



Interreg



Danube Transnational Programme

DanuBioValNet

Country Report

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***Cross-clustering partnership for boosting eco-innovation
by developing a joint bio-based value-added network for the Danube Region***

Framework Conditions for Cluster Development in bio-based industry
in the Czech Republic

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Introduction

I. Description of the region

The Czech Republic is the country with relative high share of agricultural land (54% of the total area) and forests (34%). A large area of the country is under a specific restriction due to the environmental protection (8.4% of the agricultural land and 16% of the total area of the Czech Republic) which orders some limitation in intensive farming and forestry. It also enables the cultivation of energetic crops as well as wood utilization, which is usually less intensive than conventional management of farm and forestlands.

Wood biomass is still a traditional solid fuel in household heating systems mainly in rural areas, mostly as a chopped timber wood. Nevertheless, also, furnaces equipped with automatic dosing machine for pellets (in single households) and woodchips or sawdust (in central district heating systems) is in use. New projects for co-generation heat and electricity in municipal heating plants are being laid out. Biomass as a renewable source is used mainly for producing electricity and heat. Biomass represents about 65% of share of the total renewable sources in the Czech Republic. Approximately one fifth of the energy from renewable resources is produced in biogas stations. Residual biomass suitable for energy use comes mainly from agricultural production as a by-product of food production. Specifically grown biomass has recently been gaining ground thanks to the possibility of using land that is not suitable for food production and by balancing the overproduction of food. There is also a cultivation of the chlorella algae in South Bohemia Region. (Source: Strategy of the Ministry of Agriculture of the Czech Republic with the view to 2030, Energy use of biomass)

Available biomass:

- a) Crop residues (used) fodder biomass: Straw for forage, Roughage, Fodder beet leaves, Sugar beet leaves
- b) Fodder biomass: Pulses for fodder, Beet and turnip for fodder, Cabbage for fodder, Other fodder roots and tuber, Forage from hayfield
- c) Fodder plants (arable land): Maize for forage and silage (green maize), Other annual fodder plants, Clover for forage, Alfalfa for forage, Other perennial fodder plants

Biomass from forestry:

- a) Coniferous wood
- b) Non-coniferous wood
- c) Bark

(Source: Czech Statistical Office)

II. Bio-based industry key assets in the Czech Republic

It is not possible to make conclusions from the data and knowledge so far. Only this is known:

- timber houses
- pellets
- biopolymers
- viscose fibre of wood for textile
- use of frying oil for PHA production

III. Stage of development (Initial stage and take off (IS), Drive to maturity stage (DMS), Age of mature production)

In our opinion, the topic of bioeconomy and bio-based industries in the Czech Republic is at its initial stage.

Current situation in the region

I. Key driver, Innovation landscape

The research and innovation infrastructure (universities, research institutes and technology centres) can be considered as the current knowledge hubs and key drivers of the bioeconomy in the Czech Republic.

The bio-based industries in the Czech Republic are diversified in different industries and/or sectors (agriculture, energy, plastics, textile, construction etc.), still their application and occurrence is very random. There is no common national or regional strategy on bioeconomy and bio-based industries development. The cluster organisations are mainly

focused on the traditional manufacturing and processing industries/technologies and high-tech/key enabling technologies.

Among the barriers for the development of the bio-based industry clusters there is especially the low awareness about this kind of industry (clear definition and classification) and no general concept on the national level, such as Bio-based industry strategy and the responsible Ministry/Advisory body/Agency) and related funding programmes/incentives.

II. Cluster development/cluster landscape

The cluster concept was first employed in the Czech Republic from the initiative of the Ministry of Industry and Trade and the CzechInvest implementation agency in 2002 to help with the reconversion of the lagging-behind Moravian-Silesian Region. The awareness building efforts resulted in the National Cluster Study, a statistical analysis and data assessment of the regional potential for cluster development, and National Strategy for Cluster Development 2005 – 2008 adopted by the Czech Government. This document defined the strategic objectives, measures and resources to support cluster development and embedded clusters among the national and regional tools for boosting competitiveness. Following these documents, the cluster organisations have been eligible to apply for funding for their development projects since the period 2004 - 2006 of the ERDF and ESF. Currently, there are approx. 60 cluster organisations in many fields such as engineering, automotive, nano/biotechnology, energy, ICT, furniture, etc. in the Czech Republic. However, we have identified the cluster organisations more or less related to the bio-based industries, such as:

Primary biomass sector:

- Agrocluster Vysočina
- South Bohemian Forestry - Wood Cluster
- Moravian Forestry Cluster
- ORLICKO Agricultural Cluster

Food & Feed:

- Cluster of Applied Biotechnology and Nanotechnology
- Regional Food Cluster - Tastes Great, South-Bohemian

Pulp & Paper:

- OMNIPACK Cluster - Cluster of packaging manufacturers

Chemicals:

- MedChemBio - Cluster of Medicinal Chemistry and Chemical Biology

Polymers:

- Plastics Cluster
- Moravian Silesian Automotive Cluster

Pharma:

- MoPharmaC - Moravian Pharma Cluster

Textile & Clothing:

- CLUTEX - Cluster of Technical Textiles

Renewable Energy (biomass, biogas, biofuels):

- BIODASTR
- ENVICRACK - Cluster of Alternative Energy Sources
- Hi-Tech innovation cluster

Eco-construction:

- South-Moravian Building Cluster
- National Wood -processing Cluster
- Cluster of Czech Furniture Manufacturers

New cluster initiatives regarding the bio-based industries have been started, but without further progress, in the Zlín Region – fruit-growing, Olomouc region – plant biotechnology, and Central Bohemian Region – food-processing industry. Generally, the cluster policy of the Czech Republic has preferred the support of manufacturing and processing industries, the other sector clusters, such as agriculture, medicine, transport and other services have not been financially supported.

Key asset	Primary biomass sector	Food & Feed	Pulp & Paper	Bio Chemicals	Bio Polymers	Phyto-pharma	Textile & Clothing	Renewable Energy (biomass, biogas, biofuels)	Eco-Construction
Cluster organization	X	X	X	X	X	X	X	X	X
Enterprises	X	X	X	X	X	X	X	X	X
Policy makers									
Knowledge institutes	X	X	X	X	X	X	X	X	X
Biomass supply	X	X	X	X	X	X	X	X	X
Competitive bio-based industry product on the market	X	X	X	X	X	X	X	X - pellets	X - wooden houses
Funding									
Policies, programs and regulations									

III. Where has a given region/country relevant strengths and opportunities

e.g. Primary biomass, Food & Feed, Pulp & Paper, Bio Chemicals, Bio Polymers, Phytopharmaceuticals, Textile & Clothing, Renewable Energy, Eco-Construction, etc.

Primary biomass:

According to the Action plan for Biomass in the Czech Republic for period 2012/2020, the landscape of the Czech Republic has a sufficient potential for securing its own food self-sufficiency, which is priority number one in agriculture and

thanks to that the rest of its potential could be used for energy purposes. Energy exploitable biomass from agricultural production consists mainly of: residual biomass (straw, chaff, shapes, meals, excrement), purposely grown biomass (maize, rape and others.), production of permanent grasslands, rapidly growing herbs and wood plants. Total agriculture land in the Czech Republic is 3 480 thousand hectares. So in the case that aim of the 100% food self-sufficiency will be achieved it remains 1 160 to 1 508 thousand hectares for energy usage. (Source: Action plan for Biomass in the Czech Republic for period 2012/2020 Ministry of Agriculture).

The area of agricultural land available for energy use at various stages to ensure a certain degree of food self-sufficiency

Method of land use	Type of agriculture land	Food sufficiency rate		
		70%	100%	130%
		Land area (thousand ha)		
Land of the Foodself-sufficiency	Fertile ground	140	1858	2390
	Permanent grassland	19	114	822
Free land (use for renewable sources)	Fertile ground	1147	680/(689)	169
	Free permanent grassland	913	440/(819)	99
Total agricultural land for energy use		2060	1120/(1508)	268
Total agricultural land		3480	3480	3480

Source: Ministry of Agriculture

Renewable Energy:

The contribution of the gross production of electricity from renewable sources to the total domestic gross electricity production in 2015 was 11.2 %. The estimated share of renewable energy in primary energy sources in 2015 was around 10.5 %. The share of renewable energy in final energy consumption in 2015 according to the used methodology of EUROSAT-SHARES was around 15 %.

