Mapping of EU Member States' / regions' Research and Innovation plans & Strategies for Smart Specialisation (RIS3) on Bioeconomy

Task 3

Case Study Report South Bohemia, Czech Republic

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Jan Vozáb, Berman Group

1. Short Regional Bioeconomy Profile

Name of the case region/country	Jihočeský kraj (South Bohemia Region), NUTS 3
Member State	Czech Republic
GDP – Euro per capita (2014)*	13 200 for NUTS 2 Jihozápad(South West)
Total ESIF Research & Innovation per capita per year*	44.87 for NUTS 2 Jihozápad(South West)
Total H2020 per capita per year*	2.34 for NUTS 2 Jihozápad(South West)
Value Chain Approach to the Bioeconomy**	Biomass processing and conversion – foods, beverages, crop-based primary production, fodder production; fish and meat production; Bioeconomy R+I and Tech Support – biologically active materials, crop, cattle and fish production support; water quality and water protection;
Thematic Focus of the Bioeconomy Approach**	Agro-Food – crop production, meat/fish production, milk production, food processing Other bio-based Industries – biopharmaceuticals, biochemical products, biotechnology
Research and Innovation Fields highlighted for the Bioeconomy**	Biology, biotechnology, chemistry, life sciences, nano technologies, Primary production with quality – agronomy and crop sciences, oenology, fisheries, etc..
Bioeconomy Activity Level**	Moderate innovator
CASE STUDY SUMMARY	
Bioeconomy Approach	Two major bioeconomy fields – first linked to crop, cattle and namely fish production with weak R&I, second based on biotechnology and ecology linked mostly to research of the Biology Centre and the South Bohemia University.
Bioeconomy Ecosystem	Scattered and diverse; a number of science based actors strongly involved in fundamental research with limited capacity to applied research; a few actors strong in applied research in the field of water management or environmental protection; Small innovative biotech companies prevail in the business sector or low-tech companies in food and beverages production;
Bioeconomy Policy Support	No particular bioeconomy aimed support; general innovation support available; bioeconomy covered implicitly;
Successful initiatives and Good Practices	Many successful initiatives, research centres, international projects or biotech initiatives took place in South Bohemia. However their economic impact or results that would be commercialised are limited. Gate2Biotech Platform and Portal and CENAKVA research centre were selected as specific but different cases.
Main Needs, Gaps and Bottlenecks	No particular bioeconomy strategy or schemes; bioeconomy competes regionally and nationally with other domains; lack of entrepreneurship and weak commercialisation (general for the Czech innovation ecosystem); scattered and small bioeconomy sector while very strong research and science in biology/ecology.

* Source of the data: S3 – Regional Viewer: http://s3platform.jrc.ec.europa.eu/synergies-tool

** Data collected by this Study project in Task 1.

2. Regional Bioeconomy Ecosystem

2.1 Origin of Interest of the region in the Bioeconomy

There are three bioeconomy specialisations in South Bohemia: agriculture, which supply some traditional food production (dairy products and beer production mainly), fish farming focused mostly on carp and other pond fish, and biological research.

The latter has its origin in the early 1980s when several biologically oriented institutes of the Academy of Science were moved from Prague to Ceske Budejovice, south Bohemia capital, forming South Bohemia Biology Centre of the Academy of Science. Biology Centre of the Academy of Science in its current form was founded in 2006. In early 90s the South Bohemia Biology Centre and then its successor institutes helped to establish Biology Faculty of the South Bohemia University (later Faculty of Science) with the aim, among others, to strengthen education in biology and eventually get more young scientists. The Biology Centre is the largest establishment of the Academy of Science outside Prague and with the Faculty of Science form an important European agglomeration of scientific teams oriented at research in biology and ecology. The Centre's key research domains are ecosystem biology, entomology, hydrobiology, molecular and cell biology (particularly of plants) and genetics, parasitology, physiology and developmental biology, soil biology.

