

Bioeconomy in South Bohemia Region

Initial analysis of regional potential
(English)

Zpracoval:

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1. REGIONAL BIOECONOMY STRATEGY

South Bohemian Region does not have any special strategy focused on bioeconomy. But there are several key documents related to the general development of the area in which several bioeconomical aspects can be found.

Exact term “bioeconomy” is not involved as a topic in documents for current period 2014 – 2020, though it can be found in the context. Recently we can speak about strategies that are still valid (until the end of 2020). There are two documents: Development program of the South Bohemian Region 2014–2020 and Regional Appendix to National Research and Innovation Strategy (RIS 3).

On the national level we could mention State Energy Conception of the Czech Republic, The Concept of Sustainable Development (Sustainable Development) of the Czech Republic and National Action Plan for Renewable Energy, National Action Plan for Biomass.

Source: Development program of the South Bohemian Region 2014–2020; Regional Appendix to National Research and Innovation Strategy (RIS 3).

For the forthcoming period 2021–2027 the bioeconomy becomes an integral part of regional strategic documents of South Bohemian Region.

Development program of the South Bohemian Region 2021–2027 declares support for research and pilot programmes in the field of energy supply, waste management, environment, bioeconomy and digitalization within the Priority axis 1 “Smart Region and competitive regional economy” and in the chapter “Development of education and support of active leisure time” is bioeconomy an important part of future project cooperation with academic sector.

Another important document is Regional Appendix to National Research and Innovation Strategy (RIS 3) for the period 2021–2027 – this documents brings probably the most important step which is proposal of Regional Innovation Platform for bioeconomy and circular economy to identify the perspective innovation areas where to allocate private, regional, national and EU funds. Future platform will involve stakeholders from public administration, industry, education and research branches. Its main function will be to identify and defend interests in this field, promote them at the national and European level and implement scientific research and technological innovation activities. At the same time, it will be another important element for strengthening the internationalization of the region. Bioeconomy and circular economy should serve as an important part of the regional specialization on biotechnologies for sustainable development of the society.

For Strategic development plan of the Smart Region South Bohemia for the period 2019–2023 bioeconomy is one of the key aspects of several priority areas.

In the priority area of the environment, this applies in particular to waste management – it assumes the use of residual outputs from forestry, pond farming, agriculture, food and municipal waste for further energy and other processing with high added value. The Strength



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part of the SWOT analysis of this area mentions implementation of projects developing the field of bioeconomy and the Opportunity is seen in the support of bioeconomic start-ups focused on products with high added value and new bioeconomic fields.

The priority area Effective Territorial Management & Innovation will support the education of experts in the field of bioeconomy and creation of local bioeconomy strategies. It supposes bioeconomy as a new field of study at the University of South Bohemia in České Budějovice and support of bioeconomic start-ups. In the framework of cooperation among cities, universities and scientific research institutions will be supported research and pilot projects also in the field of bioeconomy.

Moreover, one of the criteria for evaluation of the project pipeline is to contribute to public awareness of the meaning and strategic benefits of the circular economy and the bioeconomy.

On the national level there exist since July 2019 the very first truly bioeconomy strategy made up by the Ministry of Agriculture of the Czech republic – The Concept of bioeconomy in the Czech Republic from the Ministry of Agriculture point of view for the years 2019-2024

Source: Development program of the South Bohemian Region 2021–2027; Regional Appendix to National Research and Innovation Strategy (RIS 3) for the period 2021–2027; Strategic development plan of the Smart Region South Bohemia for the period 2019–2023; The Concept of bioeconomy in the Czech Republic from the Ministry of Agriculture point of view for the years 2019–2024.



2. BIOMASS SOURCES AND USE

Unfortunately, the data related to volume of biomass available in the South Bohemian Region are mostly outdated. The inventarization of sustainable produced biomass in the region to be used in bioeconomy should be one of the first steps. Presented data come mostly from the document "Territorial energy concept of the South Bohemian Region for 2018 – 2043" which is basically aimed on energetic rather than bioeconomy use of biomass but can serve as orientation source of information about usable biomass production in the region.