Renewable energy sources contributed 14 % to the electricity consumption, 6 % in the transport consumption, and the contribution of the renewable energy for heating was 20 %. (Source: The share of renewable energy on the final energy consumption 2010 – 2015 Ministry of Trade and Industry)

Total energy from renewable energy sources in 2015

	Energy from renewable energy sources in total (GJ)	Estimated share of renewable energy in primary energy sources (%)	Share on the energy from renewable energy sources (%)
Biomass (except households)	46 922 484	2,7%	25,6%
Biomass (households)	73 398 454	4,2%	40,1%
Hydropower plants	6 461 305	0,4%	3,5%
Biogas	25 663 773	1,5%	14,0%
Biodegradable fraction of communal waste	3 341 604	0,2%	1,8%
Liquid biofuels	12 435 671	0,7%	6,8%
Heat pumps	3 809 777	0,2%	2,1%
Solar thermal systems	741 779	0,0%	0,4%
Wind power plants	2 061 403	0,1%	1,1%
Photovoltaic power plants	8 149 846	0,5%	4,5%
Total	182 986 096	10,49%	100,0%

Source: Ministry of Industry and Trade

Summary of the final energy consumption of the renewable energy sources and its share on total final energy consumption in the Czech Republic (%).

Summary of final consumption	2010	2011	2012	2013	2014	2015
Biomass	73%	74%	67%	66%	65%	65%
Liquid biofuels	10%	2%	10%	10%	10%	10%
Biogas	4%	5%	7%	9%	10%	10%
Solar energy	2%	7%	6%	5%	5%	5%
Hydropower plants	6%	6%	5%	5%	5%	5%
Heat pumps	2%	2%	2%	2%	2%	2%
Communal waste	2%	2%	2%	2%	2%	2%
Wind power plant	1%	1%	1%	1%	1%	1%
Total	100%	100%	100%	100%	100%	100%

Source: Ministry of Industry and Trade

Development of renewable energy shares according to EUROSTAT - SHARES (%)

	Electricity consumption	Consumption in transport	heating and cooling	Total final energy consumption
2010	7.52%	5.12%	14.12%	10.52%
2011	10.61%	1.18%	15.43%	10.96%
2012	11.67%	6.15%	16.27%	12.83%
2013	12.78%	6.34%	17.58%	13.85%
2014	13.89%	6.90%	19.57%	15.07%
2015	14.07%	6.45%	19.82%	15.07%

Source: Ministry of Industry and Trade

Import of the biomass suitable for energy purposes (thousand Tonnes)

	2015
Firewood	6
Wood chips, wood shavings from the softwood	211
Wood chips, wood shavings from others	21
Wood sawdust	70
Residues, wood waste	134
Briquettes and pellets	60
Total	513

Source: Ministry of Industry and Trade

Export of the biomass suitable for energy purposes (thousand Tonnes)

	2015
Firewood	62
Wood chips, wood shavings from the softwood	151
Wood chips, wood shavings from others	8
Wood sawdust	136
Residues, wood waste	90
Briquettes and pellets	236
Total	703

Source: Ministry of Industry and Trade

Food & Feed:

By 31.12.2015, the total acreage of organically farmed land was almost 495,000 hectares, which represents 11.7 % share of total agricultural acreage in the Czech Republic. In the last 10 years, organic acreage has nearly doubled – from 255,000 hectares in 2005.

At the end of 2015, there were 4,115 organic farms (cc 9 % of agricultural enterprises in CZ). In (the last) 10 years the number of organic farms has multiplied almost 5 times (from 829 farms in 2005).

At the end of the 2015, there were 4,667 businesses involved in organic farming, which is an increase of 272 businesses, or 0.4 %, compared with 2014. A total of 4,115 farms (or 4,096 entrepreneurs) were registered as organic, which means a year-on-year increase of 5.9 %. During 2015, a total of 381 organic farmers ceased their activities, while 611 businesses made new registrations.

