7.000 employees.
NORD University[55] has its main campus in Bodø, in Nordland County, but it has also four campuses in Trøndelag. NORD has a focus on "blue and green growth", innovation and entrepreneurship, and welfare, health and education. NORD University was founded and accredited on January 1, 2016. The university has 11.000 students and approximately 1.300 employees.

Research & innovation Infrastructures

There exists extensive laboratory infrastructure in Trondheim with many examples of facilities that are one of a kind in Norway. This infrastructure has developed since NTH, NTNU's largest precursor, was established as the country's first technical university in 1910. For most of its history, NTH has towered on an elevated plateau over the city of Trondheim with the historical main building facing the city's other historical landmark, the Nidaros Cathedral. A large-scale organizational and spatial reorganization of the university, which is ongoing, has focused on exchange between the city and its university, which is expression and part of a larger trend which blurs the boundaries between research infrastructure and society. The main campus, for instance, which is planned to extend considerably in the coming years, has been declared to be a "living laboratory" for sustainable construction by the Norwegian parliament in 2018.
This trend towards closer integration of research and other infrastructures, has led to the implementation of laboratories in a wider sense also outside Trondheim. In collaboration with Trøndelag's universities, more remote actors have started to experiment with implementing research infrastructures in smaller cities in the form of "living labs", e.g. in the sector of health welfare services. Higher secondary schools, which are operated directly by the County Council, are at several places involved in offering facilities for research. For example, Mære higher secondary agricultural school is involved in more than 20 research projects. In addition, there are extensive R&D facilities connected to marine sector businesses. Another unique research infrastructure present in the region is the Health Survey North Trøndelag (HUNT), which collects long term health data on the population in the north of the county.

Clusters and Incubators

Major clusters and incubators in Trøndelag are:

- PRONEO (active in Verdal, Levanger, Stjørdal, Frosta, Meråker)
- Tequity-cluster
- T:Lab (Steinkjer, Inderøy, Namdalseid, Snåsa, Verran, Trondheim)

The following organizations provide innovation support in specific industries:

- Blått Kompetansesenter (located at Hitra, Frøya; ocean-based industries)
- Tindved Kulturhage (culture)
- Oi! Trøndersk mat og drikke (food)
- Arena Skog (forestry)
- NCE Aquatech Cluster (ocean-based industries)
- Renewable energy cluster

Of the clusters and incubators active in Trøndelag, directly relevant for the territorial experiment planned is an industrial cluster called Norwegian Mass Customization Cluster (NMCC) located in and around Røros. The result of a university-business collaboration in a research project, this cluster comprises small companies active in a variety of sectors, such as construction, animal DNA testing, textile and furniture production that collaborate closely around the topic of mass customization.

[55] https://www.nord.no/en/about/the-university/Pages/default.aspx

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Other institutional players

As described above, Trøndelag County Council represents the middle layer of governance in Norway. Moving down, the municipalities, above all Trondheim municipality, are powerful actors involved in a large variety of R&I activities. Different to municipalities, however, the County Council is tasked with serving the whole region, which defines its role as driver of economic development as mediator between different local and regional contexts and interests.
In Trøndelag, an important part of the innovation system consists of so-called business-gardens. These organizations are financed by national funding programs through SIVA (The Industrial Development Corporation of Norway):

- Rørosregionen Næringshage (Holtålen, Røros, Tydal, Selbu)
- iNam: Innovation in Namdalen (Namsos, Overhalla, Grong, Flatanger, Fosnes, Nærøy, Vikna, Leka, Høylandet, Namsskogan, Røyrvik, Lierne)
- Nasjonalparken Næringshage (Oppdal, Rennebu)
- Næringshagen i Orkdalsregionen (Meldal, Orkdal, Skaun, Snillfjord, Agdenes, Hemne, Rindal)
- FI: Fosen Innovasjon (Rissa, Ørland, Bjugn, Åfjord, Roan, Osen, Leksvik)

In TeRRItoria, iNam and Røroshagen Business Garden were selected as main local partners since they represent different local contexts within the region. Receiving basic financial funding by national funding sources, they promote local and regional growth, cooperation and development. They provide access to expertise, networks. Rørosregionen business garden and iNam are co-owned by SIVA, several municipalities in the surroundings areas and local companies. Despite participation in the same funding program, differences between the two actors are manifold, which makes them interesting test cases for TeRRItoria. For example, iNam bridges a larger heterogeneity of regional industrial contexts and faces competition with stronger regional innovation actors representing their respective sectoral interests. Another difference is that they were until recently located in two different counties – that now have been merged into one, Northern and Southern Trøndelag, which had different regional development policies and practices.

Governance system

Norway inhabits a special position in relation to EU regional policies because it is not a member of the European Union. This means that there are no strong incentives to participate in systems created by the EU to standardize and monitor regional development, for example in order to qualify for structural development funds. Still, there is an explicit smart specialization strategy, which, however, is only loosely modelled after its EU counterpart. The main motivation for this is the desire to collaborate with EU regions and to participate in EU projects in order to learn and develop competitiveness in the European geographical context.

Main Strategies

The implementation process of Trøndelag's smart specialization strategy so far has consisted of the choice and description of the focus areas, a strategy document (2018-20)[56] and a work plan. In addition, there is a related document on the county's R&D strategy (2016-2020)[57]. This document describes five strategies:

- Mobilization and Qualification
- Better use of public support for R&D
- Making Trøndelag a testbed for new technologies and services

[56]https://www.trondelagfylke.no/contentassets/b91afe6250b342e9b2d73dc270993796/strategy-for-innovation-and-value-creation-in-trondelag.pdf
[57] https://www.trondelagfylke.no/vare-tjenester/naring-og-innovasjon/planer-og-strategier/fou-strategi/

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- Students as resource
- Better collaboration and coordination

Participation in EU projects like TeRRItoria is one of the recommendations of this strategy. Business gardens are among other actors explicitly addressed as responsible for increased R&D in the region, e.g. through describing local and regional demands and needs and qualification measures. This happens in trainee programs, start-up courses, skills fora, through consultancy for regional businesses, and participation in regional R&D projects.
The trainee programs address the problem of recruitment of qualified persons at local businesses. Students on Master or Bachelor level are invited to work for two years as trainees in up to three local businesses. Many of them stay after this period and are employed. In addition, these trainees are offered participation in training activities organised by the business gardens. Start-up courses are organized for citizens interested in starting a business in the region. They address mostly small businesses. The course contents are standardized and comprises modules on fundamentals of starting a business. In so-called skills fora (kompetanseforum), external presenters are invited to talk about a topic relevant for local businesses. Consultancy for local businesses takes the form of annual meetings (or on demand) to identify needs, among others needs for knowledge. In regional R&D projects, the business gardens can play many roles, ranging from initiator to providing administrative support.

Priority areas specialisation

In 2017 Trøndelag's smart specialization strategy was published which describes the County Council's main strategic areas based on existing strengths:

- ocean-based economy,
- smart communities,
- tourism and event industries,
- bio-economy actors, and
- circular economy.

Bio-economy[58]

The production and processing of raw materials from the sea and land is experiencing strong growth and development and can provide major opportunities. Trøndelag must further develop the strong production communities and value chains in agriculture, forestry and aquaculture. There is great potential for better connectivity between the producers and the Universities and Research institutes. Trøndelag is well positioned to develop the bio-economy and contribute to a green transition. The region has advantages in the combination of major biological resources, complete value chains in the forestry, agriculture and marine sectors, as well as proximity to strong scientific communities. The challenge lies in developing good collaboration between the various actors and the sectors, not least across traditional value chains, e.g. collaboration between the blue and green sectors. Developing new green technologies can provide new opportunities for the industry. Moreover, it is crucial for the production industries to collaborate closely with the scientific and R&D communities when it comes to processing, breeding and production as well as land and resource management, etc. Industries that produce raw materials based on natural resources manage large areas of land and impact on landscapes and ecosystems. The attractiveness of these industries is crucial for further development and growth. Consequently, it is also important to link these business sectors with social science research.

[58] The following description of specialization areas is adapted from the English translation of the strategy document.

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Circular economy

The innovation potential in Trøndelag lies in developing collaboration, business models and technology to ensure the resources are utilized in the value chain for as long as possible. The business sector in the region is well placed to increase value creation and local employment by developing new products and services based on unutilised residual products. The R&D communities' commitment to the circular economy gives Trøndelag access to knowledge and expertise that can give the region a leading role in this work. The development of the circular Trøndelag requires open innovation processes, active participation in international cooperation and good coordination of actors in the innovation system.

Smart communities

The use of digitalisation and automation is linked with expertise about the opportunities for creating new products, services, processes and collaboration. These opportunities cross traditional industries and technologies.

When it comes to employment, business and industry, digitalisation also deals with automation, the streamlining of production, and creating and developing new business models and products. Getting more of the region's small businesses to use digital technology for innovation and product development is an important goal. Ways of achieving this include skills development initiatives and creating good physical and digital meeting places for the business sector and helpers.

In the public sector, this largely involves performing public services more effectively by means of digitising work processes. Performing public dialogue via electronic communication platforms offers greater opportunities for participation.

Tourism and event industries

Trøndelag has a wide range of events and organised experiences. They contribute to value creation, as well as for businesses in the tourism industry that provide accommodation, transport and other services to visitors, the public and participants. There is a potential for better cooperation between these actors.

The food, nature and cultural heritage of Trøndelag provide a basis for developing marketable products and services in the experience industries. Major events are important venues for promoting local food and cultural heritage. Events with regional, national and international participation or audiences attract more visitors to the region and promote Trøndelag in a positive way. These offers must be more accessible to the market in terms of visibility, marketable products and services, and through well-developed infrastructure in the transport area. New methods of communication have the potential to increase the attractiveness of the offers. In order to achieve value creation and efficient resource use, good cooperation between the business actors and the various public measures is essential.

Ocean space

The ocean space is one priority area where Trøndelag is well positioned within production and as a knowledge and innovation community. Knowledge and technology are prerequisites for achieving sustainable resource utilisation. Trøndelag's R&D communities have broad experience and expertise in fields such as shipping and ship technology, fisheries and aquaculture, offshore oil and gas and marine energy. Technological development is important for developing future activity in the ocean space.

Achieving the growth potential of the aquaculture industries in Trøndelag will require growth throughout the value chain.

Having the necessary actors and good interaction between them will be crucial towards succeeding with this. This includes establishing infrastructure such as laboratory facilities and marine incubators that cover the entire region. As part of the innovation system, the educational provision at the upper secondary and vocational college level must support such development. The development work

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should focus on digitalisation and robotization. Developing new technologies as part of the region's vibrant technology laboratories is important.
Oil and gas will remain a significant part of the future energy mix. However, value creation based on renewable resources will increase in importance in the years ahead. Trøndelag has a significant supplier industry which, along with the scientific communities, will continue to contribute to the sector's value creation.
Of the specialization areas described here, one of the two specific regions selected for TeRRItoria, Røros, is particularly strong in the sectors bio-economy and tourism. iNam and the Namdal-region has a more heterogeneous industrial structure with strong ocean-based value creation as major influence but also strong bio-economy actors.

Implementation status

The smart specialization strategy described above has been in effect since the end of 2017. Since then a work plan has been developed and is in the process of being implemented. The business gardens program has a longer history reaching back to 1998[59], where it was in the beginning aimed towards co-location of important economic development functions. Since 2006 business gardens are explicitly addressed as regional innovation actors, which was confirmed in the present funding period which is close to its completion. How funding for business gardens will look like after 2020 is still unclear.

Monitoring and **Evaluation system**

The main goals for implementation of smart specialization strategies are directed towards achieving effects on the regions. Monitoring and evaluation follow national guidelines. In terms of data formats and what is evaluated this means that national formats are prioritized which leaves little room for implementation of European standards and routines.

Factors

Strengths:	Weaknesses:
• a strong and diversified business environment mainly based on its natural resources. • the population is in general well-educated • a large number of education and R&I institutions with high technological expertise in the region. • High average income levels provide strong demand for products on the domestic market. • good access to capital for example through the regional cluster of finance (Tequity Cluster). • public and private actors are well connected with each other through long-term collaborations.	• a narrow domestic market due to low population numbers, which is aggravated through the uneven population distribution in the region • lack of resources for collaboration between research and regional actors • Personalized and informal relations dominating collaboration across sectors • many levels of intermediaries • little use of existing opportunities, such as public sector and applied PhD funding • weak incentives for university to collaborate with local businesses

[59] SIVA: Næringshageprogram 2011/ alt: Wikipedia: Næringshager

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Opportunities:	Threats:
• host of major research institutions in Norway gives privileged access to scientific and technological expertise. • the public sector is actively engaged in creating innovation opportunities, e.g. in industrial clusters. • abundant access to renewable energy in the form of hydropower generated electricity for electrification of production processes and transportation	• the economy is fueled by the income from export of fossil energy. Weakened international demand for oil and gas will hit the general economy hard and will very likely weaken regional financial subsidies. • high level of ongoing regional reform activity, which can be summarized as centralization combined with funding cuts. Produces uncertainty and threatens to disrupt existing collaborations and networks. • a similar pressure is experienced by knowledge institutions which are exposed to ever increasing demands to acquire (international) funding. This makes them less inclined to engage in activities together with regional actors

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North-East Romania – North-East Regional Development Agency (North-East RDA)

Organisational mission and vision[60]

North-East RDA vision: We believe in a future in which the North-East Region of Romania will be one of the favourite places in Europe where anyone would like to live, learn, work or invest.
The vision for RIS3: To change the regional economic situation and become, through own initiatives and smart specialization, a "leading region" in Europe
Goals

- Development of the entrepreneurial skills and mentality, based on talent and creativity
- Smart and efficient economic valorisation of regional resources
- Increasing innovation and TT, cooperation between companies and R&D centres
- Identification of solutions for societal challenges by working closely with quadruple helix players
- Encouraging the development of networks and associations
- Increasing region's attractiveness for investors and tourists

North-East RDA mission: RDA is a generator of economic and social development in the North-East Region. We develop and promote strategies, attract and capitalize resources, identify and implement financing programs and provide services to stimulate sustainable economic growth, partnerships and entrepreneurship.