Fish farming has been important in South Bohemia since medieval times. Currently this region produces about half of fish in Czechia in 25 000 ha of ponds. The fish is sold either in Czechia or in neighbouring countries, namely Germany, Austria and Slovakia which together account for more than 50% of Czech export of carp. Fisheries has to deal with several issues which increase interest of its stakeholders in innovation a research: (i) it faces water pollution caused partly by agriculture and partly by fisheries itself (from feeding fish), (ii) it has to cope with competition of sea fish import and (iii) it has to modernise and increase productivity. Fisheries Research Institute, established in 1921, now part of the South Bohemia University and core of its Faculty of Fisheries and Water Protection, has always carried out applied research to improve fish production.

Agriculture in South Bohemia has a low productivity level, being well below average of the Czech Republic's productivity[1], but the region is, apart from fish, the largest producer of pork and also producer of animal feed[2]. Milk production is also important in South Bohemia where one of the largest Czech dairy production companies, Madeta, is located. Another important industry comprises several breweries including Budějovický Budvar (real original Budweiser trade mark) and some other traditional breweries, some of them owned by multinational beverage producing companies.

[1] Czech Statistical Office: Agricultural output by region in 2014
[2] Czech Statistical Office: Harvest of selected crops by region in 2014; Meat production by region 2008–2015,

2.2 Bioeconomy Stakeholders

South Bohemia University in České Budějovice **(JCU)** has got 8 faculties of which Faculty of Science, Faculty of Fisheries and Water Protection, Faculty of Agriculture and Faculty of Health and Social Sciences are relevant for bioeconomy.

Key research centres or projects at the Faculty of Science are:

- **Centre of Polar Ecology**, which was established on the basis of project funded by the Ministry of Education, Youth and Sports. The project was linked to previous polar research undertaken at the University. The Centre carries research activities in Svalbard islands.
- **The New Guinea Binatang Research Center**, which is a Papua-New Guinea NGO. The University and the Biology Centre are key research bodies in the Centre and carry out most of the research projects as well as development of the Centre. The Centre also cooperates with Wanang Conservation Area.
- **Centre of Excellence for Global Studies of Functions and Biodiversity of Forrest Ecosystems**, sponsored from the ESF OP Education for Competitiveness (2007-2013), is linked to Papua-New Guinea research projects.

Main R&D topics of the Faculty of Science are focused on ecology and biology, though recently extended to chemistry, physics, mathematics and IT. The research is less focused on application, yet it may have implications for nature conservation, thus providing information for various (mostly public) services engaged in preservation of natural areas.

The University founded a **Bioeconomy Initiative** with the overall aim to coordinate actions mainly focused on the regional dynamics of South Bohemia in this field.

Fisheries and Hydrobiology Research Institute is a core of the Faculty of Fisheries and Water Protection. The Institute established "**CENAKVA Centre**" which was supported from the priority axis Regional Research Centres of the OP Research and Development for Innovation (2007-2013).

Office for Technology Transfer (JCTT) at the South Bohemia University used to be a joint office providing services also to institutes of Academy of Science located in South Bohemia. A network of 4 technology scouts at the University faculties is organised by the JCTT. The office serves as entry point for companies to University services. It provides services for commercialisation to laboratories and research teams. Since 2016 the JCTT provides services to University and the Biology Centre established its own technology transfer centre.

Biology Centre of the Academy of Science in České Budějovice includes 5 institutes located in South Bohemia – Institute of Entomology, Institute of Hydrobiology, Institute of Parasitology, Institute of Molecular Biology of Plants, Institute of Soil Biology. All institutes collaborate closely with the Faculty of Science in research as well as in education. Many scientists of the Biology Centre are in their respective fields among the most cited and respected in the world (according to Hirsch Index), yet the Biology

Centre's research is focused mostly on basic research and on solving general theoretical problems in biology rather than on applied research. Nevertheless the Biology Centre has also excellent results in many fields of biotechnology, from plant virology and the study of tropical diseases and biopesticides to the analysis of fish stock in water reservoirs.

There are also a few branches of other research centres or institutes in South Bohemia: **Institute of Botany of the Academy of Science** in Třeboň which hosts **Algatech Centre for Algal Biotechnologies** built with ERDF support, regional branch of the **Institute of Microbiology of the Academy of Science** and **Institute of Nanobiology and Structural Biology** in Nové Hrady, a branch of the **Global Change Research Centre** in Brno.

