



Smart specialisation in Hungary, Észak-Alföld (HU32), Hajdú-Bihar county and Debrecen

Background report to the JRC "RIS3 Support in Lagging Regions" project

Prepared by Lajos NYIRI (ZINNIA Group)

lahoska@gmail.com

15 September 2017

Table of contents

1. Introduction	1
2. Facts and figures – Észak-Alföld (NUTS2), Hajdú-Bihar county (NUTS3) and Debrecen	1
2.1. General information	2
2.2. Economy in Észak-Alföld, Hajdú-Bihar county and Debrecen	3
2.3. Innovation and research in Észak-Alföld, Hajdú-Bihar county and Debrecen.....	7
2.4. Main actors in innovation and research.....	10
2.4.1. Business sector	10
2.4.2. Higher education and public research organisations	11
2.4.3. Research infrastructures.....	14
2.4.4. Intermediary (bridge-building) organisations.....	15
3. Status of S3 - National and regional overview	17
3.1. National and regional S3 strategies.....	17
3.1.1. National smart specialisation strategy	18
3.1.2. Észak-Alföld RIS3.....	20
3.1.3. Development strategy of Hajdú-Bihar county for 2014-2020	22
3.1.4. Debrecen 'Integrated Territorial and Urban Development Strategy', 2014-2020	23
3.1.5. Correlation among RIS3 and other development strategies in Észak-Alföld.....	24
3.2. Implementation of smart specialisation strategy in Hungary	25
3.2.1. Policy mix	25
3.2.2. Governance & monitoring	32
 ANNEX 1: Actors of RIS3 strategy setting (Debrecen case).....	34
ANNEX 2: Academy-industry co-operations at the Debrecen University	37
ANNEX 3: List of major research infrastructures in Debrecen	38
ANNEX 4: Operational programmes with S3 relevance in Hungary for 2014-2020.....	40
ANNEX 5: List of interviewees	42

Figures

Figure 1: Number of employees in Észak-Alföld by educational level, 2010-2016	4
Figure 2: Share of employees with different education level in 2011; Debrecen, Észak-Alföld, HU and EU28.....	4
Figure 3: Market orientation of industrial products - Hungarian NUTS2 regions; 2010 (in million HUF)	5
Figure 4: Share of intramural R&D expenditures by sectors of performance, 2010-2014.....	8
Figure 5: Regional Innovation Scoreboard 2017 indicators - relative position of Észak-Alföld to Hungary and EU28	9
Figure 6: Approximate weights of smart specialisation angles in the three types of regions.....	19
Figure 7: Priorities and their inter-linkages if RIS3 and development strategies in Észak-Alföld (2012-2014).....	25
Figure 8: S3 strategy implementation governance structure	33

Tables

Table 1: Selected statistical data on Észak-Alföld compared to HU and EU28.....	3
Table 2: Scorecard of Észak-Alföld regional competitiveness index of 2016	7
Table 3: Funding sources supporting the S3 strategy angles	26
Table 4: Source of RTDI public measures for 2015-2017; Hungary	27
Table 5: List of calls for RTDI activities in Hungary in 2015-2017; indicative budget and source of funding	27
Table 6: Number of approved projects in RTDI related calls of GINOP - regional breakdown	30
Table 7: Allocation of EU funds for the programming period of 2014-2020 to Hungary.....	40
Table 8: Operational programmes of Hungary for the period of 2014-2020 in relation support innovation	40

1. Introduction

The present Background report aims to assist the JRC team in implementing the "*RIS3 support to lagging regions in Europe*" project, in particular in the preparation of a working visit to Hungary (Budapest and Debrecen), in the autumn of 2017.

According to the Terms of Reference, the document provides details on:

- The status of RIS3 implementation in Hungary at national and regional level:
 - ✓ A description of national RIS3 strategy and policy mix,
 - ✓ National and regional RIS3 priorities,
 - ✓ The Entrepreneurial Discovery Process,
 - ✓ RIS3 governance and monitoring;
- The relation between RIS3, the R&I and the higher education system, and
- The overall RIS3 implementation approach in Hungary and the Észak-Alföld region.

The report is mostly based on desk research, complemented by six interviews with local stakeholders and central government representatives (see ANNEX 5). The limited number of interviews, however, did not allow for a refinement of the findings and a check of the validity of several facts published or mentioned by interviewees. Therefore, later work to be done in the project should consider that and put emphasis on updating.

2. Facts and figures – Észak-Alföld (NUTS2), Hajdú-Bihar county (NUTS3) and Debrecen

Debrecen is the second largest city in Hungary, the regional centre of Észak-Alföld (NUTS2) region and the seat of Hajdú-Bihar county (NUTS3). The number of Debrecen inhabitants was 204,000 in 2015.¹ By the 18th century it was the largest Hungarian city.

The city is located on the Great Hungarian Plain, 220 km from Budapest. Debrecen's proximity to Ukraine and Romania enables it to develop as an important trade centre and transport hub for the wider international region.

Since the completion of the highway M35, Debrecen can be reached from Budapest in about two hours. The city has an international airport, where flights arrive only from Europe and from a limited number of destinations.



Észak-Alföld region (dark green), its counties (incl. Hajdú-Bihar) and its seat, Debrecen

Debrecen is a historic city. The first settlement was set up just after the first Hungarians arrived to

¹ Source: EDC (<http://invest.debrecen.hu/information#information>)

the Pannonian Basin in the 10th century. In 1361 self-governing rights were granted to the city by the king. Based on its location Debrecen suffered from the Mongolian, then the Turkish invasions. It was ruled by Hungarian kings and Serbian emperors. But in spite of this frequently changing environment, the city became a trade, education and cultural centre. It embraced the Protestant Reformation quite early, and at that time, most of its inhabitants were Hungarian Calvinists. By the early 18th century, the town was an important cultural, commercial and agricultural centre, and many future scholars and poets studied at its famous Protestant College (the predecessor of today's Debrecen University and also of Debrecen Reformed Church Theological University). In April 1849, the dethronization of Habsburgs (neglected after the fall of the revolution) and the independence of Hungary were proclaimed here at the Great (Calvinist) Church.

In 1857 the railway line between Budapest and Debrecen was completed, and Debrecen soon became a railway junction. In 1884, Debrecen became the first Hungarian city to have a steam-driven tramway.

During the 1848/49 revolution and at the end of the Second World War the city acted as the interim capital of the country.

The city has a long and strong tradition of self-governing, multiculturalism, and openness toward introducing technical innovation.

2.1. General information

Észak-Alföld is one of the seven NUTS2 regions in Hungary. Its territory is 17,723 km², accounting for 19% of Hungary's total surface. It consists of three NUTS3 counties. Hajdú-Bihar is the largest one in the region with a size of 6,209 km² (35% of the total).²

The region is less densely populated and less urbanised, producing a lower GDP per capita than the average GDP of Hungary and EU28. It has higher employment shares in public administration, manufacturing and agriculture, and lower shares in services.³

Észak-Alföld possesses some important natural resources, which determine economic and social activities and offer new opportunities for future development:

- good quality arable land for agriculture (producing raw materials for local food industry),
- thermal water – there is a large number of thermal baths in the region, providing balneology and other medical services (e.g. Hajdúszoboszló, 20 km from Debrecen, is one of the most popular medicinal centres in Hungary), while the geothermal energy exploitation is marginal;
- the Hortobágy National Park (25 km from Debrecen) is a UNESCO World Heritage site – one of the tourism trademarks in Hajdú-Bihar county.

² Source: EUROSTAT

³ European Regional Innovation Scoreboard 2016, regional scorecard

Table 1: Selected statistical data on Észak-Alföld compared to HU and EU28

	Észak-Alföld	HU	EU28
Population size, 2016 (000s)	1,470	9,830	510,280
Population density, 2015 (inhabitants per km ²)	83	106	117
Urbanisation, 2015 (%)*	57.7	67.8	74.1
GDP per capita (in current prices), 2015, €**	7,000	11,100	28,900
GDP per capita growth (PPS), 2010-2014, %	3.64	3.34	2.00
Share of employment in			
Agriculture & mining	7.7	5.1	5.1
Manufacturing	22.1	21.2	15.5
Utilities & construction	8.9	8.8	8.5
Services	48.5	55.9	63.2
Public administration	12.5	8.9	7.1
Average employed persons per enterprise, 2013-2014	3.9	4.4	5.4

Source: European Regional Innovation Scoreboard 2016 (except GDP per capita)

* Share of people living in urban areas compared to total population

** Source: EUROSTAT

2.2. The economy in Észak-Alföld, Hajdú-Bihar county and Debrecen

Employment

In 2016, 62% of the active population in the 15-64 age group was employed in Észak-Alföld. Since 2011 the region is on a steady annual growth from 49.9%. As Figure 1: shows, the fastest growing group of new employees belong to the lowest educational level (ISCED 0-2). New jobs in the period 2010-2016 provided opportunities for each education level, but the ISCED 3-4 and ISCED 5-8 groups grew by less than 20%, while the ISCED 0-2 group by more than 60%. The size of ISCED 5-8 group is still larger in the total than that of ISCED 0-2, but the difference is shrinking year by year. This pattern does not follow national trends (in Hungary, the size of ISCED 5-8 group of educated employees is continuously more than two times higher than the size of the ISCED 0-2 group, and in the period 2010-2016 the difference has not changed significantly.)⁴

Unemployment trends follow the HU average, but at a 3-4% higher level. In the past 10 years, 2011 was the worst year with 14.6%. Since 2013, unemployment has been continuously decreasing, and in 2016 it was 9.3% (EU28=8.6%; HU=5.1%)⁵.

The share of economically active population in the total population of Debrecen is less than 50% (in 2011: 44% of the total population).⁶ The distribution of workforce by education level in the city

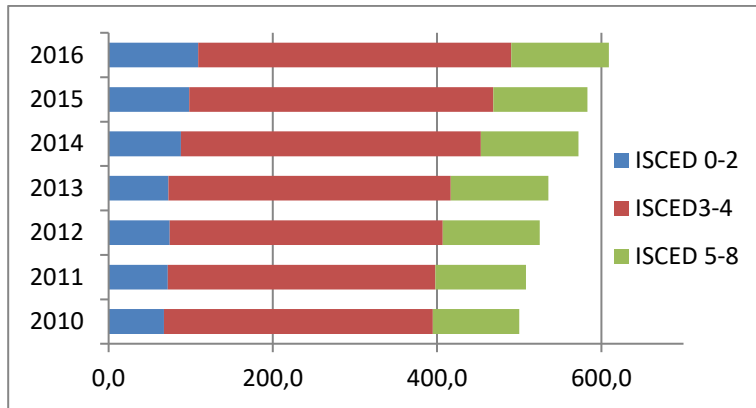
⁴ Source: EUROSTAT

⁵ Source: EUROSTAT

⁶ Source: EUROSTAT

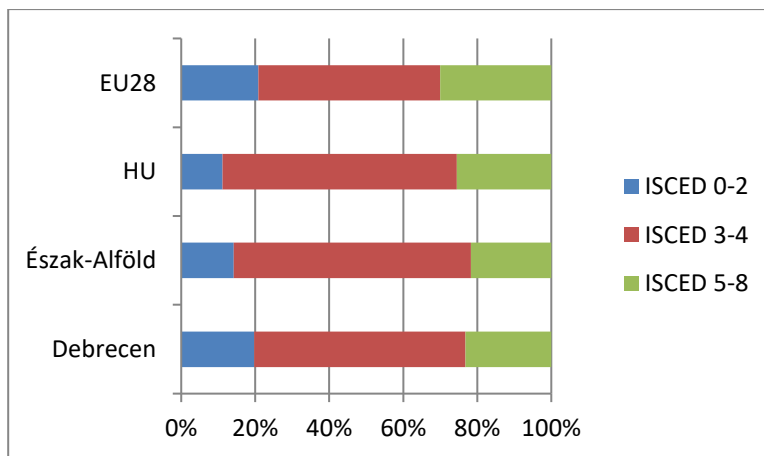
indicates some '*lagging region*' characteristics. There is a higher share of low-educated workforce than in the Észak-Alföld or Hungary, but it is close to the EU28 average (Debrecen: 20%, Észak-Alföld: 14%, Hungary: 11%, and EU28: 21 %). There is also a lower share of highly educated employees than in Hungary or in the EU28 (Debrecen: 23%, Hungary: 26% and EU28: 30%).⁷ (See Figure 2:) The level of unemployment was 8% in 2016, affecting mostly the low educated (ISCED 0-2) people, while the unemployment of highly educated workforce was marginal.