Organisational structure

Figure RO. 1 Services provided by North-East Regional Development Agency for regional development purposes.

Organisational role in R&I system

The expertise of RDA will be used in order to establish at pilot level a consultative instrument to support RRI. By inclusive debates, dialogue and 1 on 1 interviews with key actors, and with a keen eye on public engagement before, during and after the consultations at local level within the entrepreneurial discovery process, RDA will be in the position to coagulate local energies and to foster

[60] http://www.adrnordest.ro/user/file/library%20newsletter/buletin_nr_55.pdf

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on spot innovation. North-East RDA will use and adapt its RIS3 prior experience to help the communities in the pilots to accept and embrace change and to benefit of the quadruple helix energy. Based on the result of the 5 planned territorial meetings (3 edp's, 1 writeshop, 1 larger, public event), North-East RDA will coordinate the design of the brokerage platform for innovation in the pilot area.

Relevant ongoing projects

Projects in which North-East RDA is a partner:

- Interreg Europe project TraCS3[61] – "**Fostering Interregional Collaboration and Support for Innovation Infrastructure in S3 Key Priority Areas, through the Improvement of Regional Innovation Eco-systems**"– explores modalities to improve the support for regional innovation infrastructure and its better employment and involvement in innovation values chains, and to increase innovation capacities to build innovation and research excellence in the regions, as well as ways to enable interregional collaboration to help the regions open up their innovation potential to the world. The overall objective of the project is to improve regional policies in support of innovation infrastructure in S3 key priority sectors with strong innovation potential, which address region's societal challenges, and to enhance interregional cooperation within and between emerging and expanding innovation eco-systems.
- Interreg Europe project RETRACE[62] – "**A Systemic Approach for Regions Transitioning towards a Circular Economy**" – focused on systemic design as a method to allow local and regional policies move towards circular economy (i.e. waste resulting from one productive process becomes input in another, so preventing waste being released into the environment). The model will generate an intense innovation process, including that of the traditional industrial sectors, so fostering new business opportunities and models.

Projects in which North-East RDA is a beneficiary:

- "**Supporting Innovation in Romanian Catching-up Regions Project**"[63] – technical assistance project financed by EC's DG REGIO and conducted by World Bank in North-East Romania and North-West Romania, in collaboration with regions' Development Agencies. Focused on three types of interventions ("Research Valorisation Programme", "Structured Research Contract Programme", "Proof-of-Concept Programme" , "Technology Transfer Institutional Building Programme"), aimed to improve the technological transfer in the target regions, by optimizing the innovation valorisation capacity of the knowledge centres/universities and the innovation management capacity of the technological transfer structures in the two regions.

Geography, Demography and Society[64]

The 2 pilots in NE Romania are the territories of Bazinul **Dornelor Local Action Group/LAG** + **Vatra Dornei** Municipality (the only urban centre in the area, which is not included in the LAG) and **Ceahlau LAG**. Both pilots are entirely mountainous, with altitudes up to 2100m in LAG Bazinul Dornelor (Pietrosu Peak, Calimani Mountains) and 1907m in Ceahlau LAG (Ocolasu Mare Peak, Ceahlau Mountains). Both, Calimani and Ceahlau Mountains are National Parks. Besides, 2 communes of Ceahlau LAG, i.e. Damuc and Bicaz-Chei have territories included in "Cheile Bicazului-Hăşmaş" National Park. **Bistrita River** has the longest mountainous sector among the Romanian rivers, and more than half of this sector is crossing the pilot area, basically connecting both LAGs area.

[61] https://www.interregeurope.eu/tracs3/
[62] https://www.interregeurope.eu/retrace/
[63] https://ec.europa.eu/regional_policy/en/newsroom/news/2019/08/08-08-2019-commission-launches-two-projects-to-support-cooperation-and-innovation-in-romanian-regions-and-cities
[64] http://www.insse.ro/cms/sites/default/files/field/publicatii/populatia_romaniei_dupa_domiciliu_la_1_iul_2016_0.pdf

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Territorial structures	Main Natural areas	Municipalities	Rural/Urban	Surface (km2)	Population by residence / sex		Density p/km2
					M	F	
Bazinul Dornelor LAG	Suhard Mountains, Calimani National Park, Bistrita Aurie (SCI), Rarau-Giumalau Mountains (SCI), Pietrosu Brostenilor – Cheile Zugrenilor (SCI)	Panaci	Rural	137,6	2271		16.5
					1157	1141	
		Dorna Arini	Rural	147	2913		19.8
					1462	1451	
		Crucea	Rural	151,3	2094		13.8
					1045	1049	
		Dorna Candrenilor	Rural	192,3	3069		16
					1524	1545	
		Cosna	Rural	208,3	1502		7.2
					727	775	
		Poiana Stampei	Rural	180,1	2308		12.8
					1182	1126	
		Ciocanesti	Rural	110,1	1448		13.2
					706	742	
		Cirlibaba	Rural	271,5	1932		7.1
					956	976	
		Iacobeni	Rural	67	2122		31.7
					1074	1048	
		Saru Dornei	Rural	180,1	4239		23.54
					2121	2118	
		Brosteni	Urban	424,4	6484		15.3
					3271	3213	
		Total LAG; Rural/ Urban % →	**Surface:** 79.5% Rural 20.5% Urban **Population:** 78.7 Rural 21.3 Urban	U: 424.4	30373		14 .7
				R: 1645.3	15225	15148	
Vatra Dornei	As above	Vatra Dornei	Urban	144,3	17073		118.3
					8194	8879	
Total pilot 1	As above	Total pilot; Rural/ Urban % →	**Surface:** %25.7 urban %74.3 rural **Population:** %50.3 Rural %49.7 Urban	T: 2214	47446		21.4
				U: 568.7	23419	24072	
				R: 1645.3			
Ceahlau LAG = Pilot area 2	Cheile Bicazului – Hasmas National Park, Ceahlau National Park, Izvorul Muntelui lake (artificial/water reservoir)	Tarcau	Rural	398,9	3480		8.7
					1714	1766	
		Borca	Rural	205,2	6651		32.4
					3362	3289	
		Pipirig	Rural	196,8	9030		45.9
					4629	4401	
		Damuc	Rural	178,1	3058		17.2
					1566	1492	
		Poiana Teiului	Rural	165,6	4958		29.9

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					2446	2512	
		Bicaz	Urban	138,9	8575		61.7
					4226	4349	
		Grinties	Rural	138,7	2475		17.8
					1272	1203	
		Garcina	Rural	122,5	4923		40.2
					2466	2457	
		Pingarati	Rural	121,9	5513		45.2
					2738	2775	
		Hangu	Rural	121,7	3935		32.3
					2006	1929	
		Bicazu Ardelean	Rural	111,7	3866		43.6
					2023	1843	
		Bicaz Chei	Rural	102,3	4653		45.5
					2367	2286	
		Ceahlau	Rural	95,6	2466		25.8
					1231	1235	
		Tasca	Rural	95,6	2626		27.5
					1318	1308	
		Farcasa	Rural	92,3	3192		34.6
					1589	1603	
Total pilot 2		Total LAG = Total pilot 2 →	**Surface:** %6.1 urban %93.9 rural **Population:** %87.6 Rural %12.4 Urban	2285,8	69401		30.4
					34953	34448	
TOTAL pilot North-East	**Bistrita river**, **Izvorul Muntelui Lake**, **3 National Parks**, **Suhard Mountains**, **Rarau-Giumalau Mountains** as well as other natural reserves.	Rural/Urban surface distribution	Total/ Rural/Urban population	Surface (km2)	Gender distribution		Average density
		Urban: 15.7% Rural: 84.3%	Total: 116847 Urban: 32132 Rural: 84715	Total: 4499.8 Urban: 707.6 Rural: 3792.2	Total: 58370 Urban: 15691 Rural: 42679	58520 16441 42079	Total: 26 Urban: 45.4 Rural:22.3

Table RO. 1 Geography and Demograpfy in North-East Romania TeRRItoria pliot area[65 66 67 68 69 70 71].

[65] National Institute for Statistics, total population by LAU, 2016 - http://www.insse.ro/cms/sites/default/files/field/publicatii/populatia_romaniei_dupa_domiciliu_la_1_iul_2016_0.pdf
[66] National Census of Population and Housing, 2011 (to be updated in 2021) - http://www.recensamantromania.ro/rezultate-2/
[67] LAG Ceahlau local development strategy – https://www.gal-ceahlau.ro/strategie-de-dezvoltare-locala/strategie-de-dezvoltare-locala--129.html
[68] LAG Bazinul Dornelor local development strategy - http://galbazinuldornelor.ro/strategia-de-dezvoltare-2014-2020/
[69] Management Plan of Calimani National Park http://www.calimani.ro/documente/PlanDeManagementCalimaniAugust2015.pdf
[70] Management Plan of Ceahlau National Park http://www.ceahlaupark.ro/plan-management-pnc/
[71] Management Plan of Cheile Bicazului – Hasmas National Park http://www.cheilebicazului-hasmas.ro/plan_de_management_PNCB-H.pdf

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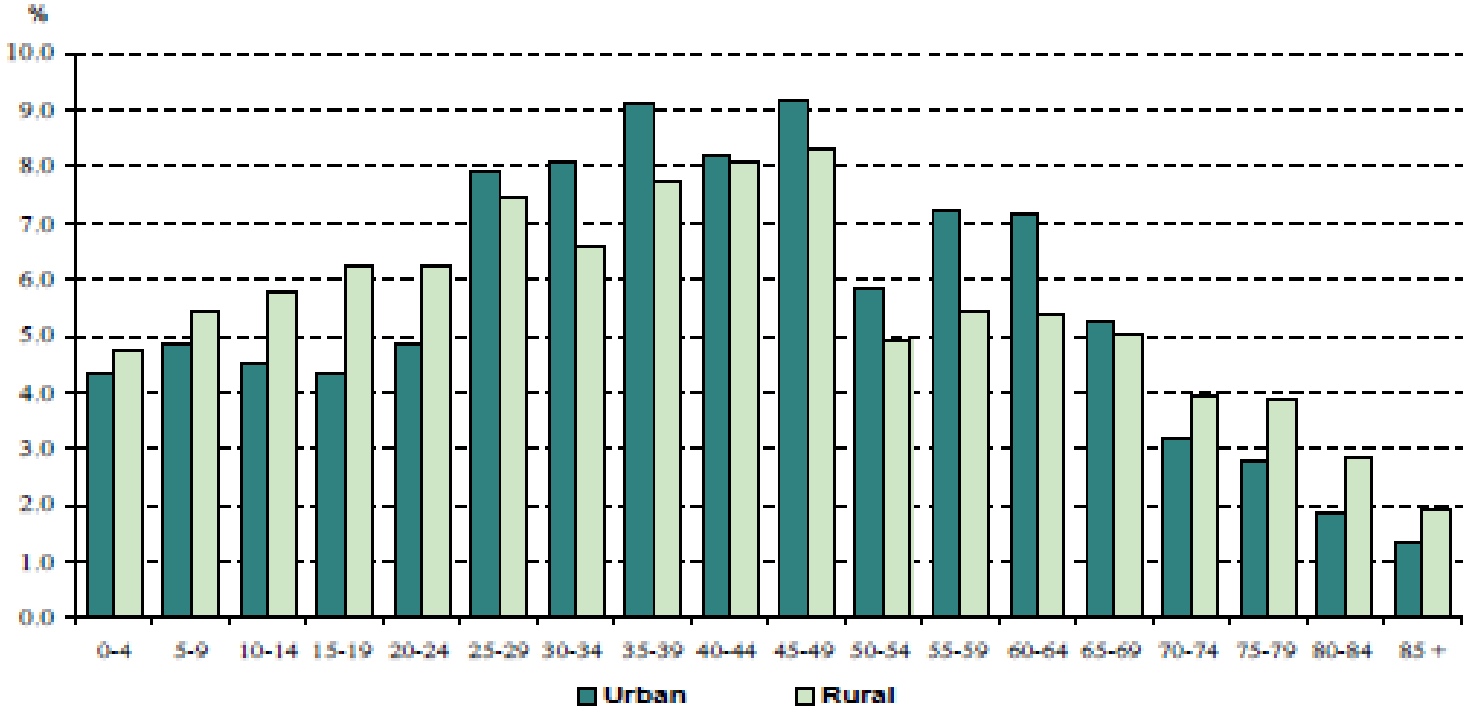

Figure RO. 2 Age distribution: Population structure by age groups and areas of residence: At the level of pilot areas such statistics is unavailable.

The Figure RO. 2 shows the situation at national level. At the level of North-East Region of Romania there is a higher percentage of the age group 0-14 (17.7% in Suceava County) and the lowest percentage of those above 65(15%)[65].