Table 1: South Bohemian Region energy balance – individual groups of fuels and energy, year 2014

Fuel and energy group	Electricity generation [GJ]	Production of sold heat [GJ]	Other final consumption [GJ]	Gross electricity production [GWh]	Production of heat sold [GJ]
Nuclear fuel	157 014 919	183 806	304 742	14 954	183 551
Black coal, including coke	0	0	287 597	0	0
Brown coal including lignite	3 860 395	3 833 725	4 638 774	362	3 339 500
Natural gas	115 365	763 213	8 891 318	26	593 693
Biomass	1 668 276	1 139 783	7 176 557	181	789 465
Biogas	2 018 901	90 152	494 675	247	52 254
Waste	0	17 112	0	0	10 376
Liquid fuels	7 738	66 945	169 664	0	42 349
Other solid fuels	0	0	0	0	0
Other gas fuels	0	0	0	0	0
Other renewable energy sources	0	0	444 225	422	0
Total	164 685 593	6 094 735	22 407 552	16 192	5 011 189

Source: Territorial energy concept of the South Bohemian Region for 2018–2043.

Biomass is the most used renewable energy source in the region. It is used mostly as firewood for heating of residential buildings. The data of Ministry of Industry and Trade from 2014 show total consumption of firewood in South Bohemian households is more than 6 mil. GJ of energy in fuel (which corresponds to 400 to 450 thousand tons). The survey of the Czech Statistical Office ENERGO 2015 shows that more than 80 000 households use firewood in the region (out of a total of approximately 277 000 permanently occupied dwellings).

Biomass is also significantly used in the energy sector, i.e. for the production of electricity and heat for the purpose of their supply for further use. In 2014, according to the Ministry of Industry and Trade, the charge of biomass fuels in the region for the production of electricity amounted to almost 1.7 million GJ and for the production of (sold) heat about 1.1 million GJ.

Source: Territorial energy concept of the South Bohemian Region for 2018-2043



3. ELECTRICITY AND HEAT PRODUCTION VIA BIOMASS INTO BIOGAS

There is (according to number of licences provided by Energy Regulatory Office) 52 biogas stations in total in the South Bohemian Region with installed electricity output approx. 32 MW and heat output approx. 32 MW too. A total of 7 production places of electricity and heat from sludge gas (another name for biogas) at wastewater treatment plants are also running in the South Bohemian Region. Approximately 1.0 MW of electrical power and approx. 0.6 MW of heat power are installed at these wastewater treatment plants. In the territory of the South Bohemian Region, there are also several electricity and heat plants for landfill gas. The main ones are the landfill in Vodňany and Želeč. The total benefit of these "biogas plants" as a whole in 2015 in the form of gross electricity production was more than 240 GWh, according to estimates 10–20% of this value was used in the form of heat, which is a by-product of biogas to electricity conversion.

Source: Territorial energy concept of the South Bohemian Region for 2018–2043.

4. TECHNICAL POTENTIAL

Biomass is a renewable source of energy which is seen to be very dynamically increasing in the next years.

Wood

According to Ministry of Industry and Trade estimates, there is a production of approx. 1.4 tons of firewood per hectare of forest land in the Czech Republic and the average timber production is approx. 7–8 m³ (excluding bark) per hectare. The share of deciduous trees will grow in the coming years (now it is about 25% of forests, the recommended share is about 36%). With this fact, it is possible it will increase the proportion of wood that cannot be used for material purposes (but usable for energy purposes) which can be around 25–50%. In the South Bohemian region 10–12 PJ of energy in fuel could be obtained from forest per year (total forest area is approximately 380 000 hectares – 38% of the whole region area).

Wood /forestry residues

As wood quality declines, lumber production and related products such as wooden sheds and sawdust production may decline. Ministry of Industry and Trade estimates current energy content to about 0.7 PJ, so far, less energy use of this component is expected, but the opposite trend is not excluded and there may be an increase in energy use, this energy potential has not big proportion - around 0.5–1 PJ.

Straw

There is a relatively significant potential for obtaining additional energy biomass from agricultural land. About 300 000 tons of straw can be produced annually from cereals production that could be used, at least in part, for energy purposes. However, if it were



possible to use (conservative) 100 000–150 000 tons of cereal and rapeseed straw for energy production, it would mean 0.931–1.5 PJ of energy in the fuel.