Figure 1: Number of employees in Észak-Alföld by educational level, 2010-2016



Source: EUROSTAT

Figure 2: Share of employees with different education level in 2011; Debrecen, Észak-Alföld, HU and EU28



Source: EUROSTAT

GDP

In **Észak-Alföld** the GDP (in current prices) grew from €9,265 M in 2010 to €10,397 M in 2015. Only 3 regions in Hungary produced more (Közép-Magyarország, Közép-Dunántúl and Nyugat-Dunántúl). However, taking into consideration the GDP per capita figures, the position of É-A is much worse: it is on the last or last but one position in Hungary during the same period, and it is only 27% of the EU28 average (2015), and this figure did not change significantly during the period 2010-2015 (Hungary average is at 39%, while the most developed region in Hungary, Budapest:

⁷ Source: EUROSTAT; all data on 2011

79%).⁸

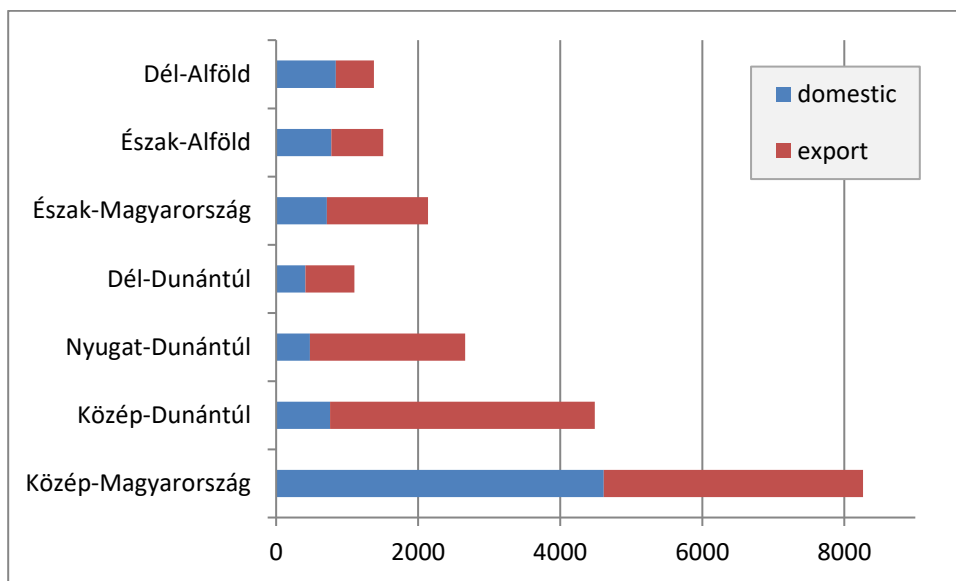
The Hajdú-Bihar county is the most developed in Észak-Alföld. Between 2000 and 2015 the growth of GDP both in Észak-Alföld and in Hajdú-Bihar was a little bit under the Hungarian average, neither É-A nor Hajdú-Bihar are in a catching up phase.⁹

FDI

The market orientation of economic activities in Hungary is strongly determined by geographical factors. Regions and counties in the Western part of the country are much more targeted by FDI and the production in general is more export-driven there. In 2010, for example, two Western regions (Nyugat-Dunántúl and Közép-Dunántúl) exported more than 80% of all their industrial products. Észak-Alföld had a 50-50% share between domestic and export markets, which is the third lowest on a national comparison.

In 2015 there were 722 companies in Észak-Alföld including FDI, around 300-300 in two counties (Hajdú-Bihar and Szabolcs-Szatmár-Bereg, in the two most Eastern part of Hungary, close to Ukraine). In terms of FDI per company, Észak-Alföld has a strong position in Hungary. FDI amounted to HUF1.617 M in 2015, the second highest in the country (70% higher than the national average).¹⁰

Figure 3: Market orientation of industrial products - Hungarian NUTS2 regions; 2010 (in million HUF)



Source: A gazdasági folyamatok regionális különbségei Magyarországon 2010-ben (The regional differences of economic activities in Hungary; 2010); KSH (Hungarian Statistical Office, Debrecen Branch), November 2011, ISSN 2061-3830

Since investors are fast to react to global and local market changes, the statistics on the size of annual FDI, the number of companies with FDI, and the size of investment per company are fluctuating year by year. However, an analysis of a longer period (data are available from the Hungarian Statistical Office for years 2008-2015) shows that Hajdú-Bihar county is most targeted

⁸ Source: EUROSTAT

⁹ Source: KSH (Hungarian Statistical Office)

¹⁰ Source: KSH (Hungarian Statistical Office)

by FDI in Észak-Alföld, but the interest of FDI has grown year by year toward Szabolcs-Szatmár-Bereg county.

Structure of the economy

According to their contribution to the regional GDP, **agriculture, manufacturing, education and health services, trade and logistical, transport and postal services can be considered as the most important sectors.** In Hajdú-Bihar county the energy and water supply should also be mentioned, while in Jász-Nagykun-Szolnok county the importance of manufacturing can be highlighted (Samsung and Electrolux, and their local SME suppliers). The Szabolcs-Szatmár-Bereg county has European importance in logistics and transport, thanks to its location (Záhony is the gate to the East through Ukraine)

Official EUROSTAT statistics on the share of gross value added across economic activities (by NACE categories) highlights the importance of some sectors in Debrecen:

- industry (between 20 and 25% of all value added; 2010-2014),
- public administration, education, human health and social work activities combined with professional, scientific and technical, and other administrative and support services represent 26-28% of value added – in 2013 more than 23,000 employees worked in these sectors.

Regional competitiveness position

According to the Regional Competitiveness Index (RCI) 2016¹¹ Észak-Alföld belongs to the bottom 20% of European regions with a score of 19.8. The region is on the 232nd position out of 263 European regions (see the methodology in Box 1).

The ranking position is a little bit higher in efficiency, and little lower in the general summary index of innovation, and equal in the case of efficiency. Least favourable areas are health and business sophistication. There are relative advantages in infrastructure, labour market efficiency, technological readiness and innovation. In the comparison with 15 reference (peer) regions, Észak-Alföld is neither stronger nor weaker by most indicators, except two: weakness is highlighted in the macroeconomic stability and strength in infrastructure.

BOX 1. Methods of EU Regional Competitiveness Index (RCI)

*The RCI 2016 provides an overview of the NUTS2 regions in Europe in a comparative manner. Three dimensions of indicators have been defined and the current status of the region is assessed according to the individual indicators. The **basic dimension** includes institutions, macroeconomic stability, infrastructure, health and basic education. The **efficiency dimension** consists of the higher education and lifelong learning, labour market efficiency and market size. The **innovation dimension** has three pillars: technological readiness, business sophistication and innovation. The final regional competitiveness index indicates the general competitive position of the given region to other ones in Europe. Each region is compared to the 15 regions with most similar GDP per capita in Europe.*

¹¹ Source: ec.europa.eu/regional_policy/sources/docgener/work/rci2016_scorecards.pdf

Table 2: Scorecard of Észak-Alföld regional competitiveness index of 2016

Dimensions	Pillars / indicators	Relative position	
		To 263 European regions	To 28 member states
Basic		233	
	institutions	214	
	macroeconomic stability		19
	infrastructure	164	
	health	256	
	basic education		22
Efficiency		224	
	higher education and lifelong learning	227	
	labour market efficiency	207	
	market size	232	
Innovation		237	
	technological readiness	211	
	business sophistication	246	
	innovation	218	

Source: http://ec.europa.eu/regional_policy/sources/docgener/work/rci2016_scorecards.pdf; European Regional Competitiveness Index 2016 scorecards

2.3. Innovation and research in Észak-Alföld, Hajdú-Bihar county and Debrecen

GERD

Both Észak-Alföld and Hajdú-Bihar county doubled the total R&D expenditures from 2005 to 2015. In terms of GERD per researcher the Észak-Alföld region produced the highest value among all Hungarian regions.¹²

In research & development intensity (measured by GERD/GDP) Észak-Alföld belongs to the medium-level regions in Europe with 1.29% in 2013. The per capita spending, however, is less than 14% of the European average (Észak-Alföld: €76.5; HU total: €145; EU28: €564 in 2014).¹³

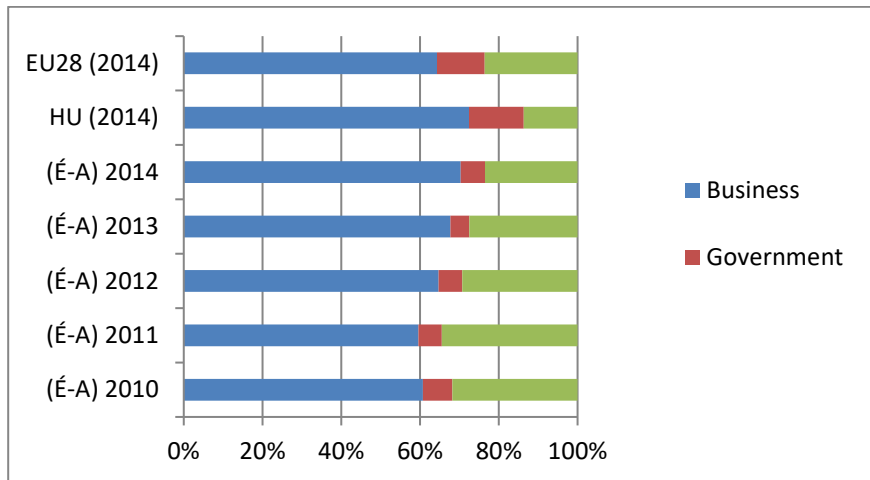
The **share of GERD by** sectors of performance shows more similarities with both HU total and EU28. The share of business expenditures for R&D is continuously growing (grow by more than 30% from 2010 to 2014).¹⁴

¹² Source: KSH (Hungarian Statistical Office)

¹³ Source: EUROSTAT

¹⁴ Source: EUROSTAT

Figure 4: Share of intramural R&D expenditures by sectors of performance, 2010-2014



Source: EUROSTAT

Research units and researchers

The **number of R&D institutes** in Észak-Alföld decreased from 300 to 272 between 2005 and 2015, but Hajdú-Bihar county, mostly thanks to activities in Debrecen, could retain this resource (2005: 212 institutes; 2017: 217).¹⁵

The **number of researchers** in Észak-Alföld increased from 1,272 to 1,567 during the same period, but Hajdú-Bihar county produced a much more intensive growth (from 957 to 1,280).¹⁶ The importance of Hajdú-Bihar county inside Észak-Alföld increased continuously in terms of both the number of research units and researchers during this period: the county represents more than 80% of the É-A regional total by both indicators in 2015.

Research performance

Researchers in Hajdú-Bihar county produced 10-12% of the country's total scientific publications in foreign languages between 2005 and 2015. In relation to the region, Hajdú-Bihar has a share between 88 and 93%. The number of publications normalised by the number of FTE researchers shows an even larger peak of R&D in Hajdú-Bihar (mostly in Debrecen): it is more than double of the country average, and the highest in Hungary.¹⁷

Regional competitive position in RTDI

According to the **Regional Innovation Scoreboard 2017** Észak-Alföld is a **Moderate - Innovator**, and its innovation performance has decreased considerably in the past years. Figure 5: shows the normalised scores per indicator and relative results compared to Hungary and the EU28.

The radar graph shows relative **strengths** compared to Hungary (red line) and the EU28 (blue line) in

- ✓ non-R&D innovation expenditures and

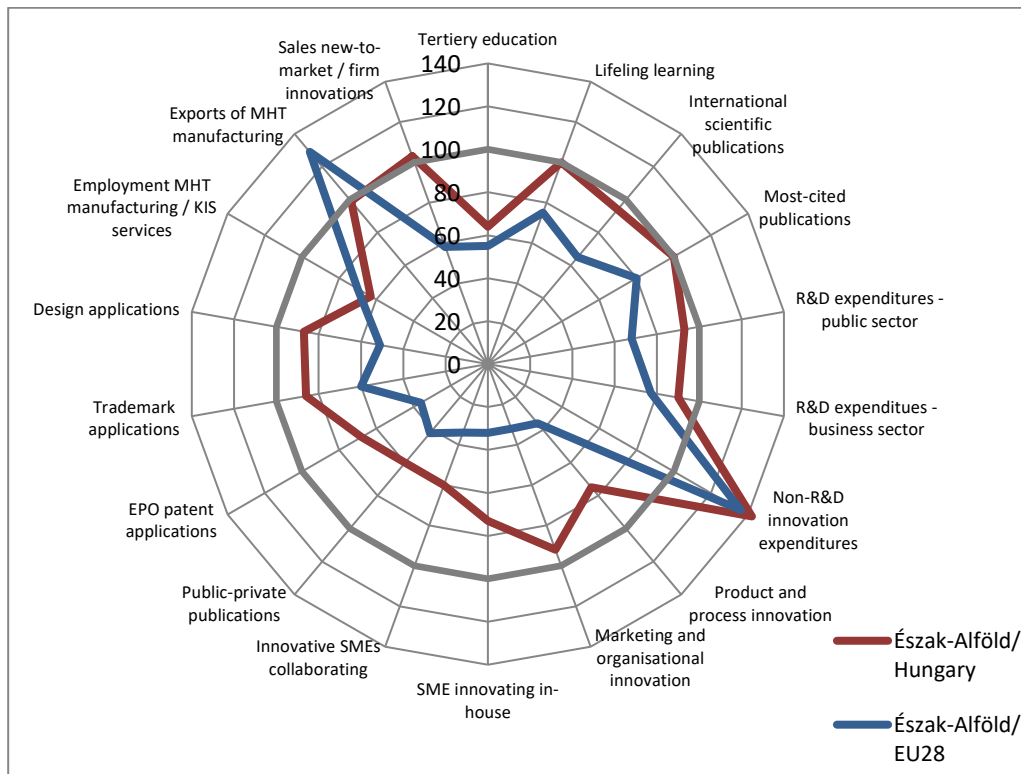
¹⁵ Source: KSH (Hungarian Statistical Office)

¹⁶ Source: KSH (Hungarian Statistical Office)

¹⁷ Source: KSH (Hungarian Statistical Office)

- ✓ exports of medium and high tech manufacturing products,
- and **weaknesses** in
- ✓ tertiary education,
 - ✓ product and process innovation,
 - ✓ SMEs innovating in-house and cooperating with others in business, and
 - ✓ employment in medium and high tech manufacturing and knowledge-intensive services.

