



CELEBio

D.3.1 COUNTRY REPORT: CZECH REPUBLIC

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Key points for bioeconomy in the Czech Republic

Bioeconomy is at an initial stage of development.

There is no specific policy for bioeconomy in Czech Republic. So far, any related regulation has been implemented according to the EC directives and it is accommodated to the existing legislations issued by the Ministry of Agriculture, Ministry of Trade and Industry, and the CTIA (Czech Trade Inspection Authority).

Czech Republic is a member of the Central-Eastern European (CEE) Initiative for Knowledge-based Agriculture, Aquaculture and Forestry in the Bioeconomy – BIOEAST – which offers a shared strategic research and innovation framework for working towards the development of a sustainable bioeconomy in the CEE countries. The mission of the BIOEAST Initiative, through this governmental initiative of the CEE countries is to set the vision for 2030, to develop knowledge and cooperation based circular bioeconomies, which helps to enhance their inclusive growth and to create new value-added jobs especially in rural areas, while maintaining or even strengthening environmental sustainability. The Czech Republic has been signature to several political initiatives under the umbrella of BIOEAST.

The short-term aim of the Czech Republic is to generate new economic opportunities and jobs from an increase in the bioeconomy business, through high added value bio-based products and services while securing the operating conditions for the sustainability of nature's ecosystems.

1. Introduction

The aim of the report is to present a set of specific, attainable, relevant biobased value chains and a time-based Action Plan for the development of bioeconomy in Czech Republic. The work has capitalised on the findings of the work in CELEBIO¹ and is structured in four sections.

The first section presents the current state of the bioeconomy based on available, discusses the country's comparative strengths and opportunities, and provides an overview of the existing policy regime per value chain stage (i.e. biomass production, conversion, distribution, end use).

The second section introduces the Bioeconomy Vision, the value chains selected through consultation with national stakeholders and outlines how they fit to the three main priorities² from the 2018 Update of the European Bioeconomy Strategy³:

- Strengthen and scale-up the bio-based sectors, unlock investments and markets
- Deploy local bioeconomies rapidly across Czech Republic
- Understand the ecological boundaries of the bioeconomy

The third section provides facts tailored to each value chain in terms of current exploitation of biomass raw materials, future actions that could steer innovative and resource efficient market uptake for biobased products, potential interventions and expected added value. This information has resulted from the consultation with national stakeholders within the duration of the project. This section also includes information on the relevance to the UN Strategic Development Goals (SDGs), selected relevant projects and markets for the biobased products that will derive from each value chain.

Finally, the fourth part provides an implementation plan, jointly developed with stakeholders, which includes time specific goals for reaching the Vision.

¹ [Czech-Republic-Country-Report.pdf \(celebio.eu\)](https://celebio.eu/Czech-Republic-Country-Report.pdf)

² https://ec.europa.eu/research/bioeconomy/pdf/bioeconomy_line_actions.pdf#view=fit&pagemode=none

³ <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52018DC0673&from=EN>

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2. Bioeconomy in Czech Republic

Current state

Bioeconomy in Czech Republic had an annual turnover of thirty-three billion Euros in 2017 which translates to 85,000 Euros per person employed in the sector, with the EU27 average being 127,000 Euros.