South Bohemian Agency for Support to Innovative Enterprising (JAIP) is a non-profit enterprise founded by the South-Bohemian Chamber of Commerce in 2005. It supports and assists in development of innovation in the South-Bohemian Region, i.e. application of research and development results in practice and support of interested entrepreneurial subjects. It provides consultations and information services to entrepreneurs, coordinates regional innovation policy and implements some of its projects. It has been co-founder and manages the 1st phase of the Science and Technology Park and it administers **Gate2Biotech initiative and administers Gate2Biotech portal**.

South Bohemia Science and Technology Park (JVTP) offers laboratories, offices, conference rooms or technology halls with about ½ of the premises devoted to biotechnology. It also provides services to firms located in the Park. Out of 20 organisations located in the JVTP (companies, public research institute, university department, cluster) 10 deal with various diverse bioeconomy topics, 2 of these companies are branches of international companies. Among others, it hosts **Czech Biogas Association**, a national technology platform with more than 40 biogas industry members and leading R&D institutions from the whole Czech Republic and from abroad.

ENKI, o.p.s., a public company is engaged in applied research in solar and landscape energy production, pond management, management of water in landscape and use of artificial or natural marsh areas. ENKI manages Technology Innovation Centre in Třeboň together with the ENVI, a.s.

Bioeconomy companies in South Bohemia region include, among others, several large and medium **breweries** (and some small and microbreweries, too), several **agriculture consulting and research companies**, dairy production and food production companies. A small regional food cluster that aims at promoting traditional food, recipes and technology processes is located in České Budějovice.

2.3 Bioeconomy plans and projects

There is no specific strategy for bioeconomy, biotechnology or related topics in the region, bioeconomy topics are implicit part of other strategies. The Strategy of the University for 2016-20 does not specify research or scientific themes or topics, it is cross-cutting in its structure, comprising objectives such as "increased cooperation among faculties in interdisciplinary approach in research". The bioeconomy is included implicitly because of the specialisation of its faculties and research teams, such as "further development of CENAKVA research centre".

Even if there is **Biotechnology for sustainable community development** specialisation domain in regional RIS3 strategy, there are no explicit programmes or instruments aimed at supporting this field. No bioeconomy specific objectives or measures have been planned yet. On the other hand the action plan for regional RIS3 implementation has been put together with understanding then needs of biotechnology and currently there are 8 interventions in the biotechnology planned for 2017 out of total 61 projects envisaged for the following year which is the largest specialisation field in the 2017 action plan.

H2020 projects. There are 6 projects at the Biology Centre in the field of biology, biotechnology or ecology: BINGO, ParaFishControl, ClimeFish, FourCmodelling, JHSIGNAL Diversity6continents, of which the latter two are coordinated by the Centre.

FP7 projects. 35 projects were funded from FP7 either in the Biology Centre or in the University of which 23 can be regarded for bioeconomy field. 4 projects have been still active in 2016: RNPNET, ANTIGONE, INsecTIME, ANTIDotE.

3. Bioeconomy Policy Support

3.1 General support framework

Innovation support in Czechia is generally provided from the national level and it is mostly funded from the ESIF[3] and a few national programmes. The programmes (incl. OPs funded from ESIF) and their strategies shall be consistent with the "National priorities of the oriented research, experimental development and innovations". The "National priorities" document, support programmes and funding schemes or measures are not oriented at specific industry or sector or specialisation domain. Their focus is either cross-cutting, such as "support to commercialization of R&D results stemming from cooperation between academia and private sector" or "technology transfer" notwithstanding the industry, or rather broadly aimed such as "energy

[3] There are two ESIF operational programmes aimed at R&D&T support: OP Research, Development and Education mostly funding R&D in public sector, with the MA Ministry of Education, Youth and Sports and OP Entreprise and Innovation for Competitivness funding innovation in private sector, with the MA Ministry of Industry and Trade. None of their strategie is sectorally focused.

resources and environmental improvement" or "progressive technologies, materials and systems". Specific focus, which will also govern the interventions of the OPs, is provided in the National Strategy of Smart Specialisation (National RIS3) describing specialisation domains for the Czech Republic. Regional annexes of this strategy (Regional RIS3s) elaborate national domains in more detail or provide additional domains specific for a region.