Figure 5: Regional Innovation Scoreboard 2017 indicators - relative position of Észak-Alföld to Hungary and EU28



Source: Regional Innovation Scoreboard 2017 - country profile of Hungary; EU (<http://ec.europa.eu/DocsRoom/documents/24175>)

Analysing the trends in Észak-Alföld since 2008, when the Regional Innovation Scoreboard was first published, the following lessons can be drawn:¹⁸

- the general regional innovation index (RII) is oscillating year by year, like a sinus curve - its value is between 0.208 (2012) and 0.226 (2010),
- both medium and high-tech export and knowledge-intensive employment keep permanently high scores,
- there is a steady grow of the share of population with tertiary education,
- the scores of business R&D expenditures and non-R&D innovation expenditures are oscillating, but following an increasing trend,
- slight decrease can be experienced in public R&D,

¹⁸ The analysis has been made on the data provided by the Regional Innovation Scoreboard 2016

- the share of SMEs innovating in-house and cooperating with others are decreasing,
- since 2012 the share of SMEs making product or process innovation has been slightly decreasing, while those making organisational or marketing innovation has been slowly increasing,
- the share of new-to-sales products is decreasing.

2.4. Main actors in innovation and research

2.4.1. Business sector

In the absence of recent statistical analyses or studies published on the innovative companies and sectors in Észak-Alföld, **the analysis of the RIS3 strategy of the region can be used to take a first glance at the state of business RTDI activities.**

Based on the number of innovative firms in the region as indicated by the CIS2010 report of the European Commission and the economic weight of sectors, **the strategy identifies the most important sectors for smart specialisation:**

- agriculture and food
- textile and leather processing
- health
- plastic and rubber
- electronics and ICT
- therapeutic (medical) tourism
- service sector

The number of companies with mid-term R&D strategies or internal R&D units is low. Debrecen has the highest potential in this sense. ANNEX 1 contains a list of key actors broken by sectors and counties and the city of Debrecen.

The RIS3 strategy of Észak-Alföld (2013) gives a short introduction of the most important industries from innovation and smart specialisation point of view:

Food industry	<i>Based on its natural environment and economic conditions (traditions) the region has significant agricultural and food processing capacities. The structure of this sector is changing and in the long term, their competitive position both in national and international markets will largely depend on the successful commercialisation of genomic, proteomic and biotech research results.</i>
Textile & leather processing	<i>The number of registered companies in the clothing sector is over 4,500. Mostly SMEs are active in the region. They, however, face major challenges resulted from the growing competition in international markets. Firms producing textile products for technical use have product development strategy and capacity. Mostly large or medium sized companies work in this area in the region.</i>
Health industry	<i>Debrecen has become one of the biggest pharmaceutical industry centres in Hungary. The Richter Pharmaceutical Co. invested 15 billion HUF in 2008 to build a new biotech factory. The TEVA Pharmaceutical Co. is part of the Israeli TEVA Group and it runs the largest European research units of the mother company in Debrecen. Its main research areas are: neuro-protection and neuro-degeneration, autoimmune diseases, and oncology.</i>

Plastic & rubber industry	<i>Szabolcs-Szatmár-Bereg county hosts three major companies in this sector: Michelin Hungária and Continental Hungary have tire factories, while Lego Manufacturing has a plastic moulding factory in Nyíregyháza. Some companies are active in plastic processing in Jász-Nagykun-Szolnok county.</i>
ICT & electronics	<i>Several multinational companies have set up their local factory in electronics: LG, Samsung, National Instruments, etc. The number of medium size companies is high. National Instruments has strong linkages with the Debrecen University and with local high schools, and runs an incubator house and an open lab in Debrecen. In ICT the smaller companies dominate the market, some of them already started activities globally (example: Pannon Software Ltd in SaaS - Software as a service, and Invictus Games Ltd in mobile game applications). This sector is targeted by most of the start ups.</i>
Therapeutical tourism	<i>There are more than 9,000 hotels in the region providing medical (therapeutical) or wellness services. More than half of them are active in the Hajdú-Bihar county, mostly focusing on medical services, while in the other two counties the wellness hotels dominate the market. There are huge opportunities in improving the quality of general health services, in particular based on thermal water (balneology).</i>
Service sector	<i>The education and tourist services are the strong parts of service sector. The weights of transport, communication, financing and real estate are lower than the HU average. In recent years, thanks to international investments several regional service centres have started activities in Debrecen: British Telecom, IT Services, and the National Instruments have also deployed some regional services there, incl. IT development centre, customer service centre, financial service centre and European legal offices. The logistical services are also important in the region.</i>

2.4.2. Higher education and public research organisations

There are universities in the seats of all three counties of the Észak-Alföld region.

The **Nyíregyháza University** acted as college for decades and became a university in 2016. It has 8-10,000 students. The university provides courses at both BSc and MSc levels on wide scientific areas, including studies on agriculture, economics, ICT, natural, social, sport sciences, humanities and teacher education. It is a typical regional higher education organisation, teaching workforce mostly for the request of the regional labour market (including cross-border areas as well) and its research capacities are also mostly focused on close-to-market demands of the region.

Examples for such activities and services provided to businesses:

- 'FOOD-ENERG' Regional Knowledge Centre – run by the Agriculture and Molecular Research Institute, the centre focuses its research on vegetables and fruits produced in the region, the development of new functional foods, including production technologies as well,
- The economics and social sciences departments jointly run research programs to study the regional economic and social transformation process, including the opportunities to develop logistical and innovation centres, marketing and tourist services.

The **university in Szolnok** is under major restructuring. The former college merged with the college in Kecskemét (the seat of another county in the Dél-Alföld NUTS2 region) and received the title of university. The training programs of the new university are under major renewal with an active involvement of the Hungarian National Bank (in particular at the faculty of economy and business management).

The campus in Szolnok has 50 years history to provide college-level teaching in agriculture and technical areas, and 30 years in economics. The research activities are limited.

Debrecen has by far the strongest concentration of both research and higher education organisations. The three main institutes are:

- the Debrecen University,
- the ATOMKI (Institute for Nuclear Research of the Hungarian Academy of Sciences), and
- the Debrecen Reformed Church Theological University (Debreceni Református Hittudományi Egyetem)

In addition to the higher education organisations, the city has 37 secondary schools, and the vocational training is also strong with active involvement of local industries. In 2019 the municipality plans to open the International School of Debrecen (ISD), which will provide internationally recognised education from age 3 to 18. It is considered as an investment to make the city more attractive to FDI.

ATOMKI

The ATOMKI (Institute for Nuclear Research) is one of the basic research institutes of the Hungarian Academy of Sciences. The institute was established in 1954, at the time when there was a boost of setting up nuclear research facilities all over the world. (The founding document of CERN was also signed the same year.) The European Physical Society (EPS) constituted the main building of ATOMKI an *outstanding Historic Site in physics research*. Sándor Szalay, the founding director of the institute and his PhD student, Gyula Csikai carried out the neutrino experiments in this building in the autumn of 1956. These experiments confirmed the existence of the neutrino and thus laid a brick of the foundation of modern physics.

While ATOMKI is a typical basic research institute under the umbrella of the Academy of Sciences, it provides innovation services based on its research capacities, capabilities, and research infrastructure in the following areas: analysis of materials and surfaces, nuclear measurement technologies, environmental analytics, radiochemistry and biomedical applications, and plasma and ion-beam technologies.

The following list of international projects and research infrastructure managed by ATOMKI gives examples on the institute's research portfolio and the quality of research done there¹⁹:

- The new Laboratory for Heritage Science – Preparing for the participation in E-RIHS – <http://www.e-rihs.eu>
- Exploration and development of a novel control software framework for research infrastructures
- ICER Centre: Isotope Climatology and Environmental Research Centre
- Radiofrequency local protection system for the European Spallation Source (ESS) – <https://europeanspallationsource.se/kind-contributions>
- Integrated Platform for the European Research Infrastructure on Culture Heritage – <http://www.iperionch.eu/>

¹⁹ Source: <https://www.atomki.hu/en/projects>

Debrecen University (DU)

The first higher education institute in Debrecen was established in 1538 (College of Reformed Church). On the basis of this college, in 1912 the parliament decided to set up a new university in Debrecen with five faculties: theology, public administration and law, medical and natural sciences, and humanities/philology/history. After the Second World War, the university was split into several university-level education organisations (also called universities). In 2000 the Debrecen University (DU) started its activities in the present form as the result of the integration of the previous higher education institutes in town (except the Debrecen Reformed Church Theological University).²⁰

The DU is the largest employer in the county both in terms of the number of employees and its annual budget (in 2016: HUF129 billion - about €43 M). According to the DU homepage²¹ the university:

- has 14 faculties in areas of medical, dental and pharmaceutical sciences, agriculture-food-environment management, natural and technical sciences, IT, musical arts, humanities and social sciences, and law and political sciences;
- has 27,000 students in the 2016/17 school year, including 4,465 students from 105 countries (the number of foreign students has grown seven times since 2000);
- runs 49 courses in foreign languages;
- has wide and strong relationship with partner universities from all over the world (from 45 countries, with 410 universities).

The university has a strong tradition in research. 80% of its professors and other instructors have at least a PhD degree, 28 professors are full members of the Hungarian Academy of Sciences. 836 students study in the 70 PhD programs in all the faculties. In 2016 the DU was granted close to HUF 24 billion (~€8.3 M) through different grants.

The quality of research done at the DU can be demonstrated by assessing the outcomes of two recently published studies.²² Both documents use publication statistics of the Web of Science. The FOI study produced the *relative ratings of disciplines* (the share of the number of publications by Hungarian universities in HU total) and the so-called *Mean Normalized Citation Score* in the period of 2010 and 2014. The Kampis study used the *citation per publication* and the *classical Hirsch-(H)-index* for the periods of 2000-2010 and 2007-2011. In spite of the fact that the two documents do not apply exactly the same categories of scientific disciplines and the timeframes are also not totally the same, conclusions can be drawn to identify internationally strong research areas and the weight of the university in the Hungarian research system. As a result of analysing the outcomes of the two studies, the following lessons can be learned:

- the DU has an outstanding position in Hungary in the areas of molecular biology and genetics, clinical medicine, immunology and microbiology,

²⁰ The college of pedagogy and teachers education in Hajdúböszörmény joined as well to the DU

²¹ <https://www.unideb.hu/hu/debreceeni-egyetem-szamok-tukreben>

²² FOI: The performance of the Hungarian universities and the Hungarian Academy of Sciences in the international system of macro disciplines, 2010-2014; Background study for the Ministry of Human Resources (A hazai FOI-k és az MTA teljesítménye a makrodizciplínák nemzetközi rendszerében, 2010–2014, Háttéranyag az EMMI koordinálta Intézményfejlesztési Tervek elkészítéséhez; EMMI 99/2016/FEKUT);

and György Kampis: Structural analysis of the research activities in the Hungarian higher education - The use of science metric tools, 2013 (A hazai felsőoktatás kutatási szerkezetelemzése – Hazai tudományometriai felmérés – „Tudományometriai eszközök és adatok hasznosítása a hazai felsőoktatási intézményrendszer értékelésében, szerkezeti átalakításának előkészítésében és a gazdasági szférával való kapcsolatának fejlesztésében”, Petabyte Kft. – Oktatási Hivatal www.oktatas.hu/pub_bin/.../Tanulmany_v2_fi_n1_korr_roviditett.pdf)

- strong international position is measured in areas of molecular biology & genetics, clinical medicine, environment & ecology, mathematics, pharmacology & toxicology, physics, geosciences, social sciences, engineering, neuroscience and behaviour, computer science and agricultural sciences.

The DU is active in innovation as well. It has 4 teaching and research off-site departments operated and managed jointly with large local companies. Pharmaceutical and chemical industries, the IT sector and nature conservation are targeted by these university units, usually led by managers of the partner organisations. The university runs a business health program and provides broad range of health services at a regional basis (including hospitals, clinics, medical diagnosis services, etc.).