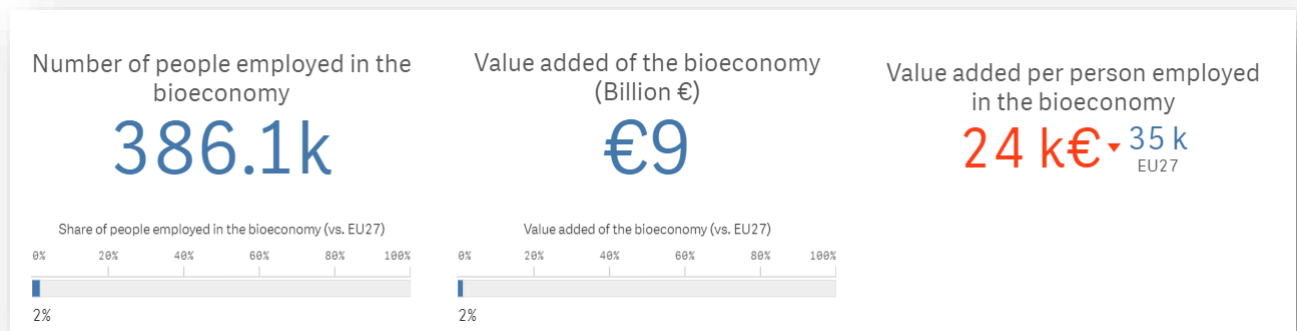


Figure 1 Value added in the Czech Republic bioeconomy (source: datam.jrc.ec.europa.eu)

The value added from the bioeconomy sector in the country was nine billion Euros and in the same year there were 386,100 people employed (Figure 1).

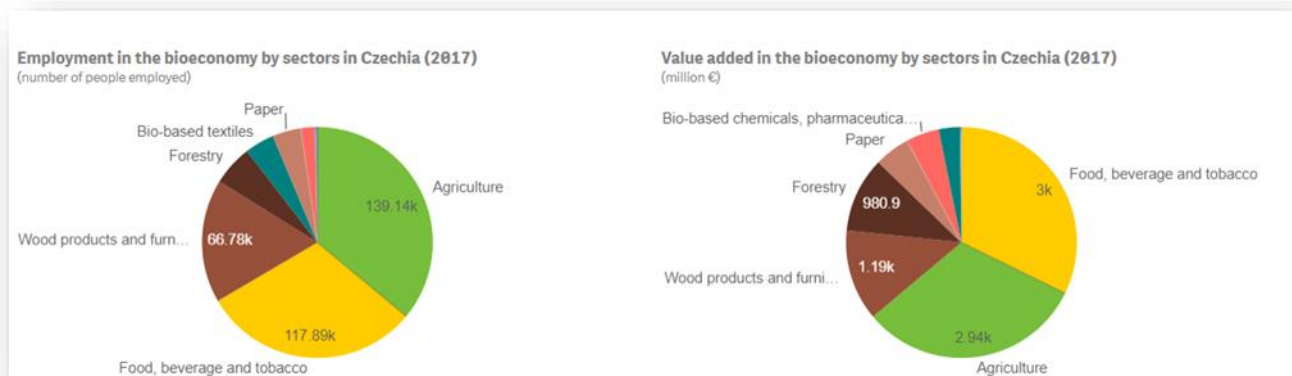


Figure 2 Employment and value added in the bioeconomy by sectors in Czech Republic in 2017 (source: datam.jrc.ec.europa.eu)

Agriculture remains the biggest sector in terms of employment (36% of the total number of people employed) with food, beverage, and tobacco following with similar share (30.5%). In terms of value-added food, beverage and tobacco leads with 3 billion Euros and agriculture follows with 2.94 billion Euros. Wood products and furniture, followed by forestry, each have a turnover of approximately 1 billion Euros annually.

Strengths, opportunities and barriers



- Agriculture sector is highly developed
- Robust food and beverage value chains
- Modern transport infrastructure

- Relatively large utilizable biomass
- Growth opportunity in development of
- Czech bio-organics market
- Local bioeconomy hub development

- Climate change, more drought and high temperatures
- Agricultural practices leading to inadequate soil and water management
- Monopolies in some value chains leading to competitive lock-out



- Strong tradition of forestry management
- Monitoring and surveillance of forest status

- Much under-utilized wood biomass
- Relatively open market for wood product development
- Lack of competition of novel technological solutions to the forestry derived products and service
- Establish local sawmills and collective wood and timber processing centres in country

- Climate change effects lead to increasing drought and mild winters
- Weak containment of the bark beetle
- Lack of urgency in prioritizing forestry as a potential industry
- Decrease ground water due to current agricultural practices, leading to the forest drying
- The main threat is political inaction and unwillingness to incorporate measures which may undercut existing business interests, even though the social, environment, and/or economic benefits favor a changed approach.