Main actors at the national level are either ministries/managing authorities which manage relevant operational programmes or Technological Agency of the Czech Republic (TACR) which manages several programmes/schemes including support to oriented research, experimental development or collaboration between research organisations and private sector. Agriculture and environment related to rural development are dealt with by the Ministry of Agriculture, MA of the Rural Development Programme and OP Fisheries. Both of the programmes include bioeconomy issues by definition yet they are strongly sectoral.

At the regional level, which means NUTS 3 in the Czech case, the tools for supporting innovations are described either in former regional innovation strategies or regional RIS3 annexes, which are specific strategic documents complementing the National RIS3, and in RIS or RIS3 action plans. Key actors at regional level are Regional Governments which in principle manage the innovation/specialisation strategies but the projects, schemes or support tools are usually organised by specific agency which overall purpose is either regional development or specific innovation support. Although the National RIS3 and their regional annexes specify specialization domains there are no functioning schemes yet aimed at supporting either a specific sector or a particular domain[4]. Sectoral or domain specific funding schemes are being prepared at the national level in the relevant OPs, though they will be aimed on all RIS3 domains with no specific focus on any particular domain[5].

3.2 Bioeconomy Policy Support

There are no specific intervention schemes aimed at the bioeconomy neither at regional level nor at national level.

Actors in the bioeconomy field participate in general R&I programmes and schemes at the national level and compete for funding with other applicants. For many factors and mechanisms of the innovation system are weak or underdeveloped in Czechia the national programmes aim at cross-cutting, overall innovation issues and are open for innovation actors from most industries or value chains.

[4] The exception is the Regional Innovation Strategy and respective RIS3 annex to National RIS3 in Southern Moravia region which is explicitly focused on several domains including Life Sciences among others.

[5] Eg. Calls for Proposals: Excellence in research in generic knowledge domains identified in National RIS3 or Long-term intersectoral Cooperation or Research in pre-applied stage

The South Bohemia region runs a few programmes for start-ups or small companies: **Micro-loan programme**, **Business vouchers** to co-finance expenses of business purchasing R&D services, and business and innovation services are provided in several innovation infrastructures. These schemes are aimed at innovation support in general and have only implicitly cover bioeconomy.

3.3 ESIF and H2020 resources for the Bioeconomy

Thematic objective 1 is supported by 2 OPs (OP Research, Development and Education, OP Enterprise and Innovation for Competitiveness). These two national OPs in Czechia which finance Thematic Objective 1 operations have a total allocation for TO1 is EUR 3.95 billion. There are no specific allocations either for a particular sector or domain in the OPs. Specific calls for proposals aimed at particular domains are being prepared by the MAs of the relevant OPs yet they will be national calls in which projects will compete from the whole country and among all domains specified in the National RIS3.

The regional R&I allocation from ESIF according to JRC calculation amounts EUR 380.4 mil. for the whole South-West NUTS 2 region. The South-West allocation in 2014 - October 2016 for H2020 amounted EUR 7.8 mil. which is the third largest allocation in Czechia after Prague and South-East region (with Brno as capital).

Total EC contribution to the South Bohemia region from the FP 7 amounted almost 9.5 mil. EUR of which more than 8.7 mil. EUR can be assigned to broadly understood bioeconomy field. Currently there are two H2020 projects which coordinator is the Biology Centre in South Bohemia region which amount EUR 3.5 mil. and four other H2020 projects which Biology Centre participates in which amount EUR 16.8 mil. yet the proportion of the Biology centre is smaller.

The ERDF in the period 2007-2013 funded CENAKVA regional research centre (EUR 8.6 mil.) and the ESF funded several training or research projects at the South Bohemia University. There were other ERDF projects funded to businesses between 2007-13 from the OP Enterprise for Innovation which in the broader field of bioeconomy amounted about EUR 13 million.

The regional actors particularly the Institutes of the Academy of Science also participated in national schemes aimed at science and research support from Grant Agency of the Czech Republic (fundamental research) but there were also other projects funded from the Technology Agency of the Czech Republic (applied research) for other regional actors.