Agricultural residues

Obtaining pellets via process of pressed plant waste from the cleaning of cereals and other crops, with addition of straw residues and other by-products of agricultural production. The production potential from various agricultural products can be between 30 000–50 000 tons per year, which corresponds to about 0.4–0.6 PJ of energy in the fuel.

Energy crops (intentionally grown plants)

Among the most important is especially maize grown "for green" or silage (as of 2015 in the South Bohemian Region according to Czech Statistical Office statistics is sown approx. 21 000 hectares of this crop). Maize is the most favourite high-energy input of biogas stations. It is possible to be sown another next 21 000 hectares of arable land with maize in the region without endangering of food security and food self-provision. With an average energy gain (calorific value of dry matter of the harvested mass) of 100–150 GJ per hectare, represents 1.0–3.0 PJ of energy in the fuel.

Waste management

The best way how to use the potential of waste and energy of waste biomass is to fulfil the condition of bio-waste separation during the process of waste collection and the use of such wastes as energy input for biogas stations for biogas production. In the area of South Bohemian Region several thousand tons of such waste could be possibly used per year. The average yield is estimated to be around 0.5–1 MWh of energy in biogas per ton of (bio) material. The total production potential can reach 0.10–0.20 PJ in biogas.

Source: *Territorial energy concept of the South Bohemian Region for 2018–2043*; Czech statistical Office
<https://www.czso.cz/csu/xcl/lesnictvi-v-kraji-v-roce-2016>

Table 2: Calculation of technical potential of energy biomass in the South Bohemian Region

Biomass source	Technical potential
	[PJ/yr]
Dendromass (incl. already used)	10 – 11,0
Wood waste from the processing industry	0.5 – 1.0
Straw (cereal and rapeseed)	1.0 – 1.5
Plant based pellets (from various by-products / residual agricultural products)	0.4 – 0.6
Energy crops (Deliberately grown crops)	1.0 – 3.0
Biowaste	0.1 – 0.2
Total	~ 14 – 16

Source: *Territorial energy concept of the South Bohemian Region for 2018–2043*.



Table 3: The proportion of different sources of biomass used in biogas stations on the region

Type of biogas station	Amount of stations
Industrial biogas station	1
Agricultural biogas station	45
Waste water treatment	7
Landfill gas	6
Total	59

Source: CZBA Map of Biogas Plants <http://www.czba.cz/en/map-of-biogas-plants.html>.

The main problems related usually to biomass use:

- International ownership – many of potential biomass producers belong to German or Austria owners, who have no interest to develop bioeconomy in the region. The local managers are not active in any innovation – they depend on top management in different countries.
- Ownership – interest of large agricultural companies in the country managing an important part of the agriculture area.
- Scientific infrastructure particularly is not so developed in comparison with traditional EU state members –consequences are lack of human resources for bioeconomy.
- Legislative obstacles, national as well as EU legislation – particularly for the food industry biomass. There is probably sufficient amount of biomass, but not used for bioeconomy due to the legislation.
- Price is limited for the using biomass for the bioeconomy. Not all biomass is cheap – this is case of algae, corn is cheaper, wood is now on the low prices.
- Using biomass for cosmetics is very profitable in the region.
- Former infrastructure is over and/or destroyed – like potato peelers, chips production, sauerkraut production, even potato production decrease – the influence of global market brings its fruits.
- Many of small bioeconomy business have no interest in any cluster, in any meetings because of concurrence advantage. They do not want to share their plans and strategies.

Source: POWER4BIO expert group meetings; Personal communication with producers and mentioned regional actors.

Agriculture

Wastes from animal and plant production are preferentially used for soil fertilization or for biogas production. Straw is used in stalls to keep the animal welfare. Little or none wastes are available outside currently running procedures since farmers are aware of value of wastes for nutrient cycling or on-farm biogas production. Crops intended for other than nutrition or gas-oil sector comprise mainly maize and partly energy crops to supply biogas production.

Source: Personal communication with producers and mentioned regional actors.



Forestry

The wastes from biomass production are burned at place or transported out of region for next utilization. The planting of woods for energy production (by its burning) is applied in the region also.