The university is very active in responding to government's STI policy goals and priorities and applies regularly to public calls which aim to improve the innovation ecosystem of regions and countries. Examples for recent successful applications of the DU in the past 20 years:

- **There are 5 clusters initiated by researchers and departments from the university, which include 180-200 companies** (see their list in ANNEX 2).
- **In 2010 the DU set up an Incubation Centre of Creative Industries financed by an EU grant.**²³
- **The Debrecen Science Park was established in 1999 as the first and so far the only industrial park in Hungarian universities.** According to its homepage, the Park provides business and innovation services to companies in the areas of functional food development (incl. food industry analytical laboratory), environmental industry (biomass and biogas pilot projects, bio-ethanol fermentation laboratory), and IT (services, server farm).²⁴

These, and other similar actions, are mostly driven by public financial sources and they are less motivated by organic development of the innovation ecosystem. After completing the publicly funded projects, the newly set organisation(s) stop working or continue(s) activities in much lower profile. Interviewees draw the attention to this phenomenon, which is typical not only to Debrecen, but to other cities in Hungary (and probably in Central and Eastern Europe) as well.

Annex 2 summarises the main forms of industry-university linkages the Debrecen University is involved in.

The Debrecen University is a strong research and teaching organisation, its impact goes far beyond the border of Észak-Alföld. It should be considered as one of the key actors in setting up and implementing any knowledge-based economic and social catch-up and renewal strategy.

2.4.3. Research infrastructures

Debrecen has a strong and unique concentration of research infrastructure (RI) in Észak-Alföld. The two major research organisations, ATOMKI and the Debrecen University, are hosting large majority of labs and equipments which offer services to industry, make possible high quality international collaborations and active in each level of higher educational training (from BSc to PhD and adult education).

The NEKIFUT data base, which was developed by the Hungarian government, contains hundreds of RIs, many of them having been given the title of "*research infrastructure with strategic importance*" (SKI). ANNEX 3 lists mostly those SKIs in Debrecen which are active at this time with business partners. Many others serve well the classical educational and research purposes.

Most of these RIs have STI importance beyond the borders of Észak-Alföld, some are unique at

²³ See more on <http://dekiik.ne.hu/index.php?lang=en>

²⁴ Source: <https://www.agr.unideb.hu/innovacio/oldal.php?megnyit=1005>

national level, and can be attractive to use in cross-border cooperation and service provision as well.

ATOMKI operates several RIs in physics, which provide services in areas like material and environmental sciences, and chemistry.

The Debrecen University is running high quality RIs in life sciences, which are used in much broader scientific disciplines and technological areas.

The university is partner in one of the largest R&D organisational and research infrastructure development projects in Hungary, funded by both EU and national sources in the area of molecular medicine. (See details in Box 2) The scientific and innovation centre of excellence will have three locations in the country, Debrecen is one of them.

BOX 2. HCEMM-MOLMEDEX – Creating the Hungarian Centre of Excellence for Molecular Medicine

The goal of the project is to set up the Hungarian Centre of Excellence for Molecular Medicine with strong emphasis on translational medicine and promoting the clinical application of basic research results.

The research programmes of the new centre of excellence are planned to be implemented in Szeged, Budapest and Debrecen, its headquarters will be hosted in the new innovation park in Szeged, in ELIPOLIS.

The project will receive a contribution of EUR 14,997,310 million (approximately HUF 4.5 billion) from the H2020 programme, the NKFIH will ensure an additional amount of EUR 5 million from the KTIA Fund for the 7-year-period which is backed with EUR 32 million (HUF 9.6 billion) from project funds under the GINOP. The full project budget is approximately EUR 52 million, i.e. HUF 15.6 billion.

Members of the HCEMM-MOLMEDEX consortium:

- *University of Szeged (SZTE)*
- *Biological Research Centre of the Hungarian Academy of Sciences (MTA SZBK)*
- *Debrecen University (DE)*
- *Semmelweis University (SE)*
- *European Molecular Biology Laboratory (EMBL)*

<https://www.sztaki.hu/en/science/news/two-hungarian-research-initiatives-among-ten-european-excellence-programmes-selected>

2.4.4. Intermediary (bridge-building) organisations

The region, in particular Debrecen, is very rich in intermediary organisations, which play significant role in the local innovation ecosystem. They are active in building bridges among knowledge and business, facilitating networking among the actors, transferring lessons learned through their daily experiences toward policy makers both at regional and national level, and promoting internationalisation of research and businesses.

Debrecen hosts the county branch of the Chambers of Commerce and of Agriculture, the Union of Hungarian Technical and Scientific Associations, and the Hungarian Innovation Association. The Hungarian Academy of Sciences runs here the Debrecen Academic Committee and its club. The general and specifically innovation focused public-funded promotion and development agencies are also active in the region. The universities have tech transfer offices, and the Debrecen University is the only higher education institute in Hungary hosting a science park.

Private firms are also active, but mostly providing traditional business facilitating services (including industry park, incubator, etc.), less directly related to innovation. Two initiatives in Debrecen, however, aim to provide facilities and services to innovative technology- and/ or knowledge-intensive start-ups and SMEs. The incubator run by Richter Pharmaceutical Company and the open lab of the National Instruments invite young entrepreneurs. Both initiatives are in a very early phase, but they indicate the strong local commitment of these innovative firms in the city.

The DBH Innovation and Business Centre was established in 1994 by Dutch and Hungarian local

authorities and development agencies as a non-profit foundation. It provides general business promotion services, but has activities in relation to innovation, in particular start-up facilitation. In 1998 the company became a for-profit organisation.

There are more than 30 industrial parks in the Észak-Alföld region, but only some can report on any R&D or innovation-related activities.

In Debrecen there are five parks, and the sixth one (the Southern Industry Park) will open in 2018. The existing industrial parks include:

- ✓ Daniella Industry Park (<http://www.daniellaiparipark.hu/>)
- ✓ Debrecen Logistical Centre and Industry Park (<http://www.delog.hu/>)
- ✓ Western Industry Park (<http://www.nyip.hu/>)
- ✓ Debrecen Regional and Innovation Park (<http://www.leandesign.hu/ipari-parkok/debreceeni-regionalis-es-innovacios-ipari-park-kft>) - hosting large innovative companies, including National Instruments and Richter Gedeon Pharmaceutical Co.
- ✓ Debrecen Science Park (<https://www.agr.unideb.hu/innovacio/oldal.php?megnyit=1014>)

Organisations of the start-up ecosystem

Most of the incubator houses in the region provide space and more general, less professional and sophisticated business services to companies with no or limited innovation activities.

In the past five years, the government gave high priority to developing the start-up ecosystem in the country. The intensive inflow of Jeremie financial sources has created favourable conditions for this business. One of the Jeremie venture capital funds in Hungary focused its activities on Debrecen and the surrounding region (**DBH Investment Venture Capital**).

The **EH Invest** provides complex services to start up and spin-off firms including incubation, co-working and fund-hunting, first of all to students and researchers at the Debrecen University. (<http://ehinvest.hu/>).

In 2016 one of the projects financed through GINOP (Economic Development and Innovation Operational Programme)²⁵ aimed to set up a spin-off incubator in Debrecen. EH Invest has already started the implementation.

Other specific services to start ups are also available in the city. The **XPotential** provides 340 m² of space for co-working (<http://xponential.hu/>), and the **Debrecen Hub** offers also co-working offices for new technology and knowledge intensive projects/firms. The **SingularityU Debrecen Chapter** (located in XPotential, as part of the Singularity University global network) facilitates the networking of start up firm leaders, organises

BOX 3. Startup Roundtable Debrecen

The Startup Roundtable Debrecen was founded in February 2015 by local innovative enterprises and start-ups that have already brought their ideas to market. The members of the Roundtable are continually increasing.

Active members of the Roundtable are:

- **Local, innovative businesses** (BitNinja, Codeyard, Optimonk, Slamby, Cybeln, RacingNet, Xeropan, Glulu, AmorFFactory, Mindensync, Planmaster 3D, Vitrolink, Syncee)
 - **Local startup organisations and unions** (DebTech, !gen Debrecen, debrecenbar.hu, DebrecenHUB)
 - **Funders, advisors, supporting companies and institutes** (EDC Debrecen, AID, DBH Group, University of Debrecen Research and Technology Transfer Centre, DTMP, FIVOSZ, MKB, NI Innovation program, HBKIK, Tender Auditor, KAVOSZ, Deloitte)
 - **Clusters** (Northern Great Plain Information Cluster, Pharmapolis Innovative Food Industry Cluster)
- <https://invest.debrecen.hu/economy#startups>

²⁵ Call of GINOP-2.1.5-15

educational programs for them and aims to assist the understanding and application of exponentially developing new technologies.

The **DOD (Developers of Debrecen) Meetup** is active in building linkages of local software programming experts with managers of interested companies in Debrecen, and provide trainings in software programming.

There are growing numbers of typical "start up" intermediaries in the city:

- INNONIC Group: startup studio²⁶
- Business&Beer: regular meetings for young potential entrepreneurs²⁷
- IGEN Debrecen: trainings for innovators and start uppers²⁸
- Team Academy: special innovative trainings for young "can-become" entrepreneurs²⁹
- DebTech Meetup: regular meetings to disseminate good practices in start up businesses³⁰
- Smart City Meetup: *"meeting point for experts, inventors, entrepreneurs, innovators and everybody who have vision about from Debrecen as the city of Future"*³¹

3. Status of RIS3 implementation - National and regional overview

3.1. National and regional RIS3 strategies

The Hungarian RIS3 strategy-setting process was launched in 2012 and completed in November 2014, when the government officially approved it.

Parallel with this process, all counties were obliged by the government to prepare their own development strategies as well.

As a result of these strategy-setting waves, the communication among the key actors (governing bodies, business, research and education, and civil societies) on formulating development objectives and priorities, defining potential tools and measures to implement them and setting up governing and monitoring systems was significantly strengthened. This newly-set strategy-setting community played a decisive role in harmonising these documents and reaching a good level of synergy among them.

There are four key documents related to RIS3 or other regional development strategies which should be taken into consideration in designing activities in the *"RIS3 support to lagging regions in Europe"* project in and around Debrecen:

- National smart specialisation strategy, 2014³²
- (Draft) Smart specialisation strategy of the Észak-Alföld region, 2013³³

²⁶ <http://www.innonic.com/>

²⁷ <http://businessandbeer.hu/>

²⁸ <http://www.igendebrecen.hu/>

²⁹ <http://teamacademy.hu/>

³⁰ <https://www.meetup.com/DebTech/>

³¹ <https://www.meetup.com/Debrecen-Smart-City-Meetup/events/225011776/>

³² Available in English at <http://nkfih.gov.hu/szakpolitika-strategia/intelligens-szakosodasi-strategia-s3>

- Development strategy of Hajdú-Bihar county, 2014³⁴
- Debrecen Integrated Territorial Program for 2014-2020³⁵

3.1.1. National smart specialisation strategy

Following the general reform of the national/regional administration approved by the Hungarian parliament in 2011, the (NUTS3) counties (and not the larger NUTS2 regions) became the highest level administrative and planning regional units in the country. Taking into consideration this fact, the Ministry of Economy (which was responsible for the preparation of the national RIS3 strategy) made at the very beginning of the process two important decisions:

1. The national strategy should be based on NUTS2 regional RIS3 strategies, which should be prepared by the publicly financed NUTS2 regional innovation agencies. These agencies were responsible in the RIS3 planning process for assisting the lower (county and city) level activities, providing methodological assistance, setting up strong EDP-driven activities at (NUTS3) county level. The network of these agencies acted as bridging organisation between the national RIS3 management team and the local efforts and activities.
2. A well-functioning management structure has been adjusted to the intelligent planning process, including the following main bodies:
 - ✓ At the beginning, the Ministry of Economy coordinated the process, with the involvement of the National Innovation Office (NIH), and provided methodological support to the regional innovation agencies in all NUTS2 regions. In the summer of 2014, when the new government established the National Research, Development and Innovation Office (NKFIH), the responsibility was fully shifted to this new agency.
 - ✓ A Steering Board was at the top of the management structure, which functioned as a forum of officials involved into the national RIS3 design process. Its work was supported by an Expert Panel, consisting of independent individuals representing all major stakeholder groups.
 - ✓ An inter-ministerial working group monitored the process and advised the management team.
 - ✓ Independent experts, contracted by the European Commission, supported the Hungarian RIS3 strategy setting, who regularly monitored the planning process and its interim results, and gave advices to the RIS3 management team.

In early 2013 the NUTS2 regional innovation agencies, at the request of the Ministry of Economy, prepared draft regional RIS3 strategies based on consultations with local and national experts and broad dialogue with regional stakeholders interested in RIS3. The agencies set up working groups on specific technological, sector-specific or application areas and made efforts to follow the quadruple-helix model. Local Research Prioritisation Working Groups acted in each county to support both the local and national planning efforts. Their membership combined researchers, investors, business leaders, representatives of intermediary organisations, relevant civil society people, etc.