Inward and outward migration:
Tacit knowledge and various mountain research papers shows that in mountains the phenomena of aging, migration and depopulation reaches higher levels comparing to the lower areas. This is especially true for the Carpathians, also for the 2 territories in concern. During the late 20'th century there was a tendency to leave the rural area for the urban proximity centre (jobs in industry), and the 4 urban spots in out pilot (Vatra Dornei, Brosteni, Bicaz) benefited for this inflow of population. Now, the tendency is to leave the area (not just the rural) for bigger cities in the NE Region (i.e. Iasi) or even beyond region's border. This is applicable for mostly for the age groups 25 – 49. Those in between 20-24 are leaving the area for studies and most of them won't return, mainly because of the lack of career opportunities

Upper Secondary education system[72]:

- 1 High school – Theoretical studies: Humanities, Social Sciences, Natural Sciences, Math&Informatics
- 3 Technological High Schools (with theoretical, vocational, and practical study programmes): Forestry, Gastronomy, Tourism, Mechanics, Agri-tourism, Agriculture, Economics. [73][74]

[72] https://scoli.didactic.ro/detalii/oferta_educationala/grupul-scolar-nicolai-nanu-brosteni
[73] http://liceultehnvasiledeac.freewb.ro/oferta-de-scolarizare-2019-2020
[74] http://liceultehnologicdornacandrenilor.ro/index.php?p=1

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Tertiary education system[75][76]: In the pilot area there are no universities but only study programmes conducted by universities for the region of beyond. Disciplines: pedagogy for primary education (Babes Bolyai University of Cluj). In Vatra Dornei there is a private post-secondary school with education programs for nurse, pharmacist assistant, spa-physiotherapy and recovery assistant. Most of the student that finish the upper-secondary education will enter the tertiary education system in Iasi or Suceava (NE region), Cluj, Bucharest (in approximately equal percentages).

There are **7 public universities** in the region:

- "Gheorghe Asachi" Technical University of Iasi
- "Ion Ionescu de la Brad" University of Agricultural Sciences and Veterinary Medicine of Iasi
- "Alexandru Ioan Cuza" University of Iasi
- "Grigore T. Popa" University of Medicine and Pharmacy, Iasi
- "George Enescu" Arts University of Iasi
- "Vasile Alecsandri" University of Bacau
- "Stefan cel Mare" University of Suceava

and 5 private universities:

- "George Bacovia" University of Bacău
- "Apollonia" University of Iași
- "Petre Andrei" University of Iași
- "Mihail Kogălniceanu" University of Iași
- "Dimitrie Cantemir"Ecological University of Iași;

Agro-food	IT&C	Bio-Tech	Textiles & New Materials	Tourism for Healthy Living	Environment & Energy
3 universities with faculties within this field, 15 research stations with agro-food applications	5 universities with IT study programs and 9 doctoral schools; more than 2500 graduates annually	5 universities with study programs related to the sector, and in Iasi there are operational the Institute of Biological Research, "Petru Poni" Institute of Macromolecular Chemistry and the Research Center for Antibiotics	The Faculty of Design and Visual Arts of George Enescu University, the Faculty of Textiles and Leather and Industrial Management of Gh. Asachi University	Specializations in balneo-physio-kinesitherapy and recovery, Geography of tourism, Management in public nutrition and agri-tourism	Educational and research programs in Energy, Environment and Climate Change

Table RO. 2 Tertiary educational offer of the North-East Region in accordance to smart specialization domains.

[75] NE RIS3 Smart Specialization Strategy https://www.adrnordest.ro/index.php?page=RIS3-Nord-Est-2014-2020

[76] NE Action Plan for Regional Education 2016-2025 http://infraed.ro/wp-content/uploads/2017/10/PRAI-NORD-EST-2016-2025.pdf

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Economy, Sectorial Structure and Enterprise characteristics [67] [68] [77]

The analysis of the main sectors of activity in Dornelor Basin highlighted that the largest share of firms is concentrated in the municipality of **Vatra Dornei**. This fact strengthens the position of Vatra Dornei in the micro-region, as well as its role of growth pole within the territory. Around 70% of the employees Vatra Dornei workin the trade subsector. The services sector engages the highest share of employees due to the transition to a market economy and layoffs from the mining sector, being among the most accessible alternatives for the inhabitants. The services sector is represented by 765 of the enterprises of Vatra Dornei, in 2012, the largest share being held by the companies in the wholesale and retail trade (58%). Other important subsectors of activity are hotels and restaurants (15%) In 2014, in the municipality of Vatra Dornei there was a slight increase in the turnover of the tertiary sector. Regarding the secondary sector (industries and construction), in the municipality of Vatra Dornei , in 2012, a number of 78 companies were concentrated, out of which 59% were active in the field of manufacturing. Within the processing industry (46 companies), the wood and furniture industry (traditional industry) and the food industry are dominant. In 2014, in the municipality of Vatra Dornei the number of enterprises in the Agriculture, Forestry and Fisheries sector represents 3.46% of the total economic activities, so the number of employees in this sector is also limited. At the level of Vatra Dornei, the number of enterprises at the end of 2014 was 434. The economic activities are mostly concentrated in the tertiary sector - services, occupying 72.42% of the economic sectors, and the secondary sector - industries and constructions - has a share of 22.12 %.
Of particular importance in the economy of the territory of **LAG Bazinul Dornelor** are the wide range of local resources:

- forests (which occupy most of the communes' area), pastures and meadows,

but also subsoil resources of:

- non-ferrous ores (whose exploitation is almost completely stopped at this time);
- mineral and carbonated springs (bottled in the communes: Dorna Candrenilor, Poiana Negri and Panaci) but also peat deposits (Poiana Stampei);

In the rural area of Dornelor Basin the average number of businesses per communes is 9.25.
The main branches of economic development in the territory are: Forestry, Primary Wood Processing, Farms & Animal Breeding, Greenhouses - Plants, Food Industry, Primary Extraction of Subsoil Resources, Public Service Units - Bars and Restaurants, Trade and services, Tourism.
In the territory of LAG Ceahlau, upon analysing of population, education, economy indicators, a relatively low standard of living is reflected, which is also justified by the values of the human development index established at national level. Thus, the human development index in Bicaz holds the higher value, 74.2, being followed by Ceahlău (67.1), respectively Pipirig (66.8). At the opposite, the localities with the indicator below 55, were the communes of Hangu (49.0) and Dămuc (54.4).

[77] Integrated Urban Development Strategy of Vatra Dornei http://www.vatra-dornei.ro/index.php/informatii-publice/strategia-integrata-de-dezvoltare-urbana

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Activity currently performed	%
Livestock farming	37
Services	14.8
Trade	11.1
Education and social services	9.9
Woodworking / wood processing	8.6
Tourism services	9.9
Forestry services	3.7
Production and trade	2.5
Agricultural services	1.2
Medical services	1.2
Total	100

Table RO. 3 Economic activities in the territory of LAG Ceahlau[67]

Innovation System

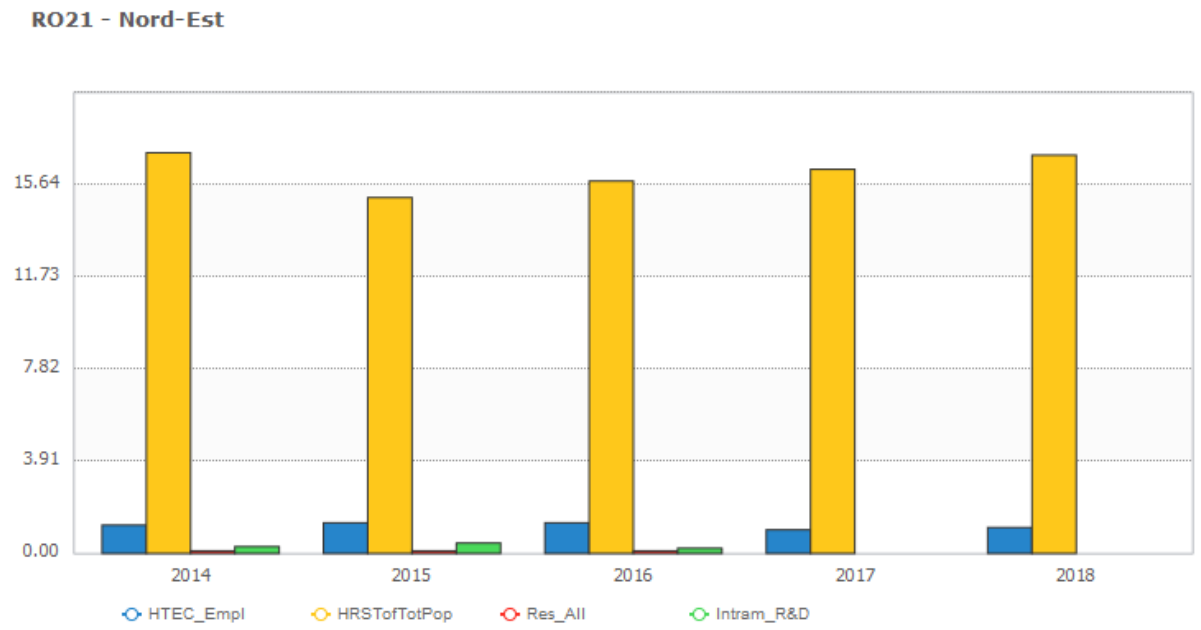

Figure RO. 3 Research and Development in the North-East region of Romania

The graph provides an overview of Regional R&D available data such as: employment in high-tech sector, human resources in science and technology, researchers in all sectors, total intramural R&D expenditure.[1]

Knowledge organization

Ce-MONT[78], the **Centre for Mountain Economy** is a research centre of the National Institute for Economic Research "Costin C. Kiritescu", of the Romanian Academy.

Overall: Founded in 2008, on European Structural and Investment Funds, Ce-MONT is the only research infrastructure in the pilot area. Mainly, it deals with fundamental scientific research, both theoretical and practical, with a multi - inter and trans-disciplinary approach, in the economy areas specific to mountains. The main research activity is focused on the mountain rural agriculture, households' typologies, small farming and family faring since these are most common in the mountains and especially in the Romanian Carpathians.

[78] http://www.ce-mont.ro/index.php/ro/

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Studies and research on:

- the specificity of human activities and ways of increasing work productivity in the agro-zootechnical economy of mountain family farms. Multi-activity and its role in small mountain farms;
- the capitalization of high-quality mountain products, through added value and ameliorating the mountain farmers' incomes;
- methods and solutions for fighting poverty, ameliorating the quality of life and the level of civilization in mountain villages;
- developing the rural infrastructure, the non-agricultural activities and the positive externalities.
- renewable mountain resources (natural, economic, workforce, cultural);
- concepts and methods for the organization and functioning of associative-cooperative organizations in mountain areas.

Structure of the laboratories:

1. Economics of mountain agricultural exploitations
2. Economics of renewable energies and non-agricultural mountain resources – industries and services
3. Economic geography, demography and mountain sociology
4. Legislation, strategies, policy and scientific international relations
5. Informatics, statistical analysis, prognosis, programmes, mountain data bank
6. Agricultural and forestry biodiversity, natural parks and protected areas
7. Ethnography, folklore techniques, agrarian and cultural mountain traditions
8. Economics of mountain tourism and agri-tourism
9. Climate change, hydro resources and management of risks in mountain areas
10. Landscaping, habitats and environmental protection
11. Mountain products' marketing and mountain product quality management
12. Editing, multiplication and dissemination of scientific works / Mountain publications

Infrastructure:

CE-MONT has a modern, beautiful building, located in a mountain ambiance, with a green area and all utilities.

Inside spaces:

- A generous hallway – appropriate for exhibitions;
- A conference room, with 200 seats and complete installations for audio-video presentations, simultaneous translation and excellent acoustics;
- The "Mountain University" (generic title), with two rooms of 30 seats each for small events (workshops, trainings, debates etc.);
- The Mountain Library – fully equipped, gathering publications of interest for the mountain area.

Research laboratories:

- 12 rooms, equipped with state-of-the-art technology according to their specific profile;
- n adequate space for editorial activities, fully equipped.

CE-MONT also has two auto-labs for field research.

On the 3rd floor and in the attic, there are located spaces for in-depth research (university professors, researchers, Ph.D. candidates, students – from the country and from abroad). The modern central

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heating uses wood, there are solar energy panels and heat pumps, there are fire prevention and electronic surveillance systems.

Human Resources:

CE-MONT is functioning under the National Institute for Economic Research "Costin C. Kiritescu" (Romanian Academy) bringing together researchers (university professors, researchers' degree I, II, III, SR and young assistants). The specialization profiles are in accordance with the laboratories structure. To extend the research activities, cooperation agreements have been signed initially with 14 universities (Bucharest, Iasi, Cluj, Timisoara, Sibiu, Suceava, Arad, Brasov, Targoviste, Pitesti), with the Mountainology Research and Development Institute – Cristian, Sibiu and Research and Development Institute for Grasslans – Brașov (Academy of Agricultural and Forestry Sciences). CE-MONT's associated researchers have been active since 2005, through participations in annual scientific conferences and published papers.

Universities and Institutes that have signed cooperation agreements with CE-MONT for the period 2016 – 2020

1. West University of Timisoara
2. University of Agricultural Sciences and Veterinary Medicine – Bucharest
3. University of Agricultural Sciences and Veterinary Medicine – Iași
4. University of Agricultural Sciences and Veterinary Medicine – Cluj Napoca
5. University of Agricultural Sciences and Veterinary Medicine – "Regele Mihai I" – Timisoara
6. "Valahia" University – Targoviste
7. "Stefan cel Mare" University – Suceava
8. "Lucian Blaga" University – Sibiu
9. "Dimitrie Cantemir" Christian University – Bucharest
10. "Gheorghe Asachi" Technic Univerity – Iasi
11. "Alexandru Ioan Cuza" University – Iasi
12. "Vasile Goldis" University – Arad
13. "Transilvania" University – Brașov
14. University of Pitești
15. Research and Development Institute for Montainology, Cristian-Sibiu (Academy of Agricultural and Forestry Sciences – ASAS).
16. Research and Development Institute for Grasslands – Brasov (Academy of Agricultural and Forestry Sciences – ASAS).

Research & Innovation Infrastructures

"Ion Ionescu de la Brad" University of Agricultural Sciences and Veterinary Medicine (USAMV), Iasi – Centre for Agronomy Practice for Students in Saru Dornei. USAMV also has a specialization in Mountainology and has a keen interest in mountain topics. They also provide training services for farmers' associations and have a partnership with Ceahlau LAG.

"Gheorghe Zane" Institute of the Romanian Academy, Iasi – research themes related to mountain agriculture, rural development, rural tourism, local markets and local supply chain.