4. Successful Initiatives and Good Practices

4.1 South Bohemian Research Center of Aquaculture and Biodiversity of Hydrocenoses (CENAKVA)

The South Bohemian Research Center of Aquaculture and Biodiversity of Hydrocenoses (CENAKVA) is a new infrastructure and research project which has been built in Vodňany town upon experience and knowledge base of the Fisheries and Hydrobiology Research Institute of the Faculty of Fisheries and Water Protection. The infrastructure project started in 2010 and was finished in 2013 but the research programmes of the Centre started or were merged to the Centre from other parts of the Faculty from the beginning of the project. The Centre is now a main research facility of the Faculty, providing laboratories and opportunities for interdisciplinary cooperation of researchers and scientists from various Faculty institutes or research teams and with other biology or ecology teams in South Bohemia institutes or abroad.

The project was co-financed by the ERDF operational programme Research and Development for Innovation, from its priority axis 2. Regional R&D centres, with the South Bohemia University as the beneficiary. Total costs amounted about EUR 10.15 mil, of which 8.6 mil was funded from ERDF and the rest from the Czech state budget. The operational costs and costs of research projects and programmes are financed from multiple resources among which various public grants represent a majority. In 2015 almost 30% of funds (about EUR 1 mil) were provided by the National sustainability programme, a grant scheme intended to support development and research costs of R&D centres established from the previous OP in the period 2007-2013. The sustainability programme is funded by the ERDF from the new OP Research, Development and Education 2014-2020. About 5% of the Centre's funding was gained by participation in international projects in 2015 and about 6% provided contractual research projects.

The mission of the Centre is to develop high quality science, research and applications in the field of fishery, aquacultures and sustainable freshwater management system, all focused on fish farming and in-land waters, mostly in Europe. The subjects of the research comprise quality of fish; biology, conservation and aquaculture of sturgeons; sustainable aquaculture; biology and conservation of crayfish; water quality and, gathering and management of experimental data.

Among other, the Centre is engaged in applied research of sturgeon, such as culture and reproduction for protection of biodiversity, production technology of male populations, caviar production technology, rearing intended for reintroductions of sturgeons, stabilization of management of sturgeon breeding shoals, development of culture and gene bank.

The Centre participated in European research (FP7) projects, such as **AQUAEXCEL, FISHBOOST, TRAFOON AND ORAQUA**.

The Centre is an example of the growth of the specialisation (in this case in fish farming, freshwater ecosystems) based on the original Fisheries Institute, its expansion through becoming part of the South Bohemia University, which, among others, led to extension of the research programmes into new topics stressing environmental and ecology topics. Establishing of the CENAKVA in 2010 shows how concentrated support from the ERDF allowed the Faculty of Fisheries to improve its laboratories, strengthen it research and attract more researchers from abroad. It also brought in new opportunities for international collaboration and for participation in international projects, such as FP 7.

4.2 Gate2Biotech Platform and Portal

Gate2Biotech is a portal currently administered by the South Bohemia Agency for Innovation Enterprising. It was created in order to provide a platform for biotechnological community in Czechia and Central Europe. Its origin is in 2012 when cooperation of companies located in the South Bohemia Science and Technology Park (1st stage) with the Agency for Innovation Enterprising and South Bohemia University led to producing the Biotechnology Report of the Czech Republic 2012 with the aim to provide information about situation in biotechnology field in Czechia at that time.

Gate2Biotech is a platform which mission is to link research community and biotechnological businesses in Czechia and Central Europe. It also provides information on authorities, support infrastructure – both, physical and institutional – and programmes available in the biotechnology field. The platform's objectives are, apart from being an information source, to stimulate technology transfer, to promote cooperation between research teams and business and to raise awareness of public about biotechnology research and applications.

Gate2Biotech collects and provides information about wide array of topics in biotechnology: (i) public and private innovation infrastructure relevant to biotechnology, (ii) biotech companies, service providers and suppliers, (iii) research institutes (public and private), (iv) government agencies and NGOs, (v) biotechnology projects, (vi) information sources – articles, books, journals, (vii) legislation and (viii) events in the biotech field in Czechia and abroad. The portal covers plant biotechnology, animal biotechnology, environmental biotechnology, enzyme biotechnology, microbial and cell biotechnology, human and veterinary diagnostics and therapeutics systems, developments in fundamental biotechnology. Biotechnology organisations of all kinds are searchable according to various criteria, such as type of the organisation or region. Although the portal and platform declare international focus, in reality the organisations are limited to these located in Czechia.