³³ Észak-Alföld intelligens szakosodási stratégiája, 2013; <http://docplayer.hu/16019373-Eszak-alfold-intelligens-szakosodasi-strategiaja.html>

³⁴ Hajdú-Bihar megyei Területfejlesztési program 2014-2020; https://www.hbmo.hu/webdocs/Files/Portal/HB_Strategiai_Program.pdf

³⁵ Debrecen integrált területi program; http://portal.debrecen.hu/upload/File/Gazdasag/koncepcioik/integralt_teruleti_program_2014_2020.pdf

The national RIS3 design applied the regional typology, developed by OECD in 2011, and suggested by the EC RIS3 Guide. According to this methodology, **each region is positioned in a three-dimensional space: smart growth, sustainable growth and inclusive growth. The analysis resulted in three types of counties:**

- **knowledge regions,**
- **industrial production zones, and**
- **low knowledge and technology-intensive regions.**

The three counties in Észak-Alföld belong to different types: Hajdú-Bihar (incl. Debrecen) is considered as knowledge region, Jász-Nagykun-Szolnok county as industrial production zone, and Szabolcs-Szatmár-Bereg county as low S&T-driven region.

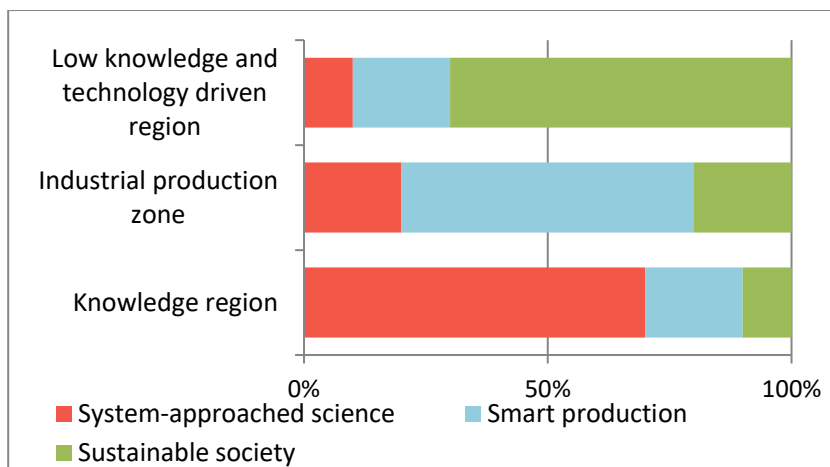
The vision on the future of the regions differs significantly based on which type they belong to. The knowledge regions (where Debrecen is located) *“will become dominant players of the macro-region and Europe”* in the selected specialization areas, and *“gain a competitive advantage through the strengthening of the knowledge centres and the involvement of the business sector”*. (National RIS3 of Hungary) The success of this region may have positive impact on the neighbouring regions (counties) as well.

In accordance with these types of regions, three national smart specialization angles were defined:

- **System-approach science** – emphasis is given to scientific activities following a systematic approach, which applies new knowledge for the benefit of business and society resulted from frontier research and favours interdisciplinary approaches.
- **Smart production** – RTDI efforts are focusing on serving product and process development, and supporting the technological renewal of the innovation chain. Special attention is given to the application of advanced materials and smart technologies.
- **Sustainable society** - RTDI provides innovative solutions to societal challenges; assists the technological renewal of existing industries and promotes the distribution of new technologies and equipments in order to improve the living standards and make the economy more productive.

There is a strong correlation between the type of the region and the weight of these smart specialisation angles. (See Figure 6:)

Figure 6: Approximate weights of smart specialisation angles in the three types of regions



Source: National Smart Specialisation Strategy 2014, Hungary

The document identifies six sectoral and two horizontal research areas as priorities in implementing the RIS3 strategy:

Sectoral priorities

- ❖ **Healthy society and wellbeing** *Understanding diseases, early diagnosis, advanced medical and instrumental therapies, clinical methods, pharmaceutical research and development, innovative health industry and health tourism*
- ❖ **Advanced technologies in the automobile and other machine industries** *Advanced production systems, advanced materials, nanotechnology, mechatronics and electronics*
- ❖ **Clean and renewable energies** *Green energy, renewable and bio-energy, nuclear energy, energy efficiency*
- ❖ **Sustainable environment** *Natural resource management, advanced environmental technologies*
- ❖ **Healthy local food** *High added value food processing*
- ❖ **Agricultural innovation** *Agriculture, forestry, hunting, aquaculture and water management, horticultural technologies, agricultural biotechnology*

Horizontal priorities

- ❖ **ICT & services** *ICT in support of the sectoral priorities and ICT services*
- ❖ **Inclusive and sustainable society, viable environment** *Education and training, promoting entrepreneurial skills, development of cooperation, networking, social innovation*

The strategy identifies tools and measures the government plans to apply in implementing the strategy. It also defines the governing and the monitoring system as well. (See more in chapter 3.2.)

3.1.2. Észak-Alföld RIS3

The NUTS2 regional RIS3 strategies were prepared in early 2013 at the request of the Ministry of Economy as input to the national RIS3 planning. The Észak-Alföld Regional Innovation Agency (INNOVA) coordinated these efforts in Észak-Alföld, involving all interested actors from the three counties in the region.

The Agency put emphasis on making a strong statistical analysis, made many interviews, set up working groups and provided methodological support to the county level activities (prioritisation working groups, SWOT analysis, focus group meetings, etc.).

The work was done in a very short period of time, only three months were given by the ministry. INNOVA has produced a good quality strategy document, supported by facts, statistics, and it applied innovative methods in analysing the available information.

The document specified the mid-term development objective for Észak-Alföld:

"For the 2014-2020 period the region of Észak-Alföld aims to facilitate and promote activities which are highly based on the application of new knowledge and technologies and will result in

***growing international competitiveness and increase social welfare in the region."*(please indicate source document and page).**

Based on the SWOT analysis of the region's innovation ecosystem, the RIS3 strategy defines two groups of priorities in order to achieve this objective:

Sectoral priorities

- ❖ Development of competitive **agriculture** (in particular the production of vegetables and fruits, and animal husbandry) by increasing the share of higher value-added products and applying resource-effective technologies
- ❖ Development of healthy, high quality **food** production
- ❖ Improve the exploitation of the available **natural resources and renewable energy** and to strengthen the related research potential
- ❖ Development of the **service sector**, in particular based on the existing health and ICT services
- ❖ Development of **health industry** (in particular pharmaceuticals, molecular diagnostics) in order to react successfully to challenges of aging society and human-environment interactions – special focus in Hajdú-Bihar county
- ❖ Strengthening the **rubber and plastic industry** innovation and its research base – special focus in Szabolcs-Szatmár-Bereg county
- ❖ Development of **machine, automobile and electronics industry** in order to strengthen the integration of these businesses into the local economy by better use of the existing innovation potentials and set up new research infrastructures – special focus in Jász-Nagykun-Szolnok county

Horizontal priorities

- | | |
|---|---|
| Development of innovation capacities | <ul style="list-style-type: none"> • <i>Developing the research infrastructure in the region;</i> • <i>Developing human resources required by the labour market (vocational training, higher education)</i> |
| Development of the innovation framework and environment | <ul style="list-style-type: none"> • <i>Improving both the availability and quality of innovation management services</i> • <i>Developing the social and public services related to innovation</i> • <i>Awareness building of innovation</i> |
| Facilitating innovation collaborations | <ul style="list-style-type: none"> • <i>Facilitating the domestic and international networking of actors in innovation</i> • <i>Supporting the preparation and implementation of public RTDI programmes</i> • <i>Facilitating the application of new forms of innovation cooperation</i> |

The Észak-Alföld RIS3 strategy has not been approved by any administrative and/or political bodies, it was used as input to the national S3 strategy. Its methodological approach and its recommendations have been clearly applied and used by the approved national strategy.

3.1.3. Development strategy of Hajdú-Bihar county for 2014-2020

All counties in Hungary were committed by law and two government decrees³⁶ to prepare and approve their development strategy for the financing period 2014-2020. The process was coordinated by the Ministry of Economy.

In Hajdú-Bihar the planning process was designed, monitored, and approved by the General Assembly of the county. The thematic standing committees of the General Assembly and the Hajdú-Bihar county Planning Forum were involved in the process. In addition, thematic working groups were set up, and consultations with municipalities in the county were also organised. All major stakeholders, including businesses, chambers of commerce and of agriculture, research, civil society organisations, churches, participated in the social dialogue related to the general and specific questions of the strategy.

The approved strategy provides a detailed fact-based analysis on the present state of the county. The proposed objectives are supported by the lessons learned and conclusions drawn from this analysis. The document defines two groups of strategic aims:

Sector-specific aims

- | | |
|---|--|
| A1. Sustainable environment | <ul style="list-style-type: none">• <i>Sustainable water management reacting to the impacts of climate change</i>• <i>Promoting the secondary use of thermal water, improving energy efficiency and the exploitation of renewable energy in households and business activities</i>• <i>Special attention to the Hortobágy National Parks</i> |
| A2. Competitive economy and healthy food | <ul style="list-style-type: none">• <i>Developing business infrastructure in order to facilitate cooperation among firms (industrial parks, incubators, clusters, etc.)</i>• <i>Promoting FDI</i>• <i>Special attention to Debrecen, as regional centre of medical services and innovation (see more details later in this chapter)</i> |
| A3. Education and vocational training | <ul style="list-style-type: none">• <i>Increasing the capacities of the local education institutes (at each level) to react fast and successfully to business demands</i>• <i>Improving the education at university level</i>• <i>Capitalising the existing foreign language teaching at the Debrecen University</i> |
| A4. Social, medical and communal developments | <ul style="list-style-type: none">• <i>Reactions to the aging society challenges</i> |

Territorial aims

- T1. Debrecen, as the medical capital of the Pannonian Basin
- T2. Centre of districts³⁷ as the hub of cooperation among local communities
- T3. Small settlements as location of rural communities

The county's development strategy puts special attention to **Debrecen**, as the seat of the county, which has regional and cross-border impacts in providing high-quality services (medical, educational, etc.) and having internationally strong knowledge base.

According to the strategy Debrecen should become the innovation centre of the region. These

³⁶ Law XXI. of 1996 on regional development, government decrees: 1600/2012. (XII. 17.), 1115/2013. (III.8.), 218/2009. (X.6.)

³⁷ 'District' (in Hungarian: járás) is an administrative unit between county and city/ village

efforts should focus on the following sectors:

- agriculture and food industry,
- health and pharmaceutical industries,
- machinery, electronics and ICT,
- logistics,
- industries/technologies related to the use of renewable energy and exploitation of natural resources.

3.1.4. Debrecen 'Integrated Territorial and Urban Development Strategy', 2014-2020

In the period 2007-2013 (the previous EU financial period), Debrecen proved to be very successful in attracting financial sources to realise large-scale development projects. The municipality received more than HUF53 B, while the Debrecen University won an additional HUF 42.5 B through different EU-funded grants.

According to a government decree³⁸, all cities in Hungary with so-called county-right were committed to prepare and approve an '*integrated strategy for territorial and urban development for 2014-2020*'. This strategy was considered as an entry-condition to access financial sources from the Territorial and Settlement Development Operational Programme (TOP - one of the OPs in Hungary). The above government decree gives a list of indicative budget for the given county and cities with county-rights. Debrecen is in a very preferential status with HUF 43.32 billion (~€140 M), by far the highest amount among all cities with county-right in the country.

These documents cannot be considered as city development strategies in general terms, since their focus is on identifying strategic projects, priorities for spending the indicative budget of one single operational program. Their preparation, however, needed broad consultations with all stakeholder groups and developed local strategy setting resources. The final results include analysis of the state of the city and indicate mid-term strategic objectives, implementation tools and priorities as well.

Debrecen had some traditions in strategy-setting. **The city approved in 2008 a comprehensive development strategy, and published an innovation development programme in 2013³⁹.**

According to the **Debrecen innovation programme**, published in 2013, the city aims to become one of the R&D and innovation centres in the European Union by 2020. The programme aims at transferring the **Vital City** concept of Debrecen into practical measures and projects. The innovation programme focuses on four areas: supporting medical and health industry, high value-added industries, promoting investments and agriculture and food industry. There are pilot projects listed in the programme as well. The strategy-setting for the use of the TOP indicative budget could use the outcomes of these strategies.

The Integrated Territorial and Urban Development Strategy of Debrecen was approved by the city council in 2015. The document specifies objectives and priorities which can fit with the TOP, but it endeavours to highlight broader development targets financed partly from TOP and partly from other operational programmes or different public sources (incl. the city's own budget).