– "Stefan cel Mare" University of Suceava (USV) – they have an information point and training facility in Vatra Dornei. Their influence on the experiment might focus forestry, economy of mountain tourism, human-landscape paradigm, food engineering.

"Alexandru Ioan Cuza" University (UAIC) of Iasi – mainly on issues related to tourism and rural development.

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Clusters and Incubators[75 79 80]

There are neither clusters, nor incubators in the 2 pilot areas. But, at regional level there are 14 **cluster organizations,** as evidenced below. Sectors: tourism, forestry, bio-economy, biotech, agriculture, textiles, constructions/buildings/real estate, IT, medicine.

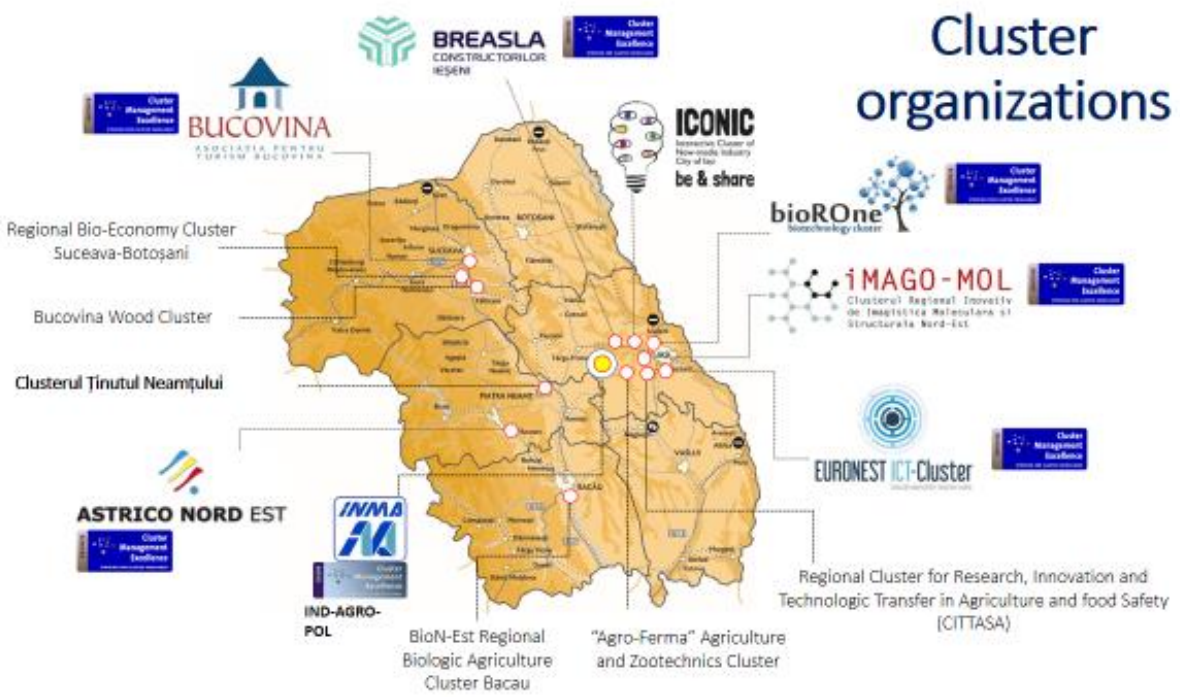

Figure RO. 4 Cluster organization in North-East Region of Romania[75]

In the North-East region of Romania there are 11 entities established with the aim to support businesses and the entrepreneurial ecosystem, providing also **incubation services**. Some of them are performing, such as Rubik Hub, while others are still struggling.

- **Ideo, Business Support and Development Centre in Iasi** - encouraging and supporting start-up businesses through management consulting, advertising and marketing services, legal assistance, business analysis and diagnostics, financial-accounting consulting, human resources management and recruitment services, IT&C services and operational support;
- **Carol Business Support and Development Centre, in Iasi** – attracting investments, sustainable development of the local economy;
- **Axa - Green Business Consulting Centre, in Iasi** – attracting investments, boosting the economic development of Iasi county;
- **Rubik Hub, in Neamt** - provides workspace, training, mentoring and coaching programs for start-ups, access to a large community of entrepreneurs, funding streams and events;
- **Cacica Multicultural Business Centre, in Suceava** - cultural activities, spaces for the production of traditional products, consulting services for economic agents;
- **"Mircea Cancicov" Business and Exhibition Centre, in Bacau** - the centre comprises a 5-level business incubator, a three-level conference room and an exhibition space;
- **CRAV Business Resources Centre, in Vaslui** - supports the entrepreneurial spirit and contributes to the increasing of competitiveness of SMEs;

[79] http://ecosystemsmapping.s3platform.eu/
[80] https://ec.europa.eu/growth/industry/policy/cluster/observatory/regional-ecosystem-scoreboard_en

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- **Tutova Business Centre, in Vaslui** – established with the aim to support and provide facilities for SMEs, foreign investors, the development of the manufacturing industries, textile and food industries.
- **Bucovina Economy Centre, in Suceava** - Exhibition spaces, conferences, research;
- **Business Incubator for SMEs, in Botosani** - Offers various business incubation services for newly established or mature SMEs;
- **HIT Hemeiuși Industrial Park, in Bacau** – Incorporates service area for software production for SMEs, industrial manufacturing area, commercial area.

Results for the six dimensions

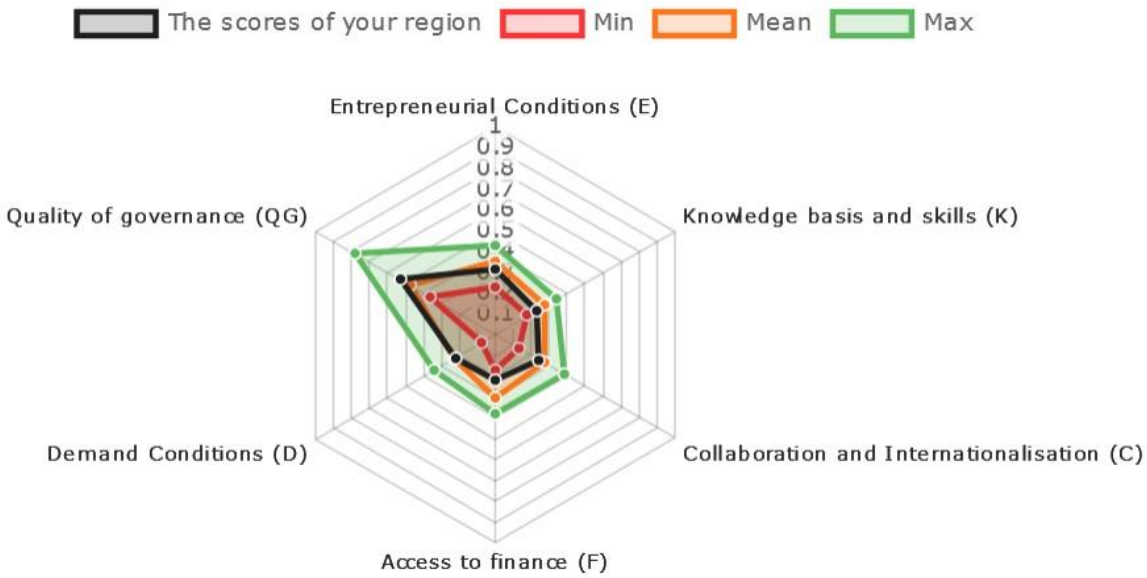

Figure RO. 5 Result of the Regional Ecosystem Scoreboard of North-East Romania with default peers[80]

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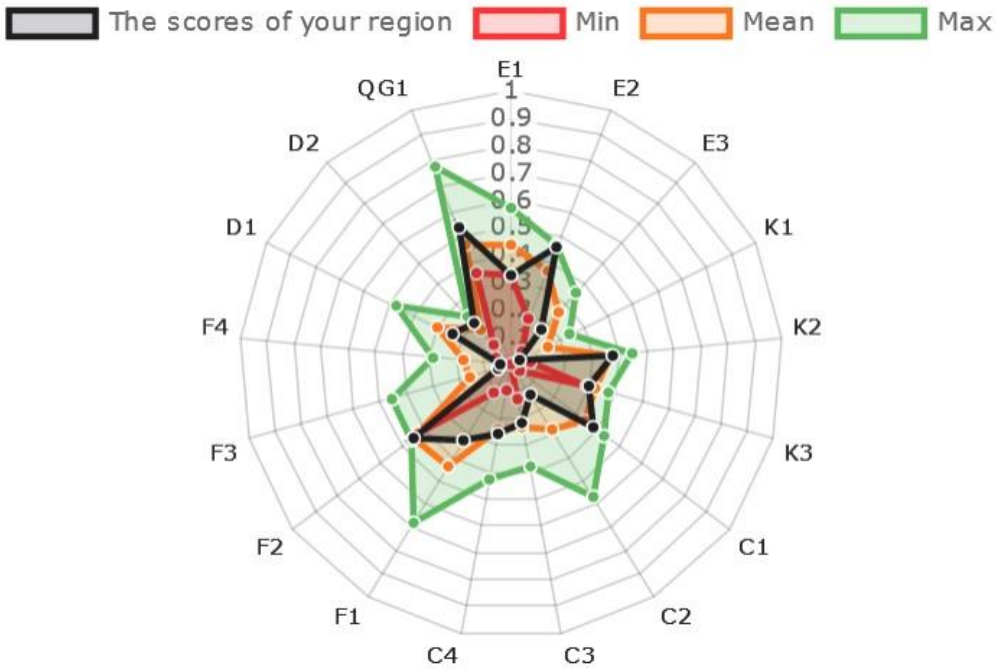
Results for the seventeen sub-dimensions



Legend
Entrepreneurial Conditions
E1: Regulatory framework for starting a business; **E2**: Entrepreneurial culture; **E3**: Attractiveness of the region and quality of infrastructure
Knowledge basis and skills
K1: Human resources; **K2**: Vocational training and lifelong learning; **K3**: Skills
Collaboration and Internationalisation
C1: General system linkages; **C2**: Cross-sectoral linkages; **C3**: Specialisation; **C4**: Openness of the region
Access to finance
F1: Attitudes of investors and private financing; **F2**: Legal framework support-ing access to finance; **F3**: Availability of funds from public sector; **F4**: Support from Structural Funds
Demand Conditions
D1: Private demand; **D2**: Public demand
Quality of governance
QG1: Quality of governance

Figure RO. 6 Result of the Regional Ecosystem Scoreboard of North-East Romania for seventeen sub-directions[80]

The analysis of the Regional Ecosystem Scoreboard is presented using several spider graphs in several levels: dimensions and sub-dimensions (Figures RO.4 and RO.5 respectively). These spider charts show the value for the selected region (represented by a solid line and shaded area) in comparison with the average of the group of the peer regions. The minimum and maximum values among the peer group are also represented in the graph. All the indicators and composite indices are scaled between 1 (best value) and 0 (worst value). Hence, the closer the region is positioned with respect to the outer border and the larger the shaded area is, the better is positioned the region in case (i.e. North-East).

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Other institutional players

- Municipality of Vatra Dornei - http://www.vatra-dornei.ro/
- The Romanian National Agency for Mountain Area - http://azm.gov.ro/
- County Council of Suceava - http://www.cjsuceava.ro/index.php/en/
- County Council of Neamt - https://cjneamt.ro/ro/
- Local Action Group "Bazinul Dornelor" - http://galbazinuldornelor.ro/
- Local Action Group "Ceahlau" - https://www.gal-ceahlau.ro/
- Calimani National Park Administration - http://www.calimani.ro/
- Ceahlau National Park Administration - http://www.ceahlaupark.ro/
- "Romontana" Association - https://romontana.org/

Governance system

North-East Regional Development Agency is the **coordinator** of smart specialization in region, initiate the process, develop strategy, facilitate dialogue between stakeholders implement and promote the strategy in the region, monitor and evaluate the whole process, collect information and coordinates the strategy review and its adaptation according to the socio-economic developments and in accordance with national / European policies. Main actors involved (designated structures):

1. **Regional Innovation Consortium (RIC)** – the governance body of RIS3 North-East, is formed by the representatives of the regional quadruple helix; its mail role is the **RIS3 endorsement** and the **prioritization** of smart specialization **projects' portfolio.**
2. **Academic Consultative Commission (ACC)** - **supports** RIC in the elaboration and operationalization of RIS3. The **Centre for Mountain Economy** (CE-MONT) is also represented in the Academic Consultative Commission.
3. **North-East RDA** – coordinator of the RIS3 elaboration and implementation and of the regional **entrepreneurial discovery process** (EDP); ensures the Chairmanship of RIC, as well as the Technical Secretariate of RIC & ACC.
4.

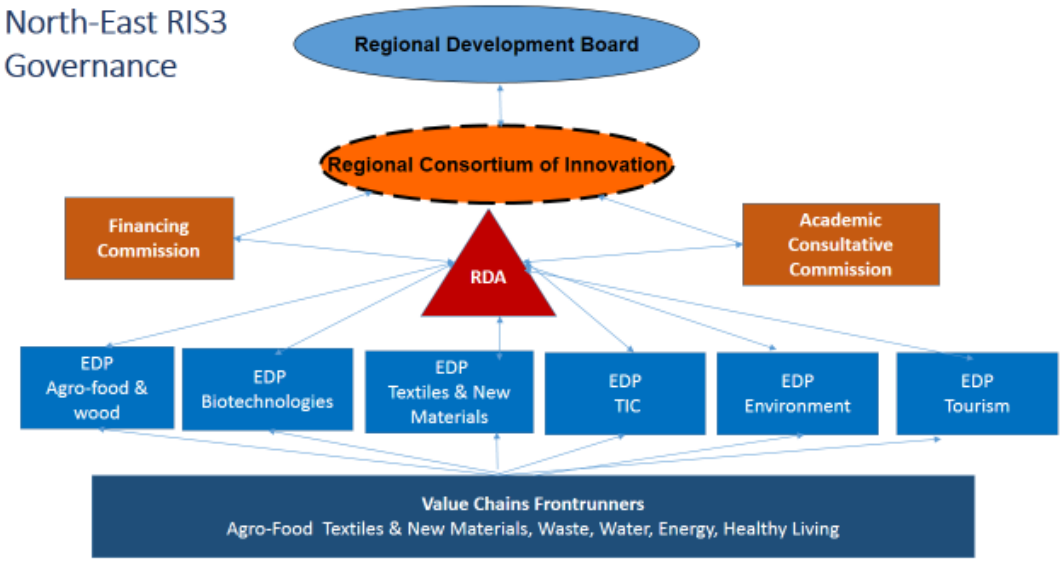

Figure RO. 7 RIS3 North-EAST Governance System

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Main Strategies and priority areas specialization[81]

RDA commitment to smart economic development[75]

The vision: To change the regional economic situation and become, through own initiatives and smart specialization, a "leading region" in Europe.