The portal provides also information about training opportunities, school programmes or scholarships for students and career development or job opportunities for professionals in biotechnology.

5. Needs, Gaps and Bottlenecks to Deploy the Bioeconomy

The needs, gaps and bottlenecks to strengthen bioeconomy and its R&I are similar to those of innovation ecosystem in Czechia in general. First, there is lack of programmes aimed at specific domains due to underdeveloped innovation ecosystem and generally week knowledge economy. Therefore the Czech interventions are in the innovation field are mostly of the "horizontal" nature, not targeted to a specific domain, sector, industry or research field/topic. Second, there is a long-term mismatch between research carried out at public research organisations and needs of companies. The companies mostly require low-end research activities such as tests, measurement which the research organisations are not usually interested in. Third there is a lack of strong, market or technologically leading companies or companies which are close to the top-level in their particular field and many companies are tier 1+ suppliers which inhibits their innovation/research demand. The specific gaps and bottlenecks in bioeconomy in South Bohemia region are as follows:

Lack of enterprises with a high value added production in bioeconomy, despite an extensive and in some cases excellent biology, biotechnology and environmental research in the region, which is the largest concentration of this kind of research in Czechia. **The business sector in bioeconomy is weak**, regional specialisation is stronger in other domains, such as mechanical or electrical engineering or mechatronics.

There is a wide gap between the biotechnology research and business sector in bioeconomy. While knowledge production in research institutions is focused mostly on fundamental research, often at the top-level in their respective fields, the innovation demand from firms, if any, is mostly in measurement, testing or other simple laboratory activities.

There is low number of biotechnology companies in the region and among them there is low number of firms implementing advanced technological innovations. Thus the **opportunities for collaboration between the research and companies are rather limited**.

Several research teams at the research institutes belong to global leaders in their specialisation yet they are involved and interested mostly in fundamental research with limited interest in application or its results. Therefore the **transfer of the research results and/or its transformation in technology and in commercial applications are limited.**

There are fragmented and underdeveloped services for start-ups (especially for young technology companies) and business services in general which applies to bioeconomy field as well. Despite strong research **the number of bioeconomy start-ups is very**

small, which is partly due to general lack of entrepreneurship and lack of initiative among (young) population in the region.

There is a lack of communication and awareness of the academia and the research community towards enterprises and vice versa, and the resulting lack of cooperation.

The regional research specialisation in biological sciences is very strong and the capacity of the research institutions is extensive yet the focus on fundamental research and low interest of researchers in applications led to **underdevelopment of applied and fundamental research** which makes it more difficult to utilise knowledge generated in biology research into bioeconomy applications and into business.

Priorities of targeted/oriented research in the region are not much developed and the **biotechnology**, though a strong implicit specialisation, **is not explicitly recognised** either in University or research institutes goals.

Lack of popularisation of RDI activities in the region and science communication with the general public thus leading to insufficient awareness of the population (and businesses) of the region and population (and businesses) elsewhere about the research excellence and about the knowledge generated in the region.

Difficulties in combining the resources from various OP or administrative obstacles in seeking synergies of ERDF and other R&I programmes, national or international ones.

Despite a few spin-off and start-ups in bioeconomy **the interest of the academic sector in commercialisation or of the students/post-docs in independent business career is week.**

Lack of programmes or schemes explicitly aimed at bioeconomy support, both regionally and rather weak nationally despite the smart specialisation strategy.

6. Information Sources

Literature and Documents:

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http://s3platform.jrc.ec.europa.eu/country-region-information

http://s3platform.jrc.ec.europa.eu/synergies-examples

Interviews and Contact details:

Name	Position	Institution/ Organisation	Phone	Email	Interview Date
Veronika Czesana	R&D specialist for RIS3 in dept. of Concepts and elaboration of Calls for Proposals of the OP RDE	Ministry of Education, Youth and Sport, MA of the OP Research, Development and Education (OP RDE).	+420 773 85 0 715	veronika.czesana@msmt.cz	1.12.2016
Michala Novotná	Managing director; Regional RIS3 manager	South Bohemia Agency for Innovative Enterprising; South Bohemia Technology Park	+420 608 57 2 269	novotna@jaip.cz	9.12.2016