- Sludge is controlled by the municipalities, the accounting for its production and usage is likely to be reliable.
- There is a trend to decrease landfilling

- A key opportunity will be the installation of new infrastructures within and around municipalities to harness both sludge and recycled food waste.
- New legislation will need to put in place to recycle organic waste and use of the biomethane for public transport vehicles in cities.

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Policy mechanisms relevant to bioeconomy in Czech Republic

There is not yet a specific regulatory frame in Czech Republic exclusively dealing with bioeconomy and bio-based economies. So far, any related regulation has been implemented according to the EC directives and it is accommodated to the existing legislations issued by the Ministry of Agriculture, Ministry of Trade and Industry, and the CTIA (Czech Trade Inspection Authority).

Errore. L'origine riferimento non è stata trovata. the policy mechanisms that are currently operational in Czech Republic.

	Production	Conversion	Distribution	End-use
Agriculture. Forest, waste	Act on converting agricultural and forest lands	Operational Programme Environment (ESIF 2014- 2020)	Eco-energy programme	Act No. 201/2012 Coll., on the protection of atmosphere (Clean Air Act: Biofuel Quota)
	Act on plant protection			Ownership tax benefits
	Act on trade in the reproductive material of forest woody plants		Act 165/2012 on promoted energy sources: Feed in tariffs, premiums	Act No. No. 353/2003 consumption tax/Excise tax
	Act on the protection of nature and the landscape			
	Water Act			
	Forest Act	Transport Policy 2014-2020	Act No. 406/2000 Coll. on Energy Management	
	Examination of agricultural lands and soils of forest lands			Act on Environmental Impact Assessment
	Fertilisers Act	Carpathian Convention		Act No. 311/2006 Coll., on Fuels
	Law on Agriculture	Air Protection Act		
	CAP: Czech Rural Dev Programme	Act No. 338/1992 Coll. on the Property Tax		
	Subsidies for forestry-env measures			
	Forest Inventory	Act No 262/2000 amending Energy Act No. 458/2000		
	Sustainability criteria for biofuels			
	Water Act			
	Wastes Act Act No. 185/2001 Coll., on waste:			
	Waste Management Act 2014-2020			
	Secondary Raw Materials Policy of the Czech Republic (2019-2022)			
	Act on Environmental Impact Assessment		Act No. 338/1992 Coll. on the Property Tax	
		Air Protection Act		
Strategic Framework Czech Republic 2030; National Climate and Energy Action Plan 2030; Circular Czechia 2040 Strategy				

Figure 3 Policy mechanisms relevant to bioeconomy in Czech Republic (green: regulations; blue: financing; beige: information provision)

3. Vision and implementation plan

Vision for sustainable and circular bioeconomy

The short-term aim of the Czech Republic is to generate new economic opportunities and jobs from an increase in the bioeconomy business, through high added value bio-based products and services while securing the operating conditions for the sustainability of nature's ecosystems. This would be a stepping-stone to the long-term vision of being fully integrated with the European ambitions of climate neutrality by 2050. A starting point to this vision will be the support of the European Green Deal by the Czech government. With a declaration of alignment, the work could commence with the formulation of an overall national strategy to support the Green Deal, with the drafting of a bioeconomy strategy. The key points to this strategy included the following:

Ensuring food security

Managing natural resources sustainably

Reducing dependence on non-renewable resources

Mitigating and adapting to climate change

Creating jobs and maintaining European competitiveness

It is envisioned that the work of a strategic plan, initially for the next ten years, until 2030, would be an effort that would require an inter-ministerial group of stakeholders, coordinated by an independent agency, which would also be empowered to implement/coordinate this agenda. Implementation of the strategy would require the agreement of metrics, both baseline and target goals, with supporting governmental actions to insure execution and delivery of such goals.

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Strengthen and scale-up the bio-based sectors, unlock investments and markets

This section focuses the Czech Republic Action Plan on value chains selected by national stakeholders as promising ones that have significant potential for market uptake of domestic raw materials and are suitable to foster innovation for the existing industrial infrastructure.