Development vision for 2022 (t1, intervention scenario) The **North-East Region** creates, transfers and transposes into practice, innovation in a systemic, sustainable manner, with societal benefits, mainly in the following key areas - **agri-food, biotechnologies, textiles & new materials, tourism for healthy living, ICT, energy & environment**.

For the moment, at the level of **TeRRItoria** pilot areas, the focus is on **tourism** and **agri-food**.

Implementation status

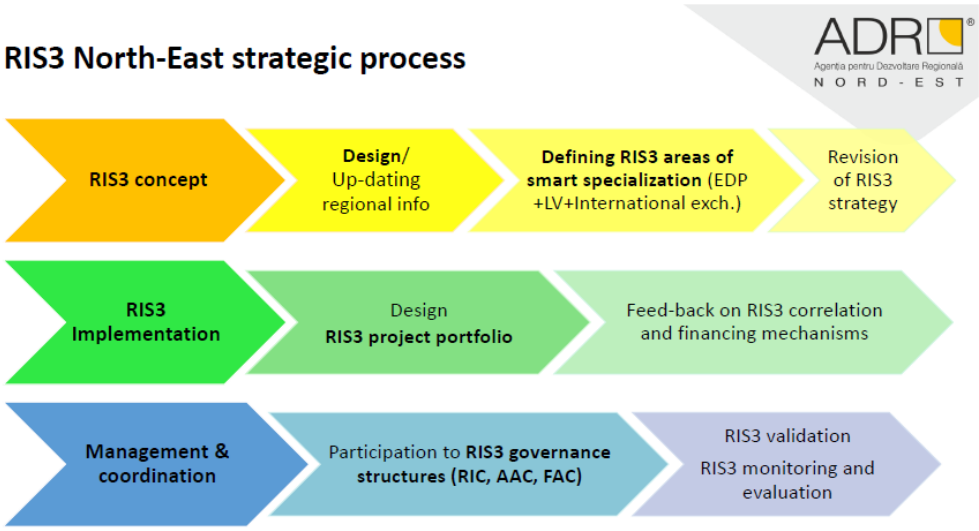

Figure RO. 8 RIS3 North-East Strategic process

Two regional calls for RIS3 projects were organized in North-East Romania in 2017 and 2016. The calls were open to entities from the full quadruple helix, who promoted solutions to the main societal challenges by projects addressing the intervention (specialization) niches identified through the entrepreneurial discovery process (EDP) conducted in the previous year (i.e. 5 EDP focus groups during 2016-2017, respectively 5 EDP focus groups in 2017). After each call, a regional Project Development Lab was organized by North-
East RDA, in order to match project proposals with the existing financial resources. A summary of this process can be found below:

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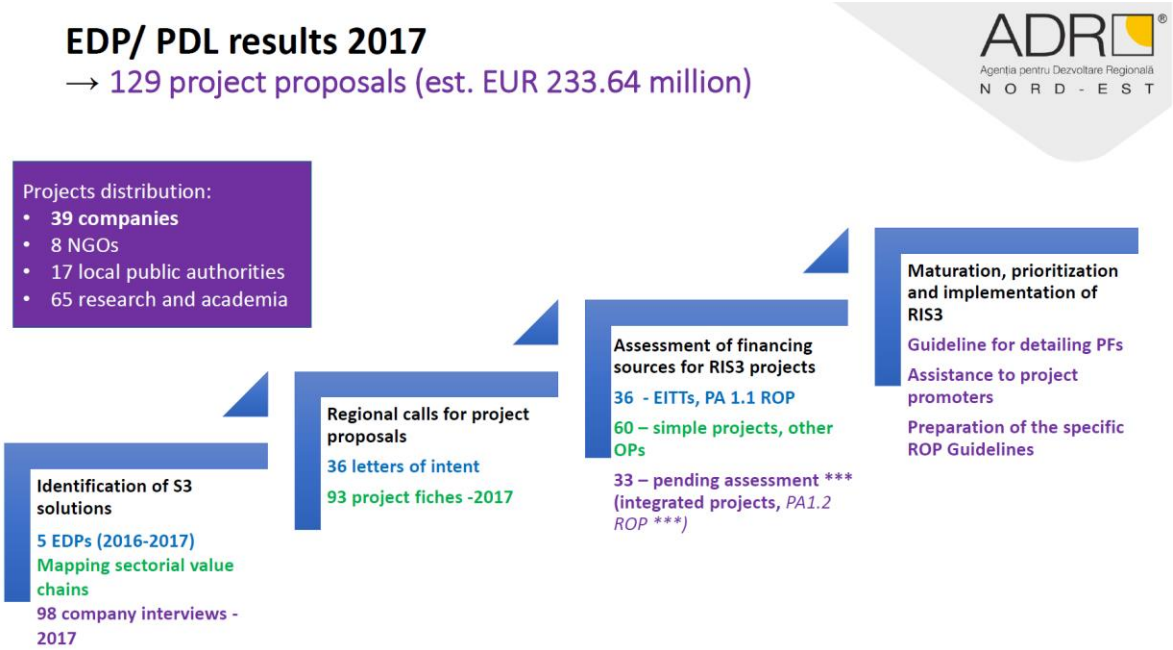

Figure RO. 9 EDP and PDL result in the North-East Region in 2017

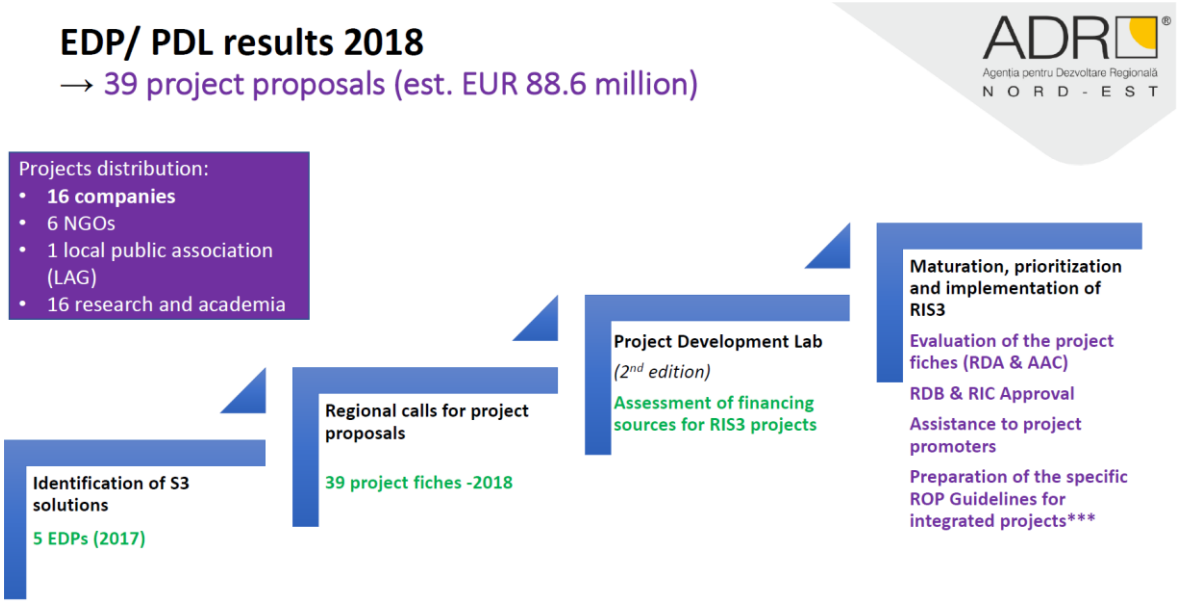

Figure RO. 10 EDP and PDL result in the North-East Region in 2018

Project proposals for whom resources were available on the market, were directed towards the respective financing bodies.

For projects proposing multipoint interventions (integrated projects combining research, production and valorisation) a new type of financing has been designed by North-Eat RDA and submitted to the national Managing Authority for the Regional Operational Program (ROP). Following MA's invitation, North-East RDA, together with North-West RDA drew the application guideline proposal, adopted and launched in 2019, under a new dedicated Specific Objective within the Priority Axis 1 "Technological Transfer" of ROP 2014-2020.

(More information regarding the implementation process can be found on the attached web address) - http://www.adrnordest.ro/index.php?page=RIS3-Nord-Est-2014-2020

Monitoring and Evaluation system[81]

RIS3 North-East monitoring and evaluation systems have been recently revised in collaboration with EC's Joint Research Centre (JRC), paying also attention to the monitoring evaluation procedures already in place at regional (e.g. the Regional Development Plan) or national level (e.g. national programmes and strategies related to innovation).

The coming monitoring action foreseen by the monitoring calendar will be in 2019/2020, in correlation to the national RIS3 performance. North-East RDA will gather the data for the selected context, result and output indicators, as follows:

- For the context indicators – data from the National Statistics Institute
- For the results and the output indicators – data from the Annual Reports of the Operational Programmes of 2014-2020, assumed as main financing instruments for the RIS3 projects. These reports are drawn up by the MAs and IBs of the respective programmes.
- If supplementary data will be necessary, additional information will be collected through surveys administrated to the organisations that implement the regional RIS3.

The resulting monitoring report will provide info on the status of RIS3 implementation, together with recommendations of improvement for a more efficient RIS3 implementation. The monitoring report will be presented to the Regional Innovation Consortium (the QH governance structure of RIS3) for analysis, discussions, and recommendations of improvement.

Factors[67 68 75 77]

Strengths:	**Weaknesses:**
• Forestry, healthy agricultural products, mineral waters in Vatra Dornei area • The activity of CE-Mont • The presence of the Agency for Mountain Area in the pilot region • The partnership between CE-Mont and other research entities form all over the country • The facilities created in the pilot area by USAMV and USV • LAG'S – bottom up approach towards development and allocation of funds • HNV pastures, protected areas • rich cultural heritage • natural landscape favorable to active tourism development all over the year • The unpolluted mountain climate • Long period of snowing days during the winter season (100 days) – favoring winter sports • Food industry is well developed, fact demonstrated by the existence of well-known national brands (Dorna, LaDorna, Bucovina, Aqua Carpatica) • The average length of stay of tourists in the resort of Vatra Dornei is above the average value at national level	• Common flood zones caused by torrents in the territory of LAG Ceahlau • The prevalence of farms below the limit of 8,000 SO (small farms / family farms, defined in the NRDP 2014-2020) • The territory is considered within the underprivileged mountain area • Slight diversification of the local economy, most of the municipalities have active enterprises in only a few of the sectors of the national economy - in particular trade • Lack of information for farmers about European norms regarding direct payments and accessing European funds • Lack of knowledge in farm management, financial management, technical specializations in the field of animal husbandry • High fragmentation of agricultural land – leads to the practice of traditional agriculture only with low economic competitiveness • Poor tourism services for leisure comparing to the potential of the territory, poor tourism PR regarding cultural and historical points of interest • Most of the localities in the area do not have a well-developed waste management system

[81]North-East RIS3: http://adrnordest.ro/user/file/news/17/RIS3_Nord-Est_05_12_2017.pdf

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• Good water quality in the area • Low number of sources of pollution • lakes within the territory of LAG Ceahlau (Pîngărați, Vaduri, Bicaz Izvorul Muntelui și Cuejdel) • Small livestock farms with growth potential • The presence of the associations of animal breeders • The presence of NGO's and other civil society organizations in the LAGs • Dornelor Basin is one of the 5 eco-tourism destination in Romania, officially recognized and certified by the Ministry of Tourism	• The absence of professional training programs / exchanges of experience for the population in the territory, with specialization on the environment, policies for the use of renewable energy (wind energy, solar energy, water energy) • Internal efficiency of the administrative act is quite low, the IT&C infrastructure is insufficient and non-performing • Low to medium fertility of soils • Massive deforestation over time • Demographically aging population, lacking regeneration capacity • The precarious state of some educational units • Poor development of infrastructure related to tourism, lack of shops with specialized articles for tourists (souvenirs, maps, guides, leaflets, sports articles, etc.) • Lack of motivational tools for local public administration staff, the public policy act is affected • Low value of Gross Domestic Product • Low salary level • At the NE region, only the 6th place (out of 8 regions) at the national level from the perspective of innovation costs • Reduced collaboration between the business environment and universities / research institutes - low technological transfer • Poorly developed technology transfer infrastructure • There is no regional offer for TRL6-TRL9 technology transfer services • Lack of technological solutions for establishing and following quality standards for organic products • Lack of technological solutions for the recovery of waste and secondary materials, for the integration in the local value chains (advanced processing of raw materials) • Lack of intermediate structures between agricultural producers and processors • Insufficient financial tools to support innovation among entrepreneurs • The absence of the majority of organic food products obtained in the region, in the market.
Opportunities: • Wind potential in the Dornelor Basin, potential for biomass-based energy production (wood waste) • High potential for cultivation of berries, mushrooms and medicinal plants	**Threats:** • Legislative, political, economic and institutional instability; Low co-financing capacity • Aging population • The emigration of qualified personnel, especially from high intelligence sectors