The strategy goes down to financial allocation of the available indicative budget for concrete

³⁸ 314/2012. (XI.8.) government decree

³⁹ http://portal.debrecen.hu/hirek/helyi/innovaciosgazdasagfejlesztesiprogram2013_kozeletihirek.html

projects. The following list includes only those ones (as examples) which may have direct impact on RIS3 related developments:

Economic development

Debrecen Innovation Programme	HUF 2.8 B (~€9 M)
Infrastructure development of Debrecen's southern economic zone	HUF 3,3 B (~ €10.5 M)
Road construction to improve the access of the Industry Park of the DU	HUF 400 m (~€1.3 M)

Improving employment linked to economy development

Investment promotion programme	HUF 450 m (~ €14.5 M)
Enterprise development programme	HUF 350 m (~ €11 M)

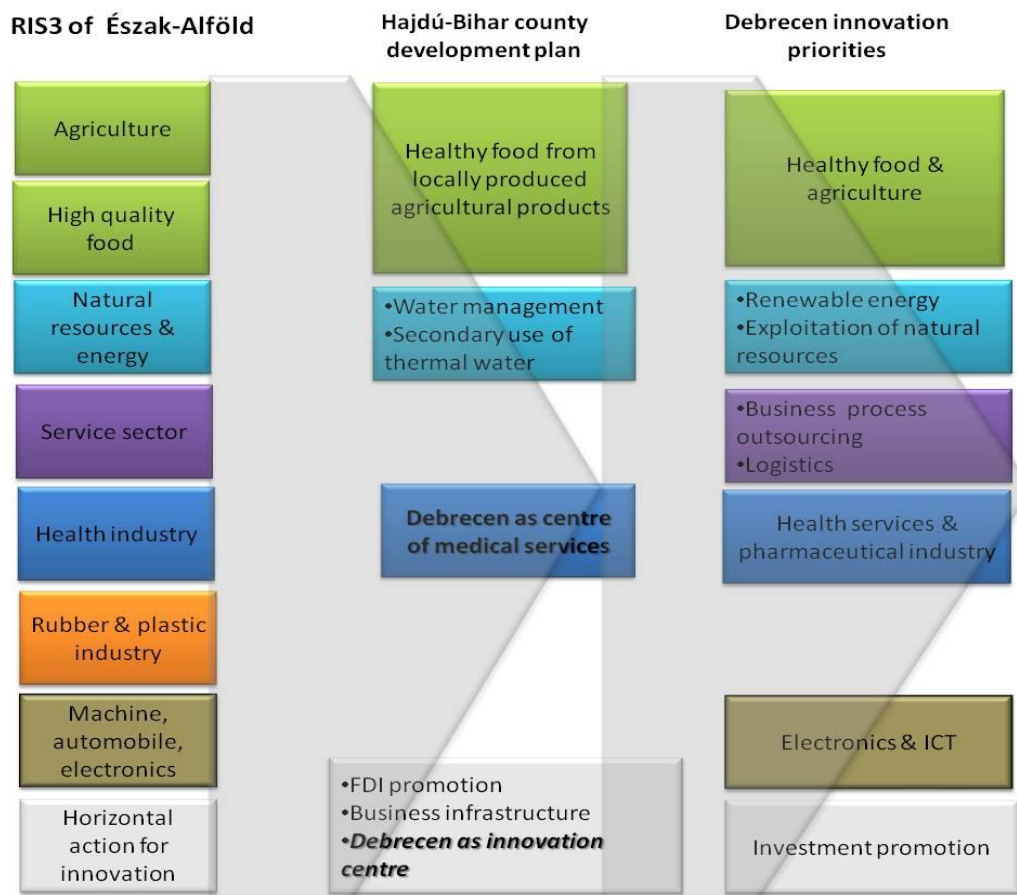
Programs for improving social cohesion

Talent promotion programme	HUF 80 m (~ €0.26 M)
----------------------------	----------------------

3.1.5. Correlation among RIS3 and other development strategies in Észak-Alföld

In the period 2012-2015 several strategies have been formulated in the Észak-Alföld region. In spite of the fact that the RIS3 strategy has not been approved formally, it had significant impact on other planning processes. The document itself and the fact that there was a large overlapping of stakeholders and experts in the different planning processes resulted in a good level of synergy across the documents shortly discussed above. It may be useful to summarise the correlation and inter-linkages of innovation priorities at NUTS2, NUTS3 and Debrecen city level. (See the result in 0)

Figure 7: Priorities and their inter-linkages of RIS3 and development strategies in Észak-Alföld (2012-2014)



3.2. Implementation of smart specialisation strategy in Hungary

3.2.1. Policy mix

The complex planning process in 2013-2014 faced double challenges: attaining synergy between:

1) RIS3 and RTDI policy targets and priorities

At the time of RIS3 strategy planning, the government had an approved national RTDI strategy for 2013-2020, which was prepared by the Ministry of Economy, but with an active contribution of the National Innovation Office (which was under the supervision of the ministry). The same organisations launched the RIS3 strategy-setting processes in 2013. But this work was completed by the newly established National Research, Development and Innovation Office partly. There were large overlapping of the staff of NKFIH and the former NIH, including teams working on RIS3 as well.

2) RIS3 strategy and operational programmes for 2014-2020

The RIS3 document, which details the RIS3 specialization directions, and the operational programmes are complementary planning materials, and the consistency between the two planning documents was guaranteed by a panel of experts set up for this purpose (the Inter-ministerial Working Group).

The peer review on the Hungarian research and innovation system, done by independent experts

and published by the European Commission in 2016⁴⁰, gave a critical overview on the state of RTDI in the country. On the policy mix the report states that

- The "country applies a very broad mix of support measures. The majority of instruments are direct interventions, targeting the generation of knowledge and innovation (supply-side measures), comprised of a mix of different grant schemes and financial instruments, including equity investments, loans and guarantees."
- The same office "administers currently both the grants for scientific research and the development of innovations by private sector actors, and a significant share of these schemes is financed from the EU Structural Funds. In addition, business enterprises can benefit from indirect support measures: tax incentives for R&D".
- The RTDI strategy for 2013-2020 aims at increasing significantly the role of demand-side measures, like public procurement of innovation (PPI) and pre-commercial public procurement (PCP). "However, many of those schemes are only in their beginnings or are still to be designed."

Direct measures for RIS3

The Hungarian government applies four types of direct measures in promoting innovation and RIS3 actions:

- EU co-funded operational programmes (see details later),
- the Research and Technology Innovation Fund (KTIA)⁴¹ financed partly by the national budget and partly by the tax-like payment (levy) of companies,
- Horizon 2020, and
- Individual government decisions on a case-by-case basis.

The RIS3 national strategy indicates the direct funding programs for supporting the different specialisation angles:

Table 3: Funding sources supporting the RIS3 strategy angles

Smart specialisation angles	Source of direct funding		
	EU funded OPs*	OTKA ⁴²	KTIA ⁴³
System-approached science	GINOP, VEKOP, EFOP, VP	X	X
Smart production	GINOP, VEKOP, KEHOP, EFOP, VP, MAHOP		X
Sustainable society	GINOP, VEKOP, EFOP, VP, MAHOP	X	X

Source: Smart specialisation strategy of Hungary

* ANNEX 4 gives detailed information on the operational programmes in Hungary for the period of 2014-2020, including their thematic priorities and breakdown of budget by sources (EU Funds and Hungarian national budget)

⁴⁰ Peer Review of the Hungarian Research and Innovation System, European Commission, Publications Office of the European Union, 2016 ISBN: 978-92-79-61827-7

⁴¹ The KTIA has two sources: (1) the innovation levy (innovációs járulék) amounts to 0.3% of the tax base, which is an obligatory payment for all medium-sized and large companies in Hungary, and (2) government contribution, matching the sum of collected levy

⁴² National Scientific Research Fund

⁴³ Research, Development and Innovation Fund

In 2015 the government decided on the use and annual breakdown of RTDI-oriented direct public funding sources in general and by call:⁴⁴

Table 4: Source of RTDI public measures for 2015-2017; Hungary

Source	Notes	2015 HUF B	2016 HUF B		2017 HUF B	
		Grant	Grant	Loan	Grant	Loan
GINOP	Support to all regions except Central-Hungary and Budapest	255.91	215.92	112.19		80
VEKOP	Support to all regions except Central-Hungary and Budapest		38.26			5.49
KTIA		11.29	68.43		89.21	

Source: <http://nkfih.gov.hu/palyazatok/hazai-kfi-palyazatok>

The synergy between the use of EU Funds and KTIA in relation to RTDI (and RIS3) funding is demonstrated by the list of calls in Table 5:. The colours in the columns of 2015, 2016 and 2017 indicate the source (GINOP, VEKOP or KTIA; see the colours in Table 4:). Many calls aim at directly implementing the RIS3 strategy, or RIS3 priorities are one of the necessary selection criteria. (These calls are highlighted in yellow in the "Calls" column.) Other calls are also linked to RIS3 implementation by developing human capital and research infrastructure, increasing business R&D and innovation potential, and improving internationalisation of the Hungarian R&D sector.

Table 5: List of calls for RTDI activities in Hungary in 2015-2017; indicative budget and source of funding

Objective	Calls	2015 B HUF	2016 B HUF		2017 B HUF	
		Grant	Grant	Loan	Grant	Loan
Business RTDI	Support to business RTDI activities GINOP-2.1.1-15 ; VEKOP-2.1.1-15 ; KFI 16	50	22			
			17.62			
			21		30	
	RTDI loan to companies GINOP-8.1.1-16			42.19		
	Support to business RTDI (grant + loans) GINOP-2.1.2-8.1.4-16		80	40		
	National technology and intellectual property venture capital programme* GINOP-8.1.3/A-16			30		
				20**		
	Smart specialisation venture capital					70

⁴⁴ <http://nkfih.gov.hu/palyazatok/hazai-kfi-palyazatok>

International	programme GINOP-8.1.3/B-17 ; VEKOP 2.1.2-17					5.49
	National capital fund GINOP 8.6.3/A-17					10
	IPR GINOP-2.1.3-15 ; IPARJOG 15	1				
		0.3			0.1	
	Innovation voucher GINOP-2.1.4-15	3				
	Innovation ecosystem GINOP-2.1.5-15 ; ÖKO 16	5				
					1.5	
	Innovative product development for export GINOP-2.1.6-16		5			
	Support for export orientation business R&D activities Export 17				10	
	Prototype, product, technology and service development GINOP-2.1.7-15 ; VEKOP-2.1.7-15	20	25			
			8			
	Co-operation for competitiveness and excellence GINOP-2.2.1-15 ; NVKP 16 ; VEKOP-2.2.1-16 ; VKE 17	50	52.92			
			2.64			
			28		17	
	Cooperation centres of higher education and industry – support to develop research infrastructure GINOP-2.3.4-15 ; FIEK 16	26.86				
			8			
Infrastructure	Excellence of R&D units GINOP-2.3.2-15 ; VEKOP-2.3.2-16	40	26			
			4			
	Strengthening of research infrastructures - internationalisation and networking GINOP-2.3.3-15 ; VEKOP-2.3.3-15	20	5			
			6			
	ELI laser research centre GINOP-2.3.6-15	40.05				
Frontier research and PhD programmes	Thematic projects initiated by researchers K 15 ; K 16 ; K 17	5.98	7		6.5	
	Postdoc calls PD 2015/1,2, 3 ; PD 16 ; PD 17	1.57	1.8		1.5	
	Thematic calls initiated by young researchers FK 17				3	
	Outstanding research groups with high international reputation KH 17				1	
	National Excellence Programme NKP 17				10	
International	Hungarian support to researchers in connection	0,45	0.45		0,45	

with ERC calls ERC HU 15 ; ERC 16 MOBIL					
Thematic calls for projects implemented under intergovernmental agreements NN 17, ANN 17, SNN 17 ; V4-Japán Közös Kutatási Program ; KNN 16				1	
Promotion of HU participation in H2020 KKV 15 ; EU KP 16 ; NEMZ 16 ; ERA-NET Infect-ERA ; ERA-NET E-Rare-3 ; M-ERA.NET-2 ; JPND ; FLAG-ERA JTC ; Quant-ERA ; EUREKA 15 ; EUREKA 16	2.2	1.5		2.05	
Supplementary support to HU participants in projects of HU2020 Teaming				1.91	
BI-lateral R&D projects under intergovernmental agreements	0.79	0.68		3.2	

Source: <http://nkfih.gov.hu/palyazatok/hazai-kfi-palyazatok>

* Support for projects/companies in seed and pre-seed phase

**Funded by the Hungarian Development Bank

According to the recent peer review report, there is "*a strong potential for using the Smart Specialisation Strategy to reorient R&D activities towards key priority themes and thematically focused grants, but so far, the government has not fully embraced this opportunity. Compliance with the priority areas identified in the Smart Specialisation Strategy became an important eligibility criterion for many funding calls..., but the priority areas are so broadly defined that applicants would be able to demonstrate this compliance for most of the proposed projects.*"

Thanks to the EMIR database (which provides statistical tables for the public, refreshed on a daily basis)⁴⁵ some analyses could be made in order to assess the application results of organisations from Észak-Alföld, Hajdú-Bihar county and Debrecen:

- In general Észak-Alföld is very active in submitting applications to different public calls. Organisations from the region have submitted 7,245 applications with a request of HUF 805.1 billion to all the running Operational Programmes. Finally 2.824 projects have been approved with a total of HUF 351.8 billion financial grant. Észak-Alföld is on the second place in Hungary both in terms of the number of contracts and financial support granted, after Közép-Magyarország (incl. Budapest).
- Hajdú-Bihar county is the most active in the region, with 2,892 submitted applications (HUF 340.7 billion request) and 1,074 approved projects (with HUF 167.5 billion support). The county has received close to 50% of all financial support to Észak-Alföld so far.
- The statistics on GINOP (the Economic Development and Innovation Operational Programme) provides more detailed information broken down by calls and different regional levels. (See Table 6:) Debrecen has strong position in both business RTDI and research-related applications.