At the end of 2015, 542 businesses were registered as producers of organic foods (579 production sites). This means 7.1 % year-on-year growth. The 76 businesses made new registrations in this branch, while 40 ceased their activities. As in previous years, the most common activities in 2015 included processing and preserving meats and

meat products, milk processing, and processing and preserving fruit and vegetables, as well as wine-making. From 542 registered organic food producers, 204 of them were also registered in the “organic farm” (bio farm) category, processing their products on site. In other words, almost 40 % of producers are on-farm processors and their share has been growing continuously (from 20 % in 2008). However, as for registered organic farmers, the number of businesses processing their own products directly on the farm remains low, stagnating at around 5 %.

At the end of 2015 the number of distributors increased to 439 localities (or 409 businesses), which represents a year-on-year increase of 16.5 %. This increase is roughly the same as in 2014 and 2013. The number of businesses importing from and exporting to so-called third countries has also increased significantly (by 26.4 % and 29.6 % respectively). On the organic food market, there is also a great number of businesses involved in retail sale (i.e. retail chains, health-food shops etc.) who, according to the Law on Organic Farming, no longer have to be registered as of 2006.

(Source: Organic Farming in the Czech Republic Yearbook 2005 Ministry of Agriculture).

The number of registered businesses in organic farming as at 31.12. 2014 and 2015

Type of organic business	Number of businesses/premises		YOY change 2015/14	
	2014	2015	(abs)	%
Organic farmer	3 866/3 885	4 096/4 115	230/230	5.9
Producer of organic foods	506/538	542/79	36/41	7.1
Distributor of organic products and organic (bio)foods	351/381	409/439	58/58	16.5
Feed producer	40/40	42/42	2/2	5.0
Seed producer	31/31	40/42	9/11	29.0
Organic beekeeper	14/14	14/14	0/0	0.0
Of which :				
Importer of organic(bio) foods from 3rd countries	110/110	139/139	29/29	26.4
Exporter of organic foods to 3rd countries	54/54	70/70	16/16	29.6
Farm processor	201/201	204/204	3/3	1.5

Source: Ministry of Agriculture

Most farms (62 %), specialized in the sale of animal organic products, 33 % of the farms specialized in the sale of plant and 5 % of farmers offering both at the same time.

Eco-Construction:

In the field of eco-constructions, a certain progress exists in the Czech Republic, especially in case of passive houses, the number of which is slowly rising. Most of them are family houses. There is also a programme called New Green Savings programme. The Programme's objective is to improve the environment by reducing greenhouse gas emissions

through the improved energy efficiency of buildings, the support of residential development with very low energy performance and the efficient use of energy sources. Funding of the programme runs through state budget. (Source: New Green Savings programme)

Pulp & Paper:

The pulp and paper industry is one of the forward-looking branches of the Czech manufacturing industry. In relation to the European Union, Czech enterprises within this branch account for approximately 1 % of total EU output. Pulp and paper products are used in all branches of the

manufacturing industry, especially in printing and packing production. For a number of years, the branch has been pursuing a sustainable development strategy. Its production is based on renewable raw materials (wood mass) and secondary raw materials (waste and scrap paper), mostly of Czech origin. Its products are used in all the other branches of the manufacturing industry, particularly printing. Paper products production and consumption increased by 7 % year on year in 2015. Domestic paper consumption per capita also increased from 130 kg in 2014 to around 136 kg in 2015. The OMNIPACK cluster is partly involved in this sector.

(Source: The Czech Pulp and Paper Supplement of Czech Business and Trade, Ministry of Industry and Trade)

Textile & Clothing:

The textile industry is one of the sensitive sectors that is facing great competition especially from the third countries on the global market and yet in the Czech Republic it is export-oriented. Economic results indicate that the textile industry in recent years flourished. Sales and value added in 2013 exceeded its pre-crisis level of 2008. The programme of the Czech Technology Platform for Textiles (ČTPT) is based on the European Technology Platform. The aim of this platform is to prepare and implement a long-term vision for the development of the Czech textile and clothing industry and implement a strategic research agenda to start the process leading to the strengthening of innovation, competitiveness and growth potential of this industry. According to the Ministry of Industry and Trade the CLUTEX - Cluster of Technical Textiles is undoubtedly important for the textile industry in the Czech Republic. The CLUTEX cluster is the member of the TEXTILE 2020 international project, whose mission is to create a European cluster focused on advanced textile materials.