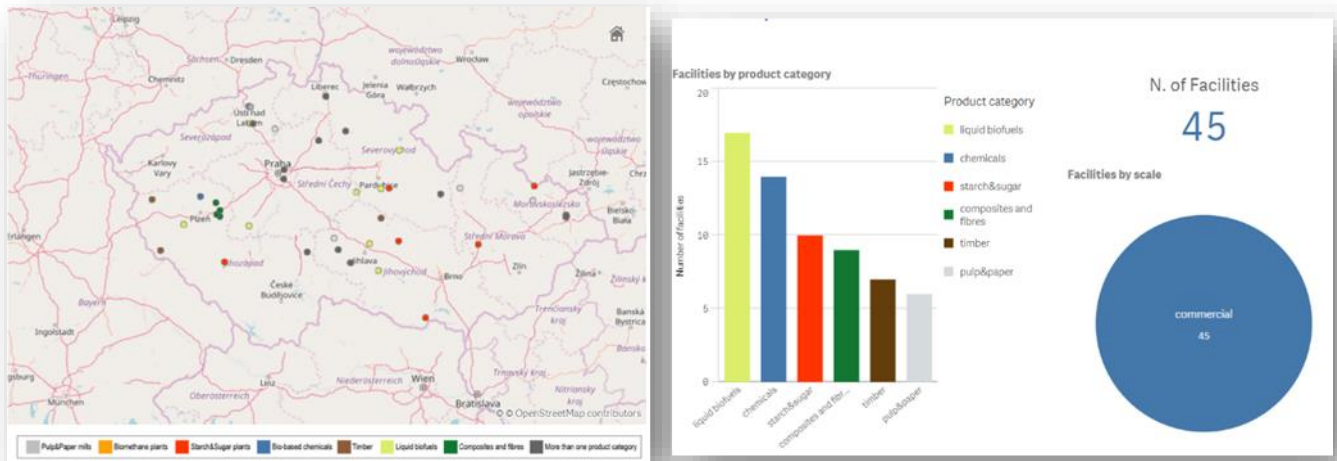


Figure 4 Biorefineries in Czech Republic (source: https://datam.jrc.ec.europa.eu/datam/mashup/BIOBASED_INDUSTRY/index.html)

Figure 4 Biorefineries in Provides and overview of the biorefineries in Czech Republic. There are currently forty-five commercial facilities operating in the country within the liquid biofuels, chemicals, starch and sugar, composites and fiber, timber and pulp and paper.

CELEBIO has also engaged with national stakeholders to understand their perspectives of the Czech bioeconomy and select value chains with strong potential to uptake indigenous raw materials, foster the development of innovative products and contribute to the development of Czech Republic bioeconomy.

Deploy local bioeconomies rapidly across Czech Republic

The value chains presented in this section and selected by national stakeholders fit well with the regional distribution of biomass raw materials across Czech regions.

Value chains from agriculture

The agricultural sector in Czech Republic is generally quite comparable to the European average. The proportion of agricultural employment in 2017 was the same (3.9%), and the agricultural area per capita, is similar to the European average. The crop (59%) and livestock (41%) outputs are also similar to the European average.

The most important crops in Czech Republic are cereals, green harvested crops (maize and other forage crops), sugar and starchy crops and oil crops, e.g. rape. Permanent crops cover a relatively small percentage of the cropping area, particularly in comparison to most EU countries.

The value chains selected by the national stakeholders are:

- **Develop the environment and facilities to enable novel bioeconomy related engineering.**
- **Increase the cultivation of technical hemp, particularly in nutrient depleted lands, e.g. mining sites.**