⁴⁵ The report uses data of 7 Sept 2017 available at the following homepage of EMIR:

http://emir.palyazat.gov.hu/nd/kozvel/?link=eupr_eljarasrendi&sc=1&ml=1&sr=167&offset=8&id_op=1382&id_tamogatascel=-1&id_paly_tip=-1

Table 6: Number of approved projects in RTDI-related calls of GINOP - regional breakdown

Call	HU total	Észak-Alföld	Hajdú-Bihar county	Debrecen
Business RTDI (GINOP 2.1.1-15)	258	45	24	19
Prototype, product, technology and service development (GINOP 2.1.7)	404	69	38	30
Co-operation for competitiveness and excellence (GINOP 2.2.1.-15)	94	14	10	7
Excellence of R&D units (GINOP 2.3.2-15)	59	10	9	9
Strengthening of research infrastructures - internationalisation and networking (GINOP 2.3.3 -15)	41	11	11	11
Cooperation centres of higher education and industry – support to develop research infrastructure (GINOP 2.3.4-15)	5	1	1	1

Source: EMIR database of 7 Sept 2017

- According to the President of NKFIH⁴⁶ the Debrecen University received about HUF 22.5 billion for 41 projects from different RTDI public funding schemes (Operational Programmes and KTIA calls) in 2015 and 2016. It is by far the highest amount among all the Hungarian higher education institutes. There are two companies located in Debrecen that are among the top 20 firms having received public financial sources to RTDI in the same period (Richter and Hajdúhús 2000)⁴⁷

Indirect measures for RIS3

Both the Hungarian RIS3 and RTDI strategies clearly aim to strengthen the use of indirect measures in facilitating innovation activities of companies. The Hungarian taxation system favours the costs of R&D, wages of researchers and IP income as the incentive base:

- Popular tax incentive in Hungary: enhanced allowance⁴⁸ and patent box⁴⁹.
- There is an opportunity to reduce the taxes and charges on employment of personnel participating in R&D activities.

⁴⁶ At the event of ELTE-Újbuda Innovation Day, 18 April 2017

⁴⁷ Richter Pharmaceutical Co. has production facilities in other locations in the country as well, it is impossible to check what share of the support is going to the Debrecen factory and labs. Hajdúhús 2000 is active in food industry.

⁴⁸ An enhanced allowance effectively decreases the base amount that is taxed by allowing to 'inflate' the R&D expenditure base

⁴⁹ A patent box is a tax incentive that offers a reduced corporate income tax rate for income derived from patents

- All companies with more than 50 employees are obliged to pay the innovation levy, which is a separate tax amounting to 0.3% of the tax base. The innovation levy, however, is reduced if a company incurs R&D expenditures. These companies have double benefit through this system: receiving tax benefits and having high potential to receive direct financial support as well through the KTIA grant calls.
- In spite of the fact that the government considers the start-up ecosystem as a high priority RTDI policy area, there are no tax benefits targeting innovative start-ups or business angels.

According to the recently published EU peer review analysis, *"the portfolio of available measures matches the options available to businesses in many other countries. They include among others the preferential tax treatment of income derived from R&D projects, and reductions in payroll costs (compulsory social security contributions) for highly skilled R&D employees (PhD holders or doctoral candidates), alongside more traditional measures, reducing tax burdens based on the R&D expenditures (including research contracted to universities or HAS)."* The main bottleneck of the present system is that the benefits are distributed among a very limited number of companies.

The nationally applied instruments can be accompanied by local tax advantages, e.g., business tax advantage. The Debrecen municipality has some advantages given to companies if they are active in R&D activities.⁵⁰

In addition to the taxation system some financial measures are also available for companies in Hungary. Examples for such measures:

- investment programmes (like JEREMIE),
- export guarantees,
- collateral bank guarantees (the Funding for Growth Scheme, provided by the Hungarian National Bank)
- the capital asset investment credit for export.

In summary, the policy mix aiming at the implementation of the national S3 strategy consists of direct and indirect measures, provided by the national government and local authorities/municipalities.

Regional activities in EU Framework Programmes

It is hard to assess precisely the impact of Framework Programme 7 and HORIZON 2020 in Hungarian or regional RIS3 implementation. In the framework of this project (and contract) research disciplines and technology areas close to the RIS3 priorities can be subject of assessment. At regional level, the FP7/H2020 statistics may indicate strong areas of RTDI.

According to the statistical analysis of **FP7**⁵¹ participation Észak-Alföld is on the third position after Közép-Magyarország (Central Hungary) and Dél-Alföld in terms of financial sources granted (13.0 M€) and second in terms of number of projects contracted (92). Large majority of funded projects in the region are managed by organisations located in Hajdú-Bihar county, mostly in Debrecen (82 projects out of 92). With this result the county is on third position in Hungary, after Budapest and Pest county.

The strongest scientific/technological discipline was health with 8 supported project participations. The total financial support was €1.8 M to participants (mostly from Debrecen). There were five projects in food, agriculture and biotechnology (with close to 1 M€ support). Six projects supported research infrastructure development. Six projects from ICT were also selected

⁵⁰ 29/2007. (VI. 28.) decree of the Debrecen municipality council

⁵¹ Statistical data were provided by NKFIH on 8 September 2017

for funding.

The Debrecen University had more than 50% of all project participations (50 projects) and received about 70% of all financial support from the EC, followed by the ATOMKI (8 projects with €1.4 M). The university in Nyíregyháza also participated in five projects, but with a marginal sum of support (€60.5 thousand). The most successful company was UG-Genomed (4 projects and 0.8 M€). Two clusters were also among the participants in 1-1 projects (Innovative Food Industry Cluster and Pharmapolis Cluster).

H2020 statistical data are more or less in line with the above assessment:

- 25 projects have been selected for support by the EC with a grant of €3.1 M so far from Észak-Alföld. All project lead partners are located in Debrecen. The Debrecen University is far the strongest applicant with 15 projects, ATOMKI has 2, and innovative SMEs have 4 projects.
- Both in terms of the number of selected projects and their financial support the *"Health, demographic change and wellbeing"* thematic objective is the most successful area with six projects (€ 1.2 M grants). In *"Innovation SME"* there are four projects (€25,600), while in *"Marie Skłodowska-Curie actions"* and *"Research infrastructure"* there are 3-3 projects (MSCA: €423.6 thousand, RI: €461.9 thousand). Two projects are supported in *"Secure, clean and sufficient energy"* (€116.5 thousand) and 1-1 project in *ICT, emerging technologies, food security, and "Teaming"*.
- Taking into consideration the priorities of the regional draft RIS3 strategy and other county and city level priorities set by the approved strategies (see chapter 3.1.) the success of health and medical research is good news, while the poor participation in agriculture and food R&D areas is bad news.
- In comparison to the number of projects in all HU regions (except Central-Hungary, incl. Budapest with its extreme high share by any means) the low interest of organisations in Észak-Alföld in food research calls is even more visible. Each other HU regions have more approved projects than in Észak-Alföld. (For example Dél-Alföld has 10, Közép-Dunántúl 5 approved projects in this area.) In health research Észak-Alföld is on the top, but surprisingly no project participation in transport at all from this region (while other regions have shown interest in this area as well).
- The success rate in terms of the contracted financial support shows poor performance of Észak-Alföld (only 2%) and Hajdú-Bihar county as well. The level of total request from Észak-Alföld is high, third in the country, but in terms of success rate it is only last but one. Hajdú-Bihar is in the middle ground among all the counties in Hungary with €3.1 M contracted.

3.2.2. Governance & monitoring

The approved national RIS3 strategy aimed at setting up a multi-level governance system: *"A key objective of this strategy is... to develop an RDI coordination system at the national and county levels, which operates a transparent, stable and supportive institutional structure... and develops the necessary framework and maintains it on the long term... The smart specialization process does not end with the completion of the national S3 as a strategic document. Among other things, the continued evaluation and monitoring system of S3, as well as the maintenance of the operational programmes require continuous learning, feedback and development during the seven-year planning cycle."*⁵²

The applied governance model follows the general approach of the Hungarian government: implementation of RIS3 and RTDI strategy goes hand in hand. The RIS3 priorities and strategic

⁵² National S3 strategy of Hungary, 2014

directions determine the goals, applied tools and measures of STI policy and its implementation measures. The governance model covers both RIS3 and RTDI and at this time it has five types of actors:

- Government
- Advisory Committee on Innovation
- Targeted inter-ministerial meetings
- Operational Program Managing Authorities
- S3 Management Team

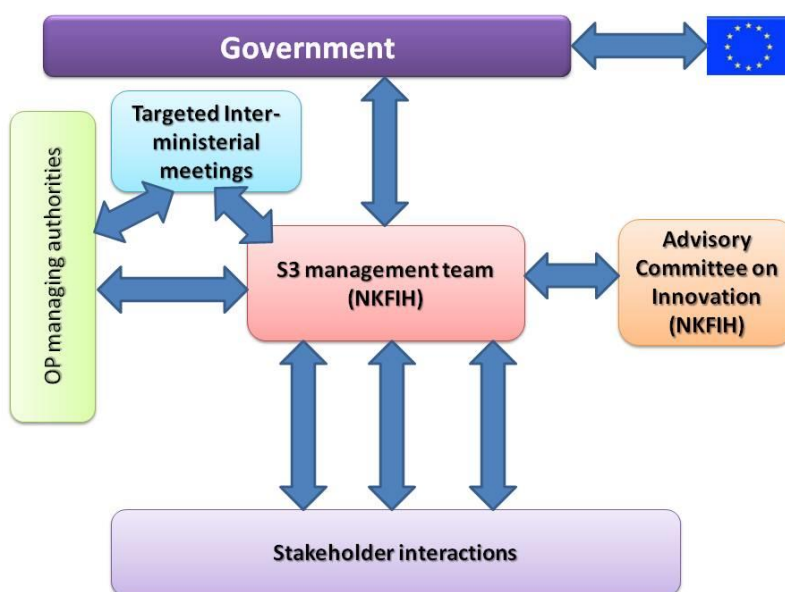
The **S3 Management Team** supervises the implementation of the strategy, coordinates activities, monitors regularly the outcomes and results, and suggests revisions or necessary steps to be taken in improving the efficiency and effectiveness of the implementation. It works in the structure of the National Research, Development and Innovation Office (NKFIH).

The president of NKFIH and the S3 Management Team are supported by the **Advisory Committee on Innovation**, which consists of independent experts representing stakeholder groups. The Committee has an important role in evaluating the results of the RIS3 implementation process. Specific panels on concrete RTDI issues (e.g. R&D infrastructure, or ICT) may also be set up in assisting the work of the body and NKFIH.

The **OP Managing Authorities** are responsible for implementing the operational programs, managing the calls, the contracts, collecting raw data for statistical purposes and analysis in order to draw lessons learned.

The **Targeted inter-ministerial meetings** are responsible for the coordination of the use of direct funding measures, in particular the synergies between the operational programmes and the national resources (in particular the KTIA fund). There are no standing members of this forum, in each and every case experts who are most relevant on the specific issues discussed are invited. These meetings provide opportunities to disseminate lessons learned through the implementation of funding measures.

Figure 8: S3 strategy implementation governance structure



Source: ??

The **RTDI strategy for 2013-2020** is **under revision** in order to better match with the fast changing market demands and react to the lessons learned from the implementation of the RIS3 strategy and the funding experiences of different operational programs.

The National Research, Development and Innovation Office (NKFIH) has recently launched the revision process. As the first step, the Office started to collect general statistical data both at national and regional levels, and facts and figures related to the calls of relevant operational programmes and KTIA in 2014-2017. Based on their analyses, it is planned to organise focus group meetings in key technological areas and sectors. Members of the Advisory Committee on Innovation will be involved into these activities, but other stakeholders will also be invited to the meetings. One of the key tasks of the revision is to assess the lessons learned in implementing the RIS3 strategy, and examine whether any changes should be initiated with the aim of improving the efficiency of the RIS3 implementation. The process is considered as mid-term monitoring of the RIS3 implementation as well.