Bio Chemicals:

Unfortunately, there are no data just about the bio chemicals industry on the national level. Generally, the chemical industry plays an important role. The chemical sector is highly interconnected with other sections of the manufacturing industry, such as plastics and rubber, textiles, electronics, automotive and others, and represents for them an important sub-sector. There is also an Institute

of Organic Chemistry and Biochemistry of the Czech Academy of Sciences. The Institute carries out fundamental research in organic chemistry, biochemistry and related disciplines, focusing in particular on medical and environmental applications. It educates graduate students. It is the seat of the Committee for defence of doctor of science dissertations in organic and bioorganic chemistry. (Source: Panorama of the Manufacturing Industry in the Czech Republic in 2015, Ministry of Industry and Trade)

Bio Polymers:

In the Czech Republic, there are several research institutes/faculties focused on biopolymers, such as the Tomas Bata University in Zlin's Centre of Polymer Systems, which is a dynamic research unit with long-term sustainability and high added value. CPS as an important regional research centre will support national plastics and rubber industry from the personnel, technology and knowledge viewpoints, and at the same time it will work internationally on all activity levels. The scientific part is framed into two mutually linked programmes connected with polymer processes, bioactive polymers and polymer composites. The research programmes create a sufficient space for the cooperation with the commercial sector with an accent on innovations.

The Technical University in Brno is another example of the developed biopolymer research. The application of the research is expected within the Plastic Cluster and Moravian-Silesian Automotive Cluster in the future.

Phytopharmaceuticals:

The extent of cultivation of the MAPs (Medicinal and aromatic plants and spices) is determined by the unstable situation of their sales. There is a lack of domestic growers. The reasons are the high economic and professional demands on the cultivation of MAPs, and on the other the low purchase price of the competition and cheap imported MAPs and yet domestic MAPs retain their position thanks to its quality. (The high content of active substances and low content of impurities of microbial contamination.) These features are crucial for processing MAPs to make the final product. (Source: Situation report medical, aromatic plants and spices, Ministry of Agriculture)

Development and production of MAPs plants in the Czech Republic

Year	2006	2007	2008	2009	2010	2011	2012	2013	2014
Surface (ha)	5 858	5 184	4 015	5 674	7 864	8 588	7 225	5 659	5 566
Production (tonnes)	4 727	3 925	3 847	3 900	5 605	7 016	6 098	3 775	5 066
Yield (tonnes)	0,81	0,76	0,96	0,69	0,71	0,82	0,86	0,67	0,91

Source: Ministry of Agriculture

Transportation:

Biofuels:

The most common biofuels, which are in use in the Czech Republic, are rapeseed oil methyl ester (FAME) and bioethanol (biofuel). They are used either in the form of low blends, into all gasoline and diesel is added a certain amount of biofuels or high-percentage mixtures (e.g. alcohol-petrol E85 mixture or blend of diesel with 30% of FAME content) or pure biofuels (E.g. 100% biodiesel or vegetable oil). According to the Action plan for biomass of the Czech Republic (created by Ministry of Agriculture), the use of biofuels will play a significant role in the decentralized production of electricity and heat, but a smaller role in the transport segment. On the other hand, a recommendation could be also found in this action plan. The recommendation for further research in the biogas and bio-methane production editing technology because industrial engines used in cogeneration units are at adequate design and adjustment, so they easily cope with variable gas composition and many undesirable substances than conventional automobile engines, which are using natural gas. Biofuels contribute to about 4.2% of energy consumption in transport in the Czech Republic. According to statistics of the Customs Administration in 2012, 6,658 million litres of motor fuels were sold, thereof 366 million litres of biofuels, including 63 million litres of pure biodiesel and 209 million litres of biodiesel for blending in diesel and 83 million litres of ethanol. For E85 and biodiesel, relatively extensive infrastructure exists. These fuels are commercially available on a large number of the stations. Because the quantity of fuel sold is clearly not a small number of vehicles that are approved for these fuels, it is clear that concentrated biofuels are used in existing fleet as a replacement for conventional petroleum fuels ("drop-in fuels"). (Source: National Action Plan for Clean Mobility Ministry of Industry and Trade/ Action plan for Biomass in the Czech Republic for period 2012/2020 Ministry of Agriculture)

Summary balance of biofuels in 2015 (Tonnes)

2015	FAME	bioethanol	bio-ETBE
Production	167 645	99 725	4 990
Import	175 839	37 342	517
Export	67 623	31 066	-
Domestic consumption	277 266	114 558	5057
Production capacity	420 000	160 000	-

Source: Ministry of Industry and Trade

The number of vehicles with alternative drives can be estimated from unofficial statistics. The largest share represent cars with LPG in the number about 200 thousand. By the end of the 2014, about 9 thousand vehicles operated on CNG (according to CGA). It is estimated that in the Czech Republic about 1500 vehicles operate with hybrid drives and 300 pure electric vehicles (BEV).