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• The legislation for local gastronomy points; Tourism (cultural, ecumenical, mountain, agri-tourism, ecotourism) • Existence of financing programs for young farmers and investors in non-agricultural activities • Development of organic farming and advanced agriculture; Existence of certification systems for ecotourism and agri-tourism pensions (ANTREC, ECO-ROMANIA) • Harnessing and promoting the mineral waters; Involving the population in ecological education activities • Funding programs for tourism activities and investments in tourism • Exploiting synergies between the agricultural and energy sectors, between health and tourism, between tourism and agriculture • Increasing the regional and national interest for stimulating the interaction of companies with the RDI institutes • The interest expressed by foreign tourists in relation to folk customs, specific Romanian cuisine • Encouraging the development of new forms of tourism - scientific tourism • Very good prospects for exploring the mountain areas throughout the year through hiking, horse riding, mountaineering, extreme sports, skiing • Existence / implementation of Tourism Action Plans at regional and county level • Harnessing the nautical potential of Lake Bicaz in recreational structures • Increasing the number of jobs for agricultural business development • European and government funding for public administration in order to make public utility investments.	• Reluctance of companies to invest in R&D activity • Lack of coordination between different sectorial policies • The small number of public-private partnerships • Lack of short supply chains, local markets for capitalizing on the products made / obtained in the territory, local brand, "local basket" • The declining number of livestock • Migration of youths • The lack of a specialized associative framework (in local food marketing issues) that can act for the benefit of farmers • Lack of financial support and market for traditional products • Uncontrolled deforestation with implication generating landslides

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Gabrovo

Organisation mission and vision

The political vision of Gabrovo Municipality is to achieve smart, sustainable and inclusive growth and competitiveness, addressing the principal societal challenges. The main strategic document and policy instrument is the Municipal development plan of Gabrovo municipality 2014 - 2020[82], which long-term vision is: ***"Gabrovo Municipality – Green, Innovative, Sustainable"***.
The main goals and priorities embedded in the Municipal plan and related to local economic development and innovations support are, as follows:
Strategic goal 1: Stimulation of economic growth and enhancement of competitiveness of local business in Gabrovo municipality

Priority 1: Stimulating development of innovations and creation of conditions for partnerships.

Specific goal 1.1. Enhancement of knowledge and provision of information for development of innovations with focus on the priority economic sectors in Gabrovo municipality (innovations in technologies and products in traditional and new manufacturing companies, in agriculture, tourism and other economic sectors).

Specific goal 1.2. Development of business infrastructure and related networks in order to stimulate innovations with proactive participation of Technical University of Gabrovo with wide territorial scope (regional, national and EU level).

Priority 3: Supporting the vitality and competitiveness of SMEs in the municipality.

Specific goal 3.1. Encouragement of entrepreneurship and stimulation of SMEs in Gabrovo municipality, through application of flexible local incentives and measures.

Specific goal 3.2. Improvement of conditions and basic infrastructure coming to the industrial zones and sides, including the infrastructure into the zones on the territory of Gabrovo municipality, through regeneration and conversion.

In order to achieve above mentioned goals and to improve the existing innovation eco-system Gabrovo Municipality developed an Implementation Plan for innovations focused in the thematic area of the national S3 strategy - "Mechatronics and pure technologies" and "Informatics and ICT", specified for North Central Bulgarian Region in national S3[83].
An Action plan for development of SMEs support system to support innovations has been approved within the implementation of project ESSPO, funded by Interreg Europe program.

Strategic documents related to innovations:

- Municipal plan of development of Gabrovo municipality 2014 – 2020[82]
- Implementation Plan for innovations
- Action plan for development of SMEs support system

Institutional Website: www.gabrovo.bg

[82] https://www.gabrovo.bg/bg/page/537
[83] https://mi.government.bg/files/useruploads/files/innovations/ris3_final_27062017_eng.pdf

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 824565

Organisation structure[84]

Administrative structure:

The staff of Gabrovo Municipality consists of 193 working positions of which:

- state employees 82 positions; positions for labour contract 111
- managerial positions 43, expert positions 149
- unoccupied positions – 20 of which state employees 12 positions; positions for labour contract 8

Municipal management:

- Mayor of Gabrovo municipality;
- Deputy Mayor "Social-Economic Development" for management of areas: "Education and social activities" and "Sustainable Development" Directorates;
- Deputy Mayor "Territorial planning, infrastructure and ecology" for management of areas: "Infrastructure and Environment" and the "Territorial Planning" Directorates;
- Deputy Mayor "Finance and municipal property" for management of Directorates "Finance and accounting", "Municipal property and economic activities" and "Local taxes";
- Chief architect of Gabrovo Municipality;
- Secretary of Gabrovo Municipality for management of Directorate "Administrative, legal and information services".

The necessary equipment and software to provide for uneventful and effective implementation of the various work tasks of the municipal employees, such as servers, computers, printers and scanners, multimedia projectors, video wall; touch-screen monitors' computers; AKTOPIS – an automated registries about the civil status; WORKFLOW - financial and accounting information system; Archimed eProcess - electronic management of work processes and control of work flow; ELARDO - specialized software for electronically archived family records.

The most important IT tool for economic development and strategic planning in Gabrovo Municipality is the implemented Geographic information system with several layers.

One of the most important tools for economic policy making with opportunity to see the trends, which was developed by Gabrovo Municipality, is the **economic GIS-layer**[85]. There the companies and they activities are presented within the territory of Gabrovo. It presents the location and economic data for local companies, as well as it is a very effective tool the local authority to serve as an analysis's basis. The information is regularly updated, at least annually with official data from the National Statistics. The tool provides detailed information about the companies with the possibility for any company to add new information that will be automatically updated in its personal profile. The information is structured by economic and statistical indicators, main business categories, innovation information. The layer is to be further developed with possibilities to select certain areas, types of businesses, size of the enterprise, sphere of activity, etc.

For more than a decade Gabrovo Municipality makes systematic and focused efforts for the preparation and implementation of various projects, creating conditions for sustainable economic growth. Predominantly, those are EU financed project for applying measures in various sectors of society, managed under programmes with direct financing or under the Operational programmes.

Directorate for sustainable development presented by the Department "Projects and economic development" is the main responsible body for strategic planning, policy making and projects development.

[84] https://gabrovo.bg/files/strukturaGabrovo.pdf
[85] https://gishub.gabrovo.bg:3344/webappbuilder/apps/34/

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Organisation role in R&I system

Gabrovo Municipality animates the innovation eco-system because of a lack of intermediary organizations and branch organizations in the region for economic development and support of innovations.
Gabrovo Municipality designed its policy to support innovation ecosystem in the region, based on the recommendation from the peer review reports done during KNOW-HUB project, funded by Interreg IVC[86] and ESSPO[87] project, funded by Interreg Europe.

An Implementation plan for innovations on local level is being developed by Gabrovo Municipality to stimulate R&D and implementation of innovations in local businesses, based on smart specialization. The implementation plan is a part of the Municipal Plan of Development of Gabrovo municipality 2014-2020. Its strategic goals are:

- To stimulate R&D and innovation activities in companies
- To establish and coordinate a network for innovations among sub-regional innovation stakeholders with proactive participation of Technical University

An Action plan is designed for the creation of a new demand-oriented SMEs support system to cover the territory of Gabrovo municipality with potential to be expended on regional level. Its main goal is to increase the capacity and competitiveness of SMEs trough provision of expert support for development and implementation of projects in the manufacturing sectors of smart specialization. The main actions are:

- Introduce new support measures for better communication with local companies through development of a new digital business platform for innovations, including branding of local economy and organization of a campaign for its promotion abroad (participation in trade fairs, advertisement in worldwide famous economic media, participation in innovative pro-EU networks and business platforms)
- Establishment of a new business support structure (a regional innovation centre/hub/club etc.) though public-private partnership with broad participation of all interested stakeholders in Gabrovo innovation eco-system (local companies, experts, Technical University of Gabrovo, Chamber of Commerce and Industry, Gradishte Foundation, District Information Centre, local and district governments etc.)
- Creation of co-working space for young entrepreneurs and start-ups

A regional stakeholders' group to foster innovations and economic development, supporting the development of a new SMEs support system, was established in 2017[88]. The group functions as an Advisory Council and consists of more than 80% business representatives. Regular meetings, workshops and business dialogue events have been organized during the last years, in order to develop the Action plan for establishment of SMEs support system, and better implementation of RIS3.

The new demand-oriented SMEs support system will transform the traditional industrial sectors of Gabrovo economy according to the new realities of INDUSTRY 4.0. The competencies on specific products and technologies of Technical University - Gabrovo, know-how of the innovative companies, business supporting NGOs and other important stakeholders in Gabrovo innovation eco-system will be used to increase innovation potential and capacity of SMEs.

[86] https://www.gabrovo.bg/bg/article/3390
[87] https://www.interregeurope.eu/esspo/
[88] https://www.gabrovo.bg/files/files/ESSPO_Gabrovo_stakeholders'_meeting.pdf

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Gabrovo Municipality participated in project "RIS3 in lagging regions" of JRC[89] , where a detailed report for innovation policy in the region was developed.
Gabrovo Municipality has initiated recently networking events of different scope/participants/topics, related to Industry 4.0 – KEP Industry 4.0[90], European Industry Day'2019[91], Open Business Day, 2018[92], Innovation Camps, 2016, 2017, 2018[93] , Dialogue with business Day, 2017[94], Beyond EDP – together with JRC, May 2018, Science meets regions, 2017. Within the ESSPO project[87], a positive experience of conducting a number of networking events for the business representatives is gathered. These events were conducted in different formats, all of which allowed included interaction, exchange of information, sharing of opinions, expressing ideas searching for answers to crucial problems, etc. The established practices for networking will be sustained in the future. A strong intention on part of the NGO sector, initiated by "Gradishte" Foundation, is declared to organize events focused on entrepreneurship, new technologies and soft skills in cooperation with the local authority and interested business partners, related to the Programme for university students and involving local entrepreneurs, guest lecturer, etc.

Relevant ongoing projects

Project PGI00087 ESSPO "Efficient support services portfolios for SMEs", funded by Interreg Europe[87]
The project takes a long-term approach to contribute to the creation of effective and efficient SME support service portfolios, which are capable to impact the regional economies via increasing SME's competitiveness, especially focusing on their growth on national and international markets as well as on their improved engagement in innovation processes.
The demand-oriented SMEs support system developed through ESSPO project[87] will include services for selected target groups based on assessment of companies' needs through a diagnostic tool working with selection criteria. The competencies on specific products and technologies of the Technical University of Gabrovo, business NGOs and the local branches of the suppliers' chains will be used. Enhancement of internationalization through participation in joint projects, innovative pro-EU networks and platforms is also included.
The story goes back to 2016, when the project team of Gabrovo Municipality started the idea to develop a SMEs support system. Gabrovo has already had experience of identification of local economic fabrics. The idea was to establish a system that serves the needs of companies providing technical expertise for development of innovative projects. The first rounds of ESSPO regional stakeholder group debates revealed the Municipality is expected not to be a technology transfer partner, but to develop and integrate the demand and supply for expertise support based on public-private principle. Especially that it is difficult for the Municipality to provide financial incentives within the national legislation. All stakeholders understood their role and started to think for a new win-win policy.
The implementation plan for innovations, developed in KNOW-HUB project, was updated in 2017 by the inclusion of a plan for a new communication environment with main focus on B2B knowledge and technology transfer. Thus, the plan became more business oriented. Companies like MECHATRONICA, AMK, IMPULS, GABINVEST and others approved the need to develop new IT solutions for better communication and finding expertise. Also, the University found the system being a new opportunity to promote its ideas, doctors and students. The dialogue and collaboration between the University and the companies progressed well and in 2018 the University started to implement a project for establishing a Competence Centre, funded by Operative programme "Science and education for

[89] https://s3platform.jrc.ec.europa.eu/ris3-in-lagging-regions
[90] https://www.gabrovo.bg/bg/news-article/8233
[91] https://ec.europa.eu/info/policies/business-and-industry/eu-industry-days-2019/eu-industry-week_en#bulgaria
[92] https://www.gabrovo.bg/files/files/ESSPO_Open_Business_Day_in_Gabrovo.pdf
[93] https://gabrovoinnovationcamp.eu/
[94] https://www.gabrovo.bg/files/files/ESSPO_Dialog_s_biznesa_Gabrovo_tarsi_vazmoznosti.pdf

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intelligent growth" 2014-2020. The project is mainly oriented to development of a new R&D infrastructure for eco-, energy and resource efficient innovative solutions based on companies' needs. One of the most proactive Stakeholder Group members - "Gradishte" Foundation, an organization of youth experts, identified a need to develop a co-working space for young people and to promote a program for capacity building and training of start-ups.
Large companies as MECHATRONICA, AMK, CERATIZIT, IMPULS and others brought up a challenge of how to bring smart people and recruit talents, and how to integrate their intelligent ideas into the existing companies.
Recently additional idea of establishing a new regional structure - a regional innovation centre was born during the Business Dialogue Day in October 2017, confirmed after with additional events organized with ESSPO contributions: Science meets regions and parliament (November 2017)[95] , EDP (May 2018)[96] . Ms. Tanya Hristova – the Mayor of Gabrovo Municipality welcomes the idea: "We need to make the connection between science, business and cities really strong, because all sides are committed to the citizens to create conditions for working and living together..."[97]
All these ideas would not appear if not for the dialogue forum of ESSPO local stakeholder group, recommendations of peer review made by TECNALIA, and the contacts and inspiration of ESSPO Task Forces workshops. It approved the main conclusion that if we collaborate and search for a "win-win solution", rely on our own resources, we can do really a lot for the sustainable and successful local economic growth. We believe that we can involve smart people to make our city an attractive place to live and developed careers. The project made us more confident in setting an ambitious goal of transforming Gabrovo into the technological heart of Bulgaria.