ANNEX 1: Key actors in RIS3 strategy implementation (Debrecen case)

Enterprises

Sector	Jász-Nagykun-Szolnok county	Szabolcs-Szatmár-Bereg county	Hajdú-Bihar county (not in Debrecen)	Debrecen
Food industry & canneries	<ul style="list-style-type: none"> • Jásztej • Kuntej • Bunge • Syngenta Seeds 	<ul style="list-style-type: none"> • EKO • Parmen • Master Good 	<ul style="list-style-type: none"> • Pentafröst • Élelmiszer Kft. 	<ul style="list-style-type: none"> • Milli-FrieslandCampina • Hajdúság 2000 • Parmen • Hajdú Gabona • Parmen • Petisfood
Textile industry	<ul style="list-style-type: none"> • Tisza Cipő • (Many SMEs) 	<ul style="list-style-type: none"> • Szamos Kft. • (many SMEs) 	<ul style="list-style-type: none"> • (SMEs) 	<ul style="list-style-type: none"> •
Pharmaceuticals and other chemical industry, health industry		<ul style="list-style-type: none"> • Taurus Agrotyre • Unilever • Alkaloida K+F 		<ul style="list-style-type: none"> • TEVA • Richter Gedeon Pharmaceutical Co. • Szinapszis Market Research and Consulting Service • Walkable Future • AstridBio (Debrecen) • UD-GenoMed • Biosystem International
Machinery industry	<ul style="list-style-type: none"> • Electrolux • Carrier • Stadler 			<ul style="list-style-type: none"> • Hajdú • EMD Endoszkóp Műszergyártó

	<ul style="list-style-type: none"> • <i>Ruukki Tisza</i> • <i>Dometic</i> • <i>Agrohíd</i> • <i>FF Fémfeldolgozó</i> 			
Manufacturing	<ul style="list-style-type: none"> • <i>Samsung</i> • <i>RAFI Hungária</i> 	<ul style="list-style-type: none"> • <i>Carl Zeiss</i> • <i>MOM</i> 		<ul style="list-style-type: none"> • <i>National Instruments</i>
Plastic and rubber industry	<ul style="list-style-type: none"> • <i>Jász-Plasztik</i> • <i>Metálplasztik</i> • <i>T-Plasztik</i> • <i>Samyang Hungary</i> 	<ul style="list-style-type: none"> • <i>Michelin</i> • <i>Continental</i> • <i>Lego Manufacturing Co.</i> 		
ICT				<ul style="list-style-type: none"> • <i>EPAM</i> • <i>Invictus Games</i> • <i>Neuron Software</i> • <i>Pannon Software Informatikai Kft.</i> • <i>evopro systems engineering</i> • <i>start ups</i>
Energy				<ul style="list-style-type: none"> • <i>ENEREA Észak-Alföld Regional Energy Agency</i>
Regional service centres				<ul style="list-style-type: none"> • <i>ITSH</i> • <i>Services</i> • <i>Merlin</i> • <i>Ryanair</i> • <i>DHL</i> • <i>IT Services</i> • <i>British Telecom</i>

Intermediary organisations

Chambers

Chamber of Commerce (Hajdú-Bihar county)

Chamber of Agriculture (Hajdú-Bihar county)

Scientific and innovation associations/academy

MTA Debreceni Akadémiai Bizottság⁵³

MTESZ⁵⁴ Hajdú-Bihar county office

MISZ⁵⁵ regional office

Publicly funded agencies

INNOVA Észak-Alföld Regional Innovation Agency

ENEREA Észak-Alföld Energy Agency

EDC Debrecen

⁵³ Debrecen Academic Committee of the Hungarian Academy of Sciences

⁵⁴ Union of Hungarian Technical and Scientific Associations

⁵⁵ Hungarian Innovation Association

University tech transfer office	Business Development Foundation ⁵⁶ Debrecen University Knowledge and Technology Transfer Office
Open labs	The National Instruments in Debrecen is operating an open lab for those using the products of the company in developing new tools, technologies and products

Industry parks

List of existing industrial parks in Debrecen:

- ✓ Daniella Industry Park (<http://www.daniellaiparipark.hu/>)
- ✓ Debrecen Logistical Centre and Industry Park (<http://www.delog.hu/>)
- ✓ Western Industry Park (<http://www.nyip.hu/>)
- ✓ Debrecen Regional and Innovation Park (<http://www.leandesign.hu/ipari-parkok/debreceni-regionalis-es-innovacios-ipari-park-kft>) - hosting large innovative companies, including National Instruments and Richter Gedeon Pharmaceutical Co.
- ✓ Debrecen Science Park (<https://www.agr.unideb.hu/innovacio/oldal.php?megnyit=1014>)

Organisations of the start up ecosystem

- ✓ DBH Investment Venture Capital
- ✓ EH Invest provides complex services to start up and spin-off firms including incubation, co-working and fund-hunting, first of all to students and researchers at the Debrecen University. (<http://ehinvest.hu/>)
- ✓ XPotential
- ✓ Debrecen Hub
- ✓ SingularityU Debrecen Chapter
- ✓ DOD (Developers of Debrecen) Meetup
- ✓ DBH Investment Venture Capital
- ✓ IGEN Debrecen

Civil society organisations

- ❖ Fiatalok Magyarország Jövőjéért Egyesület⁵⁷
- ❖ KOCKA KÖR Tehetséggondozó Kulturális Egyesület⁵⁸ <http://www.kockakor.hu/>
- ❖ Logiscool⁵⁹ <https://www.logiscool.com/hu/#%21debrecen/c17nj>

⁵⁶ Vállalkozásfejlesztési Alapítvány

⁵⁷ Young People for the Future of Hungary Association (activities related to university students)

⁵⁸ KOCKA KÖR Talent Promotion Cultural Association

⁵⁹ It is a country-wide trainings in IT programming for people at the age of 7-17; it has a branch in Debrecen

ANNEX 2: University-industry co-operation at Debrecen University

Forms of co-operation	Example	Participating organisations
Joint university department	<i>Pharmaceutical industry off-site department</i>	<i>Debrecen University TEVA</i>
	<i>Operation of IT systems off-site department</i>	<i>Debrecen University IT Services</i>
	<i>Petrochemical and Polymer Technology off-site department</i>	<i>Debrecen University TVK</i>
	<i>Nature Conservation and Zoology off-site department</i>	<i>Debrecen University Hortobágy National Park</i>
Jointly run vocational training		<i>National Instruments IT Services secondary schools in Debrecen</i>
Clusters	<i>Pharmapolis Debrecen Innovative Pharmaceutical Cluster</i>	<i>Debrecen University TEVA Richter + other smaller companies</i>
	<i>Pharmapolis Innovative Food Industry Cluster</i>	<i>Debrecen University + companies (not only from Debrecen, and the region)</i>
	<i>Thermal Health Industry Cluster</i>	<i>Debrecen University + companies (not only from Debrecen, and the region)</i>
	<i>Prizmatech Instrument Manufacturing and Developing Cluster</i>	<i>ATOMKI several companies</i>
	<i>Silicon Field Regional IT Cluster</i>	<i>Debrecen University + companies</i>
	<i>Facility Energy Cluster</i>	<i>Debrecen University + companies</i>
	<i>Exploitation and Innovation of Thermal Energy Cluster</i>	<i>Debrecen University + companies</i>
	<i>Green Energy Cluster</i>	<i>Debrecen University + companies</i>

ANNEX 3: List of major research infrastructures in Debrecen

Host organisation / Name of research infrastructure	Scientific fields using the RI	Innovation activities and potentials
Debrecen University		
Atomic force microscopy laboratory	<i>Biology, physics, medical sciences</i>	<i>The only atomic force microscope for cell biology applications in the region.</i>
Clinical Genomics and Personalised Medicine Centre	<i>Biology, general medical sciences, medical biotechnology</i>	<i>Microarray services have been offered, but both equipments and expertise are available to broadening services to the local and international markets</i>
Super Resolution and Molecular Dynamics FCS and TIRF Microscopy Laboratory	<i>Biology, medical biotechnology</i>	<i>Daily practice to work with companies, incl. SMEs; Patenting</i>
Molecular Cell Analytical Service Laboratory	<i>Biology, physics, biotechnology, general and clinical medical sciences, nanotech</i>	<i>Daily practice to provide services to companies, incl. SMEs</i>
Molecular Anatomic Imaging and Electron Microscope Service Laboratory	<i>Biology, general medical sciences,</i>	
Proteomics Service Laboratory	<i>Biology, chemistry, general and clinical medical sciences, biotech, plant and animal production</i>	<i>Active in technology development, training programs for companies, etc.</i>
FLIM-TIRF and LSM-FCS Functional Cell Analytical Laboratory	<i>Biology, physics, chemistry, general and clinical and medical sciences</i>	<i>Active in service delivery to clinics, medical technology development with and for SMEs</i>
Biomolecular Interaction Service Laboratory	<i>General and clinical medical sciences, chemistry, biology</i>	<i>Active cooperation with pharmaceutical companies</i>
Molecular Morphology Service Laboratory	<i>Biology, health sciences,</i>	
Agro-meteorological and Agro-ecological Monitoring System	<i>Environmental and agricultural sciences</i>	<i>Applications related to the complex analysis of the soil-plant-climate system</i>
ImmunoScreen	<i>Medical sciences, biology, medical biotech</i>	<i>Contribution to health services and pharmaceutical development</i>
ATOMKI, Debrecen		
Ion Beam Application Laboratory	<i>Physics, material sciences, nanotech, environmental sciences, chemistry, archaeology</i>	

ATOMKI Acceleration Centre	<i>Physics, chemistry</i>	<i>Unique services at regional and national level</i>
ATOMKI HEKAL (Hertelendi Ede Environmental Analytical Laboratory)	<i>Physics, chemistry, environment sciences, archaeology, agricultural biotech, plant production</i>	<i>The lab was set up as an output of cooperation between ATOMKI and its spin off firm. The lab has internationally unique set of instruments and expertise in environment-related research services.</i>

Three national research infrastructure networks are coordinated by organisations located in Debrecen:

- Bioimaging Network (Debrecen University)
- Genomika Network (Debrecen University)
- Hungarian Ion Beam Physics Platform (ATOMKI)

The Debrecen University is one of the partners of establishing centre of excellence in molecular medicine (HCEMM-MOLPEDEX project funded by the H2020 teaming programme).

ANNEX 4: Operational programmes with S3 relevance in Hungary for 2014-2020

In the present financial period (2014-2020) the operational programs are financed by the European Regional Development Fund, the European Social Fund and the Cohesion Fund.

Table 7: Allocation of EU funds for the programming period of 2014-2020 to Hungary

European Regional Development Fund & European Social Fund	Less developed regions	15,005.2 M€
	More developed regions	463.7 M€
Cohesion Fund		6,025.4 M€
Total cohesion		21,905.9 M€
Share in total EU28 cohesion policy funds		6.2%

Source: Regional Statistical Yearbook 2016, EUROSTAT

In supporting the national S3 strategy implementation the following EU funded operational programmes should be highlighted:

Table 8: Operational programmes of Hungary for the period of 2014-2020 in relation support innovation

HU short name	Name	Financial sources (M€) ⁶⁰
GINOP	Economic Development and Innovation Operational Program ⁶¹ <i>Thematic priorities: Research and innovation, education and training, ICT, SMEs competitiveness, low-carbon economy, environment and resource efficiency, and employment and labour market</i> <i>HU contribution: 1,079.2 M€</i>	ERDF: 5,899.1 ESF: 1,735.3
KEHOP	Environment and Energy Efficiency Operational Programme ⁶² <i>Thematic priorities: low-carbon economy, climate change and risk prevention, and Environment and resource efficiency</i> <i>HU contribution: 567.7 M€</i>	ERDF: 85.8 CF: 3,131.3
EFOP	Human Resources Development Operational Programme ⁶³ <i>Thematic priorities: education and training, and social inclusion</i> <i>HU contribution: 456.8 M€</i>	ERDF: 904.8 ESF: 1,708.0

⁶⁰ ERDF = Regional Development Fund; ESF = European Social Fund, CF = Cohesion Fund, EMFF: European Maritime and Fisheries Fund, EAFRD = European Agricultural Fund for Rural Development

⁶¹ http://ec.europa.eu/regional_policy/en/atlas/programmes/2014-2020/hungary/2014hu16m0op001

⁶² http://ec.europa.eu/regional_policy/en/atlas/programmes/2014-2020/hungary/2014hu16m1op001

⁶³ http://ec.europa.eu/regional_policy/en/atlas/programmes/2014-2020/hungary/2014hu05m2op001

TOP	Territorial and Settlement Development Operational Programme ⁶⁴ <i>Thematic priorities: low-carbon economy, environment and resource efficiency, employment and labour market, and social inclusion</i> <i>HU contribution: 580.9 M€</i>	ERDF: 2,978.1 ESF: 411.9
VEKOP	Competitive Central-Hungary Operational Programme <i>Thematic priorities: research and innovation, education and training, better public administration, ICT, SMEs competitiveness, low-carbon economy, environment and resource efficiency, employment and labour market, and social inclusion</i> <i>HU contribution: 463.7 M€</i>	ERDF: 257.8 ESF: 205.9
VP	Rural Development Operational Programme	EAFRD: 3455.3
MAHOP	Fisheries Operational Programme	EMFF: 39.1

⁶⁴ http://ec.europa.eu/regional_policy/en/atlas/programmes/2014-2020/hungary/2014hu16m2op001

ANNEX 5: List of interviewees

Name	Organisation	Position	Notes
Attila Tamás KISS	National Research, Development and Innovation Office (NKFIH)	Head of Department for Strategy and Programme Planning	
Judit BALOGH	National Research, Development and Innovation Office (NKFIH)	Head of Department for Innovation Policy	
István SZABÓ	Ministry of Human Resources	Head of Department of Higher Education and Research Strategy	<i>Former ESFRI representative of Hungary</i>
Norbert GRASELLI	Bay Zoltán Nonprofit Ltd. for Applied Research	General Director	<i>Former director of INNOVA Észak-Alföld Innovation Agency</i>
László ÁBRAHÁM	National Instruments Hungary	General Director	
Máté RAB			<i>Start-up guru in Debrecen</i>