Human resource:

The human resources of the bio-based sector in the Czech Republic comprise of employees, entrepreneurs, academics, researches, students, engineers and technicians in the bio-based industries. Currently, the human resources could be described as low developed in the Czech Republic, with the exception of agriculture. Especially in the field of industry, the capital of the human resources is quite low concerning the number of employees in the biomass production (other than traditional agriculture and forestry/wood processing) and bio-based sectors in the Czech Republic. According to the National bioeconomy profile of the Czech Republic ¹⁾, there are approx. 532 081 persons employed in the sectors (13.5 % of total employment in the region).

On the other hand, there is a big potential of the academy and R&D sector. There are several universities and research centres focusing on biotechnology, biochemistry, biomaterials, chemical bioengineering, agriculture and food, polymers and other material engineering specialisations. For example, the Czech University of Life Sciences in Prague, Charles University, University of South Bohemia in Ceske Budejovice, University of Pardubice, Masaryk University, Palacky University in Olomouc, University of Chemistry and Technology Prague, Mendel University in Brno, Brno University of Technology, Tomas Bata University in Zlin, etc.

According to the National bioeconomy profile of the Czech Republic, the tertiary education covers approx. 5 800 graduates in the 1st and 2nd stage of the tertiary education leading to an advanced research qualification in the field of occupation – life sciences and agriculture, forestry and fishery. The number of R&D personnel in biomass production and bio-based sector is approx. 3 100.

Exploit technical managerial and other know-how from your region worldwide?

Not known yet!

1) https://biobs.jrc.ec.europa.eu/sites/default/files/generated/files/country/National%20Bioeconomy%20Profile%202014%20Czech%20Republic_0.pdf

Regional Bio-based industry Strategy

There is no Regional Bio-based Strategy in the Czech Republic. The information below is based on the desk research and data analyses of the available

document and information regarding the established cluster organisations in the Czech Republic (following the bio-based cluster landscape).

Criteria	Indicator	Region	
		2010	2015
Land use ²⁾	Forestry land (% of total land area) ³⁾	33,8 %	34 %
	Agricultural & horticultural land (% of total land area)	53,6 %	54 %
Biomass availability ⁴⁾	Agricultural biomass production (kg/capita]	894	961.9
	Blue biomass production (kg/capita)		
	Forestry biomass production (kg/capita)	940	910.4
	Waste production (kg/capita)	3 025	3542
Innovation ⁵⁾	SME birth rage (% of total firms in region)	11,3%	9,1%
	R&D expenditure (index (EU = 1))*	1,4% GDP	2% GDP
	R&D employment (% of total employment in region)**	10,7%	12,8%

* "index (EU=1)"

** FTE - Full Time Equivalent

Cluster size ⁶⁾	Firms in total bio-based industry sectors (% of total firms in region*)	X	0,0594%
	Employment in total bio-based industry sectors (% of total employment in region**)	X	0,8069%
	Firms in primary biomass sector (% of total firms in region*)	X	0,0162%
	Employment in primary biomass sector (% of total employment in region**)	X	0,1795%
	Firms in food & feed sector (% of total firms in region*)	X	0,0033%
	Employment in food & feed sector (% of total employment in region**)	X	0,0382%
	Firms in paper & pulp sector (% of total firms in region*)	X	0,0071%
	Employment in paper & pulp sector (% of total employment in region**)	X	0,1049%
	Firms in chemicals sector (% of total firms in region*)	X	0,0027%
	Employment in chemical sector (% of total employment in region**)	X	0,0382%
	Firms in polymers sector (% of total firms in region*)	X	0,0061%
	Employment in polymers sector (% of total employment in region**)	X	0,1954%
	Firms in phyto-pharma sector (% of total firms in region*)	X	0,0010%
	Employment in phyto-pharma sector (% of total employment in region**)	X	0,0053%
	Firms in textile sector (% of total firms in region*)	X	0,0049%
	Employment in textile sector (% of total employment in region**)	X	0,1180%
	Firms in energy sector (% of total firms in region*)	X	0,0070%
	Employment in energy sector (% of total employment in region**)	X	0,0488%
Quality of workforce	Secondary & Tertiary education in bio-based industry (% of total population in region)		