The waste from forestry is used mostly as wooden chips for heating and sometimes for briquette production.

Source: Personal communication with producers and mentioned regional actors.

Communal waste

Plastic, metal, glass and paper wastes are separately treated in general but industrial capacities for their recycling are limited in the region.

Source: Personal communication with producers and mentioned regional actors.

Wastes from food industry

The effective procedures for utilization of wastes from supermarkets and restaurants is missing. The wastes are not recycled. The legislative limits the utilization of food wastes.

Source: POWER4BIO expert group meetings; Personal communication with producers and mentioned regional actors.

5. PRODUCTS

Biogas and production of heat (public heating – wooden chips and residues combustion) can be understood as most common product in the region. The biogas producers have their own Czech Biogas Association operating also in South Bohemian Region.

There are also a lot of other small producing companies with different products (e.g. hemp or herbal medicine, nutritional supplements, clothes, fibres) from different types of resources and materials (hemp, algae, paper mill waste, wood industry and agricultural waste) but they are not involved together in group or cluster or association. They are afraid of loss of their know-how and competitive advantage.

Source: POWER4BIO expert group meetings; Personal communication with producers and mentioned regional actors

6. BIOMASS MARKET

Current situation on the Czech biomass market can be described with following words:

- Functional biomass market does not exist yet. The extent of biomass market is limited and has mostly regional character. Two thirds of biomass used has specific character (individual consumption of firewood and cellulose extracts).
- Only small part of used biomass is targeted biomass, the share of residual biomass is still dominant.
- The use of biomass (with the exception of co-incineration) is decentralized and biomass except households is mainly used in small local heating plants.



- The use of pellets and briquettes produced from biomass is still very low.

Cost of obtaining primary raw materials

- The "price" with which the given bio-mass enters the process can range from a de facto zero cost, excluding transport costs, to prices close to CZK 100, converted to GJ energy in a given mass.

The cost of combustion of solid biomass

- Heat production costs between 200 and 450 CZK/GJ of heat produced.
- Heat prices up to 350 CZK/GJ can be considered as the highest permissible for price competitiveness.

Source: *Biomass Action Plan for the Czech Republic for 2012-2020*

7. BARRIERS

We can say that in general the main hurdle is **lack of finance** at any level combining with the lack of knowledge both on administrative and in business sphere. There is lack of state support.

When speaking about **information gap and lack of knowledge** a decision should be made whom to consider as a stakeholder. Academic environment and clusters (biogas, breweries, and fisheries) probably know the problem/topic and they are already dealing with it.

The main problem lies on the “**implementation**” level of SMEs and Local Action Groups or municipalities. These “small-scale” stakeholders do not know the term bioeconomy yet. It would be probably much easier to name already known activities included in this term.

Lack of engagement of the stakeholders is connected with high input costs combined with lack of accessible finance. There does not exist a simple financial tool – financial aid is diversified into different fields. Economic sustainability and uncertainty of such projects after subsidizing finishes has to be taken into account. The region has to wait for appropriate national documents, though we can say there are some optimistic expectations connected with the development on the national level – (i.e. BIOEAST mentioned above).

Lack of interest of large companies in hi-tech biotechnology development caused by the fact that they are often only part of the international holding with owners, top management and research units being located in EU15 country. Heads of Czech branches are not independent in their decision making and most of the research and innovation takes places outside the country.

Source: *Presentation for POWER4BIO Kick Off Meeting (POWER4BIO_WP2_Workshop_final-ENG.pptx); personal communication with regional actors*

8. BUSINESS ENVIRONMENT

There are two types of entrepreneurs in the bioeconomy branch in the region and probably widely in the whole country:



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- Already existing functional economically viable production within current legislative and conditions which is economically viable. The members of this group are watching their know-how and the probability of full open cooperation is questionable.
- Currently unprofitable, mostly in the phase of experimental production or idea. There is currently a lack of legislation and sources of funding (subsidizing policy), if these problems would be solved it is probable this will become a promising branch. We suppose this type of stakeholders will be willing to cooperate with us.

Source: POWER4BIO expert group meetings; Personal communication with producers and mentioned regional actors