Project 585151-EPP-1-2017-1-BG-EPPKA3-VET-APPREN "Apprenticeship Cluster for industry ready engineers of tomorrow", funded by programme Erasmus+ [98]
The Consortium comprises of 3 VET providers - universities from AT, BG and PL, 2 enterprises in the sector of Mechanical Engineering and Mechatronics from BG and PL and a local authority from BG, as well as 2 associated partners from BG.

Rationale
Industry 4.0 demands new skill-intensive jobs, which mostly affects the manufacturing sector, in particular engineers – the driving force of innovation. However, it turns out that EU is not well prepared to meet that challenge. The situation varies across the member states. Within the regions of Gabrovo, BG and Koszalin, PL, where the sector of Mechanical Engineering and Mechatronics is a priority in the regional development strategies, the respective enterprises find difficulty in filling their engineering positions due to lack of industry-relevant skills of young engineers. WBL practices are not well known and universities do not possess the required competence to exploit their potential for their own benefit and that of business. The engineering graduates often become unemployed or do low-skill jobs. Therefore, there is a desperate need of strong cooperation between universities and enterprises in the introduction of WBL and apprenticeship at tertiary level so as to produce industry-ready engineers.

Target groups:
3rd and 4th – year students following a bachelor's degree course in Mechatronics
Enterprises in the sector of Mechanical Engineering and Mechatronics
University teachers

[95] https://gabrovo.bg/bg/news-article/6409
[96] https://gabrovo.bg/bg/news-article/6930
[97] https://cor.europa.eu/Documents/Migrated/events/Gabrovo%20-%20Science_meets_regions%202017.pdf
[98] http://aciret.eu/index.php/en

Main products: Apprenticeship Cluster in Mechanical Engineering and Mechatronics, WBL Curriculum focusing on apprenticeship in Mechatronics, E-Apprenticeship Workshop.
Impact: Better cooperation between universities as VET providers and enterprises in the delivery of WBL and apprenticeship education to engineering students. More active involvement of regional authorities and social partners in shaping industry-relevant educational provision that best matches regional labour market needs in relation to the priority sector of Mechanical Engineering and Mechatronics. Provision of industry-relevant WBL curriculum and study programmes, which will help to produce industry-ready engineers in Mechatronics thus facilitating their access to the labour market and easing enterprises to fill their engineering positions so as to boost performance. Better collaboration between university teachers and in-company trainers to improve their competences thus implementing apprenticeships more successfully.
As a result: a better cooperation between universities as VET providers and enterprises in the delivery of WBL and apprenticeship education to engineering students; **active involvement of regional authorities** and social partners in shaping industry-relevant educational provision that best matches regional labour market needs; a provision of **industry-relevant WBL curriculum** and study programmes are available. Through the realization of the project activities and implementing the WBL into the curricula of the Technical university-Gabrovo not only skills upgrading and adapting to the real needs is achieved, but an innovation at the university education in BG piloted.

Projects for Centre of Competence "Smart Mechatronic, Eco- and Energy Saving Systems And Technologies", funded by OP SCIENCE AND EDUCATION FOR SMART GROWTH 2014-2020, managed by Technical University of Gabrovo[99].
9 companies participate in the project as associated partners: („ABB Bulgaria" Ltd with one owner; „AMK drive and control equipment" Ltd. ; „ECO PROJECT" Ltd.; „Caproni" joint stock company; „Mechatronika" joint stock company"; „Milara International" Ltd.; „PODEM CRANE" joint stock company; „First" Ltd.; „Ceraticit Bulgaria" joint stock company), 3 clusters: (Cluster of mechatronics and automation; Cluster of green synergy; Cluster Thracian economic zone) and 4 representatives of employers' organizations: (Bulgarian Chamber of Industries – machine building; Chamber of Commerce and Industry – city of Stara Zagora; Chamber of Commerce and Industry – city of Gabrovo; Industrial Economic Association/ Business Chamber - Gabrovo).The project is supported by Municipality of Gabrovo.
The main objective of the project is to build a sustainable functioning Competence Centre "Intelligent Mechatronics, eco-and energy-saving systems and Technologies" (IEEST) in which the three sides of the "knowledge triangle" – education, scientific Research and business are found in effective and dynamic interaction based on shared strategies, strong and specific commitments and collaborative scientific projects and partnership.
The main activities within the project are related to significant modernisation of existing specialised research infrastructures, purchasing of equipment necessary for realization of research and innovation programs, conducting market-oriented research and development/modification of new technologies at a high international level, widespread dissemination of research results and introduction of new training and educational methods in the Centre's practice and transfer of knowledge and technology and provision of specialized business research services;
Technical University - Gabrovo is also one of the partners in the project for establishing of a Centre for Advanced Achievements "National centre in mechatronics and clean technologies", funded by OP SCIENCE AND EDUCATION FOR SMART GROWTH 2014-2020[100].
Both projects of the University aim at boosting the performance level and market orientation of research activities carried out in TU-Gabrovo and enhancing the capacity for research and innovations, which will generate possibilities for partnerships in business and/or opening of new business enterprises.

[99] http://2020.eufunds.bg/en/4/0/Project/Details?contractId=gbZTNmrj4V0%3D&isHistoric=False
[100] https://www.mon.bg/bg/706

The focus is on integration of planned research with the development of new or emerging novel technologies; possibilities for introduction and adoption of research outcomes and development of innovative activities.

Geography[101]

Gabrovo municipality is situated in in the North Central region of Republic of Bulgaria on a territory of 555.579 km² with population of 70 775 people. The municipality consists of 133 villages and the city of Gabrovo, located along the Yantra River in the northern suburbs of the Balkan. The city is part of trans-European transport corridor № 9 (Helsinki - Istanbul) and the most important road links pass through Gabrovo. Over 50% of the territory of Gabrovo is covered by forests, mostly beech-trees. One third of the territory is included in Nature 2000. The strategic city location and the proximity to the geographic centre of the country define its significance as an important transport intersection.
A bypass road of Gabrovo and a tunnel under the Balkan are under construction, which will considerably facilitate the southward city access.

Figure BG. 1 Location of Gabrovo municipality in Europe.

Demography and society[102]

After a rapid deterioration of the demographic picture in the district in recent years. Gabrovo became the district with the highest age replacement ratio (the ratio of people aged 65+ to those aged 0 to 14). In 2015, it reached 242.1% vs. the national average of 146.4%. The natural growth rate fell to –12.5‰, which is twice lower than the national average of –6.2‰. (national statistics for 2015)
Old age dependency ratio (65+ to 0-15) for 2017 reached 246.50%.

101 www.gabrovo.bg
102 https://ec.europa.eu/eurostat/web/regions/data/database

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2014	2015	2016	2017	2018
118,271	116,351	114,272	112,334	110,254

Table BG. 1 Population of Gabrovo Municipality over the years according to Eurostat[102]

Besides, the age dependency ratio (the ratio of the population aged 65+ to that aged 0 to 14) in the district of Gabrovo was the second highest in the country after that of Vidin. Gabrovo is also among the districts with the lowest net migration rate: in 2015, it reached –5.5‰.
The majority of the population is concentrated in towns: 81.8% compared to the national average of 73.1%. However, population density in the district is still lower than the national average.

Economy and labour

Gabrovo ranks second in Bulgaria in both economic and social development after Sofia (the capital city) according to the regional profile done by the Institute for market economics[103]. It ranks fifth in GDP per capita, incomes in the district are higher than the national average, and salaries have been rising at a stable rate. Gabrovo has one of the highest amounts of EU funds absorption per capita in the country. It is rated as a district with active electronic government, administrative one-stop shop services and administrative transparency. Education and healthcare indicators are good, cultural life – intensive.

2012	2013	2014	2015	2016
765	872	1 361	1 390	1 192

Table BG. 2 The numbers for total R&D personnel and researchers in NUTS 2 region North central, BG[102]

Because of the rapid deterioration of the demographic picture in the district, GDP per capita rose steadily after 2010, and in 2014 Gabrovo took the fifth place in the country with a GDP per capita of 9,804 BGN. In 2017, Average annual income per household member is 6973.00 BGN. The relative share of population living in material deprivation and the relative share of people living below the country's poverty line have been maintaining stable low levels since 2013 onwards.
The gross domestic product (GDP) per capita for 2016 is 11152.00 BGN[103].
The Unemployment rate of the population aged 15-64 is traditionally low and has been kept in such limits in the last decade[103].
The above listed regional characteristics predetermine the development of the region as an industrial centre based on innovation and modern engineering solutions. Having a main priority innovation-based economic development and stimulation of smart specialization sectors, Gabrovo Municipality initiated the creation of a new SMEs support system. A need is registered for: improvement of companies R&D capacity, fostering innovations, attracting "smart ideas" youth, development innovative projects with market potential – thus the brain drain/depopulation would be revered, and entrepreneurial potential boosted.

[103] https://www.regionalprofiles.bg/en/regions/gabrovo/

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EMPLOYMENT BY INDUSTRY IN %

MANUFACTURING TOTAL	100
Machine-building and tool manufacturing	36
Apparel	29
Food, beverages and tobacco products	10
Rubber and plastic	9
Furniture and wood products	8
Other	8

BUSINESS SERVICES TOTAL	100
Construction	31
Transport and logistics	28
Administrative and ancillary services	14
Professional services and research	12
IT and telecommunications	6
Other	9

Figure BG. 2 Distribution of employment in manufacturing and business [104]

Sectoral structure

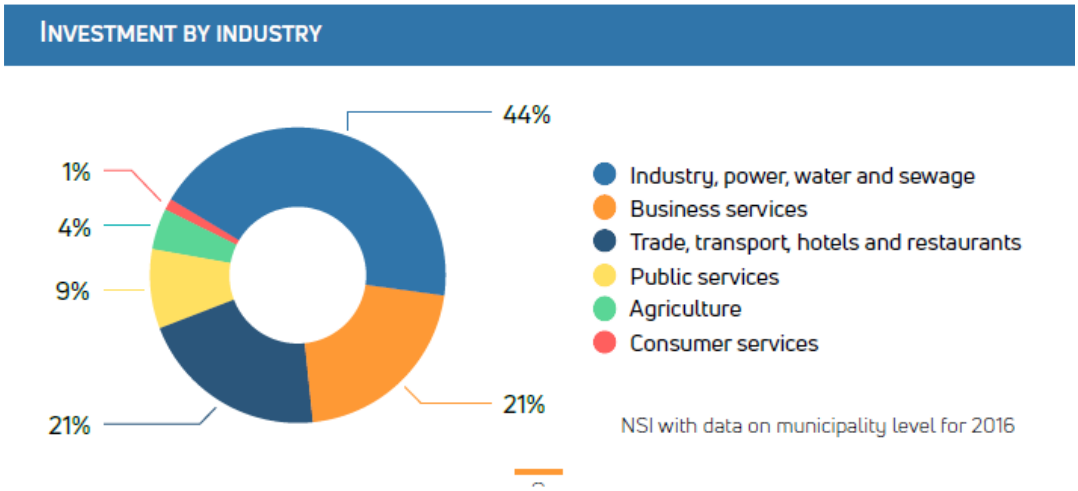

Figure BG. 3 Distribution of investment by the type of industry[104].

A new Investment profile of Gabrovo was developed: https://www.discover.gabrovo.bg/

Enterprise characteristics

Gabrovo is one of the most important economic centres in Bulgaria with long traditions in industry, a stable group of SMEs, developed educational system, high level of concentration of a qualified and high skilled labour force, availability of constructed facilities and VET establishments at secondary and tertiary level. In the last 20 years, Gabrovo has been undergoing dynamic regeneration regarding its industrial development. The leading economic sectors are still being developed based on the educational traditions and owing to the qualified workforce.

[104] https://www.discover.gabrovo.bg/en/

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Main sectors of economy are machine building industries and production of tool equipment, mechatronics, electronics, robotics, plastic manufacturing, textile, etc. The investments in the companies are mainly focused on innovations, technical modernization resource and energy efficiency.
3,608 companies operate in the municipality of Gabrovo, 468 of which are in manufacturing.
Portfolio of enterprises (2017) by size according to National Statistics:

- 2384 micro enterprises (less than 10 employees)
- 1190 small enterprises (less than 50 employees)
- 26 medium size enterprises (less than 250 employees)
- 8 big enterprises (more than 250 employees)

Manufacturing is the leading sector in the local economy, contributing almost 50% of the added value and workplaces in Gabrovo manufacturing companies. The largest share of investments, made for acquisition of fixed tangible assets, is in manufacturing – almost 44% of the total investments in the municipality.
The structure of the local economy indicates presence of a well-developed network of local suppliers. The leading sub-sectors are machine building, tool manufacturing and plastics.
More than 80% of the manufacturing companies are export oriented. There is a large number of foreign investors in the region with factories being active for more than 20 years.

Innovation system

According to the Peer review report of TECNALIA, Spain (ESSPO project):

- There is an incipient innovation ecosystem, but this Innovative Ecosystem of actors needs to be better connected and structured. There is a lack of intermediary organisations to support R&I actors.
- Innovation is also incipient so it would be recommendable to push an innovation culture especially in companies, in the companies this was already happening, but probably it would be good to extend this practice to other companies.
- To have a common starting point to innovation, a definition on what is innovation to set the context and draft guidelines to. Increase capabilities to think on innovation and in an innovative way would be very beneficial.
- Need to reinforce cooperation among the existing R&I actors: Try also to create some clustering and or networking initiatives in such a way that the companies and stakeholders from the same value chain could better cooperate, reaching a win-win situation. Big companies can take profit from smaller ones and vice versa. Also, some cross-cutting activities would be of interest for instance traditional industries work with other ones, betting on more innovative sectors that could give added value to those industries.
- Technology transfer should be also promoted and reinforced.
- As regards Clustering as such. Only informal structures exist. Cooperation between clusters and innovation networks generates a high-quality competitive advantage.
- On top of the innovation gap some educational gaps, especially a need of trained human resources for companies. More connection among universities and companies is needed in order to adapt the training programmes to the company's needs, and also increase the innovation capabilities.