* total number of firms in the CZE: 672 144

** total number of employees in the CZE: 3 928 300

2) Large area of country has specific restriction due to the environmental protection (8,4 % agricultural land and 16,0 % of total area of Czech Republic). Source: Ministry of Agriculture

3) The area of forestland itself increases each year by 2000 hectares.

4) Czech Statistical Office

5) Eurostat Statistics, CzechInvest Statistics, Czech Statistical Office

6) Data of established cluster organisations (following the bio-based cluster landscape)

I. Is there a specific regional Bio-based industry strategy? On which pillars is the strategy focused? Is there a smart specialization strategy? Is the strategy focused on Value Chains?

There is no specific national/regional bio-based industry strategy in the Czech Republic. No single responsible Ministry for Bio-based industry has been appointed. Yes, there is a smart specialization strategy of the Czech Republic. For the purpose of smart specialisation under the conditions existing in the Czech Republic, these domains have been defined related bio-based industries: advanced materials, nanotechnology and industrial biotechnology. There are also the key application sectors

and application themes, such as natural resources, sustainable agriculture and food safety and sufficiency, drugs and medical products.⁷⁾

II. How is Bio-based industry supported?

There is no primary source of financing for the bio-based industry. However, the fact is that bio-based industries involve a large scale of sectors (agriculture, energy...), which are supported within the national/sectoral funding programmes.

III. Who are the authors of the strategy? Which clusters are involved?

Not relevant for the Czech Republic.

Strategy implementation

The Czech Republic does not have the national strategy for bio-based industry.

Effects/Impact

There is no Regional Bio-based Strategy in the Czech Republic.

Future challenges for cluster development in bio-based industry

- Organization (cluster organization reinforcement, clear membership, enrich services provided to cluster participants)
- Actors (R&D providers)
- Biomass supply
- Competitive bio-based products
- Funding
- Policies and measures
- Lessons learned
- Key recommendations

There is no coherent cluster development policy in the Czech Republic now. The Ministry of Industry and Trade operates the Structural Funds-based programmes where the Cooperation Programme for cluster organisations is included. However, clusters of other industries and sectors, such as agriculture, medicine, transport, services etc., have no financing cluster scheme available.

Thus, the recommendation is to prepare and adopt a new cluster policy covering all sectors of economy, including bioeconomy based on new global reality and growing competitiveness needs, with new scope of application and new rules.

⁷⁾ National Research and Innovation Strategy for Smart Specialisation of the Czech Republic (National RIS3 Strategy), 2014. P. 111

Annex

Definitions/Glossary

Clusters: Clusters are generally described as groups of specialised enterprises, often SMEs, and other supporting actors in a particular location that cooperate closely together.

Cluster initiatives: A cluster initiative is an organised effort aiming at fostering the development of the cluster either by strengthening the potential of cluster actors or shaping relationships between them. They often have a character like a regional network. Cluster initiatives usually managed by a cluster organisations.

Cluster organisations: Cluster organisations are entities that support the strengthening of collaboration, networking and learning in innovation clusters and act as innovation support providers by providing or channelling specialised and customised business support services to stimulate innovation activities, especially in SMEs. They are usually the actors that facilitate strategic partnering across clusters. Cluster organisations are also called cluster managements.

Cluster participants: Cluster participants are representatives industry, academia or other intermediaries, which are commonly engaged in a cluster initiative. Given the case a cluster initiative has a certain legal form, like associations, cluster participants are often called cluster members.

Cluster policy: Cluster policy is an expression of political commitment, composed of a set of specific government policy interventions that aim to strengthen existing clusters and/or facilitate the emergence of new ones. Cluster policy is to be seen as a framework policy that opens the way for the bottom-up dynamics seen in clusters and cluster initiatives. This differs from the approach taken by traditional industrial policies which try (and most often fail) to create or back winners.

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