Gabrovo Municipality is animating the local innovation network involving different stakeholders from business community, NGOs and educational system, encouraging the collaboration between business and education, in order to improve business environment and to stimulate innovations in the territory.

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Knowledge organization[101]

Gabrovo has a well-developed educational system. One of its main advantages is the existence of Technical University – Gabrovo, which was established in 1964 for more than 5000 engineering students. It is one of the most attractive and pro-active in the country. Currently, the University is implementing a project for establishment of a new Centre of competence with focus on eco and energy-saving technologies. Its cooperation with the business sector is a key factor for the local economic development and responsible innovations in the territory. The traditions and the well-established entrepreneurial mindset of Gabrovo residents provide a favourable business environment – for local companies and foreign investments.

Research & innovation Infrastructures[101]

R&I infrastructure is very fragmented, and it exists in the most innovative companies and in the University. Follow-up activities are necessary to be undertaken in order to achieve an integrated and interconnected innovation eco-system providing well developed infrastructure and high-quality services to the companies at local level, based on PPPs and B2B. An upgrade of the existing innovation eco-system is planned through the establishment of the new Competence Centre and the Regional Innovation Centre, which will develop those interconnections and improve significantly Gabrovo innovation eco-system.

Governance system

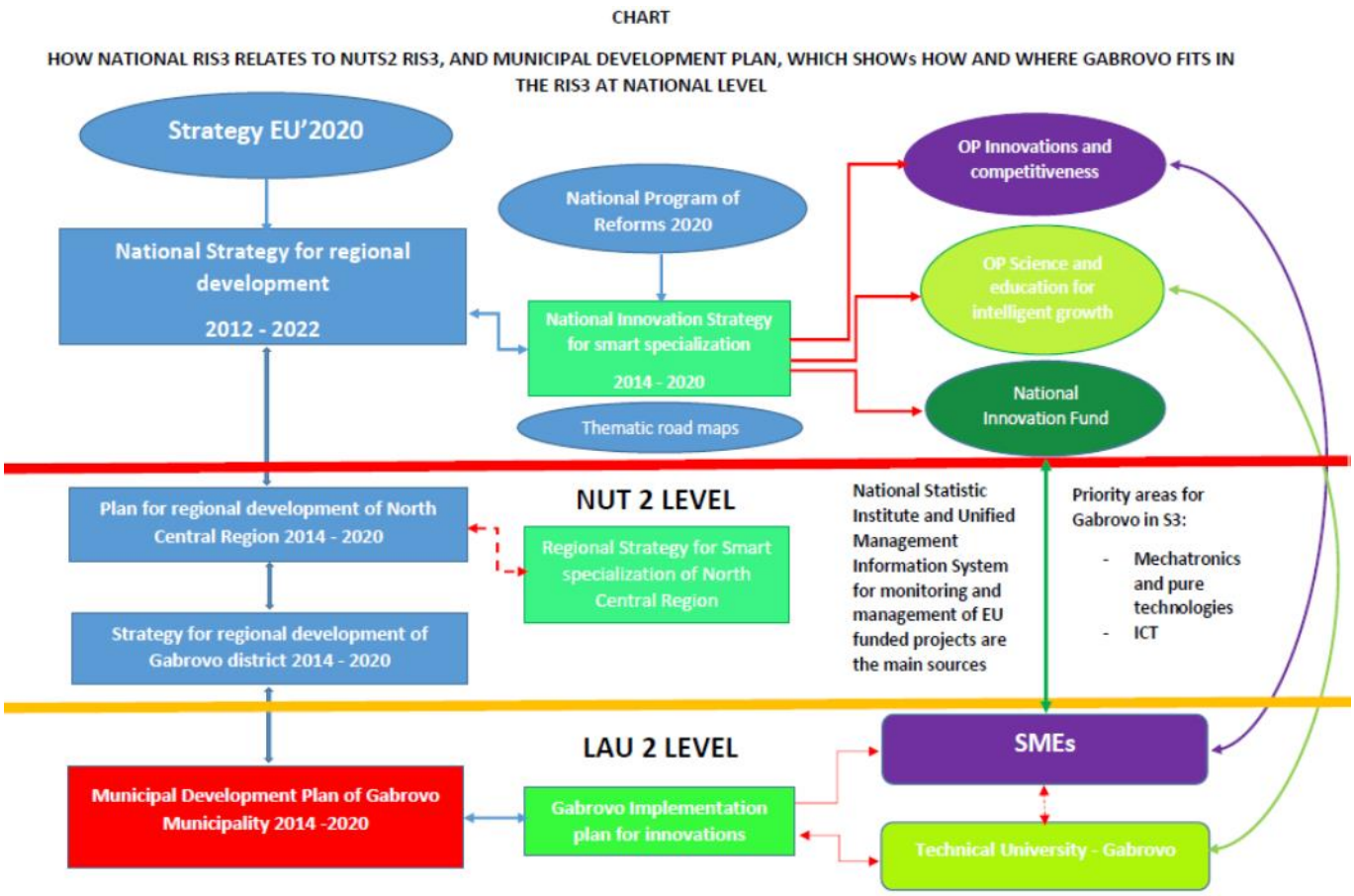

Figure BG. 4 Chart showing place of Gabrovo in the RIS3 at national level.

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Main Strategies

Gabrovo Municipality has developed an Implementation plan for innovations on local level to stimulate R&D and implementation of innovations in local businesses, based on S3. It is a part of the Municipal plan of development of Gabrovo municipality 2014-2020[82]. Its main goal is to stimulate R&D and innovation activities in companies with proactive participation of Technical University of Gabrovo. The target group includes companies; Technical University of Gabrovo; Chambers of commerce and industry; regional innovation stakeholders and NGOs

Priority areas specialisations:

- "Mechatronics and pure technologies"
- and "Informatics and ICT"

Implementation status

The existing traditional industrial sectors need to be transformed according to the new realities of INDUSTRY 4.0. A creation of a new demand-oriented SMEs support system is under implementation according to the approved Action plan. The scope of the System will cover the territory of Gabrovo municipality. The main goal is to increase the capacity and competitiveness of SMEs trough provision of expert support for development and implementation of projects in the manufacturing sectors of smart specialization. The competencies on specific products and technologies of the Technical University of Gabrovo, know-how of the innovative companies, business supporting NGOs and other important stakeholders in Gabrovo innovation eco-system, including suppliers in the whole production chain, will be used to increase innovation potential and capacity of SMEs. Enhanced innovation capacity of companies in development and implementation of innovative projects will increase the opportunities for internationalization and larger market share of Gabrovo industry.

The main elements of the SMEs support system are:

1. New support measures for better communication with local companies through development of a new digital business platform for innovations, including branding of local economy and organization of a campaign for its promotion abroad (participation in trade fairs, advertisement in worldwide famous economic media, participation in innovative pro-EU networks and business platforms).
Analysis show that local companies have low and limited capacity in development and implementation of innovative projects. The existing national policy is very centralized with limited funding provided mainly by the Operative Program "Innovations and competitiveness" 2014- 2020, NIF and some other programs. There is no local fund to support SMEs and to provide funding of business projects. There isn't an ability to release a municipal fund for this purpose because of the legislation. The link between educational institutions, NGOs and business is weak.
In 2017 Gabrovo Municipality established a stakeholders' group for innovation. Stakeholders' group worked on the development of an online survey on innovation capacity and needs of SMEs. According to the results it the need of development and implementation of a new business platform for innovations InnovaGab was approved. The platform will support the companies to find appropriate experts for development of their innovative projects. It will also provide information for funding opportunities, successful projects, business information and available training courses. The platform will connect companies with experts and scientists through an open register. Every company and expert can register creating an account into the platform. That will also foster B2B connections. Companies can present their profiles to different experts, business organizations and academia. The concept of the platform is based on three pillars – business, experts and science (PhDs, students and scientists). The different modules will be entirely business oriented and use the already developed economic GIS Layer created during Know-HUB project, funded by Interreg IVC. Using the database,

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acquired by the National Statistics Institute (NSI), a separate profile will be created for each company on the territory of Gabrovo municipality.

2. Establishment of a Regional Inovation Centre based on public-private partnership with broad participation of all interested stakeholders in Gabrovo innovation eco-system (local companies, experts, Technical University of Gabrovo, Chamber of Commerce and Industry, Gradishte Foundation, District Information Centre, local and district governments etc.)
The Centre will support the economic development of the region as an investment, hi-tech and innovative destination. The organization will function as a structure based on networking between public and private sectors. It will combine the activities of an accelerator, an incubator and co-working space. That will provide new opportunities to brand and internationalize the region, as a technology centre.

3. Creation of co-working space for young entrepreneurs and start-ups based on good practices from EU.
A physical space that will be designed to create a co-working space for young people - a place where they will be free to experiment and develop their own ideas. Gabrovo Municipality in partnership with "Gradishte" Foundation (NGO), has begun the preparation of a space for the realization of a co-working space, which will be a part of the new innovation centre.

As one of the main stakeholders in entrepreneurial ecosystem, Technical University-Gabrovo has been occupying a prominent position for years in the industrial transformation of the city, in the process of scientific research and innovative inventions in the sector of technologies and industry-related solutions. The university is an active agent in the community development of the region with the new perspectives of innovative technologically focused regional development.
Technical University-Gabrovo has initiated wide-scope partnership EU-financed projects with which two different types of centres will be established to support the ecosystem - https://www.tugab.bg.
National Centre of Excellence in Mechatronics and Pure technologies will be the country's leader in the scientific domain "Mechatronics and pure technologies". The establishment of three research campuses is planned, with modern equipment allowing high-quality researches; realization of a long-term plan in the domain and achievement of an effective technological transfer.
Centre of Competence "Intelligent Mechatronics, Eco and energy-saving systems and technologies". Within the project a reconstruction will be done of building premises and provision of hi-tech equipment. Laboratories, educative halls, working spaces will be organized as parts of a Centre of Competence. Leading researchers form the country and abroad will be attracted in the Centre to work together and exchange ideas and scientific research experience.

Monitoring and evaluation system – part the Action plan

Factors

Strengths	**Weaknesses**
• Industrialized region with developed infrastructure and industrial zones (more than 50% of employed people in the industrial sector) • Low taxes • Stable business community with a lot of foreign investments • Well-developed educational system and a Technical University	• Infrastructure for innovations is very segmented with not stable interconnections • Lack of intermediary organizations in the region to support innovations and development • Insufficient knowledge on the needs of the companies • Weak operational power of the Municipality • Lack of financial resources • Lack of structured innovation eco-system

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• Human capital with high entrepreneurial spirit • Entrepreneurial courses and trainings at all levels of education • Proactive and prepared administration with political commitment and clear vision how to support entrepreneurship • Established Innovation ecosystem • Busy Calendar of entrepreneurial events • Good international relations and membership in international networks	• Lack of entrepreneurial culture • "Business as usual" vs small innovative companies • Low R&D intensity and productivity • Limited spin-off processes • Service portfolio to entrepreneurs and SMEs is very limited and needs new types of services to be implemented • Low level of stakeholder engagement • Insufficient interest of young people • Lack of coordination between main actors • Disparities between the needs of local business and the training of students graduating from the Technical University of Gabrovo.
Opportunities • Gabrovo's entrepreneurial image & traditions • Availability of qualified academia in the technological/engineering studies • Launched initiatives for development of a Smart specialization strategy • Available workforce in a short distance which can be attracted in the region • Full access to European expertise • Interest of foreign investors and existing foreign companies in the municipality • Good international economic positioning • Involvement in many different EU networks and projects • Successful cases of business in the field of R&I • Acceleration of business dynamics in knowledge-based sectors • Experience in assisting start-ups	**Threats** • Demographic decrease • Ageing population - lack of workforce • Migration of youth – brain drain • Uninterested workers/experts in enlarging their competence • Uninterested entrepreneurs in enlarging business/investing in new R&I solutions • Uninterested community actors in networking/communicating/supporting/exchange • Centralised planning culture • Bureaucracy

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Summary

The presented reports summarize the organizational structure and points of focus of smart specialization of the 4 territories and 1 municipality where the transformative experiment will take place. Emphasis should not be placed on arriving to a common conclusion or comparison, because these are distinct territories with their own unique background, culture, infrastructure and priorities regarding the adoption of RRI practises. Nonetheless common ground for potential exchanges and mutual learning can be found in priority areas for smart specialization strategies:

1) Central Macedonia:
    a. Agro-food (priority A)
    b. Construction (priority A)
    c. Textile & Clothing (priority A)
    d. Tourism (priority A)
    e. ICT (priority B)
    f. Energy & environment (priority B)
    g. Transport & logistics (priority B)
2) Emilia Romagna
    a. Agri-food (priority A)
    b. Construction (priority A)
    c. Mechatronics and Automotive (priority A)
    d. Health and Wellness (priority B)
    e. Cultural and Creative industries (priority B)
3) Trøndelag
    a. Ocean-based economy
    b. Smart communities
    c. Tourism
    d. Bio-economy
    e. Circular economy
4) North east Romania
    a. Agri-food,
    b. Biotechnologies,
    c. Textiles & new materials,
    d. Tourism
    e. Health & Wellness
    f. ICT
    g. Energy & environment.
5) Gabrovo
    a. Mechatronics
    b. ICT

As seen from the list above there exist some overlap between different regions in priorities for smart specialization. Those mainly include: **ICT, Tourism, Agri-food, Health & Wellness, Energy & environment, Textiles, Mechatronics** and **Construction**. Exploiting those overlaps via mutual learning and exchanges could lead to fruitful inter-regional synergies.

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