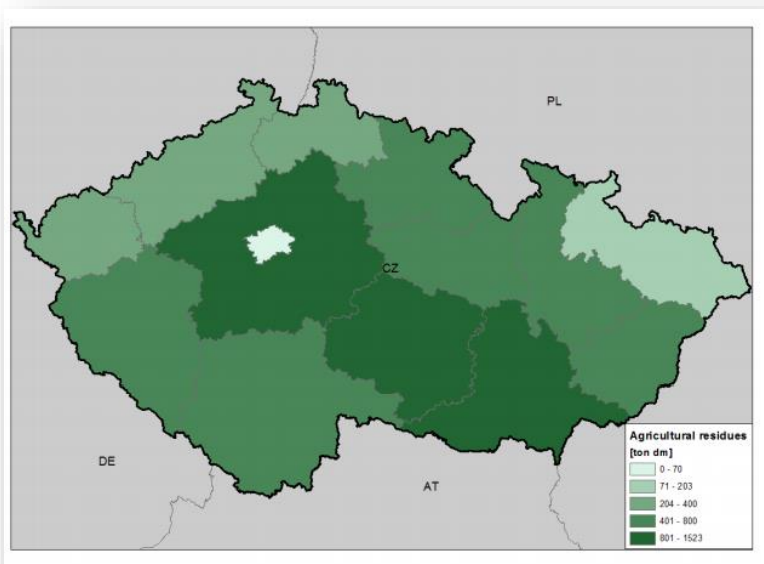


Figure 5 Total primary residual biomass potential from agriculture in ton d.m/year (S2Biom Base 2020 potential)

Errore. L'origine riferimento non è stata trovata. illustrates the concentration of primary agricultural residues in Czech Republic regions

Value chains from forestry

Forestry is an industry deeply anchored in the Czech tradition. With its area of forest cover reaching more than 2.67 mil. hectares (CZSO, 2019a), that has increased by 3% over the last 50 years, it is an important landscape and ecosystem element. It accounts for about 0.5% of GDP and gives jobs to almost 13,650 people. In recent years, forestry has faced significant challenges, which include, first and foremost, the effects of climate change, as well as the effects of an unbalanced forestry cover formation in the past, manifested in particular by the bark beetle infestation.

The value chains selected by the national stakeholders are:

Conversion of excess wood and its residues. Wood for eco-innovation/ construction Furniture fertilizers and bio-degradable packaging materials.

Local wood processing facilities need to be established in several regions in the country on a small and sustainable scale to enable wood and timber processing.

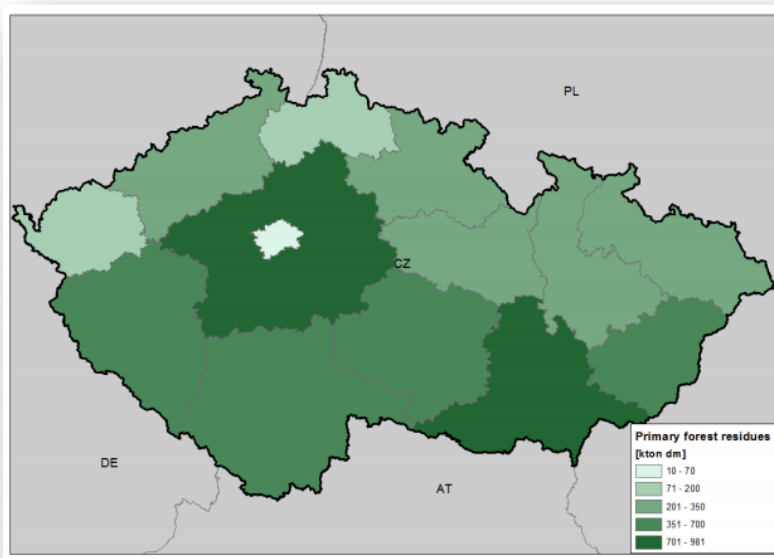


Figure 6: Distribution of primary residues potential from forests Kton d.m (S2Biom Base 2020 potential)

Figure 6: Distribution of primary residues potential from forests Kton d.m (S2Biom Base 2020 potential) illustrates the concentration of primary forest biomass in Czech Republic regions

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Value chains from biowastes

Current disposal methods for sewage sludge include landfill, incineration, composting, and agricultural use.

To deploy bioeconomy in Czech forestry the following actions must take place:

- Stimulate the usage of industrial residues and waste
- Creation of pilot and demonstration facilities
- The exploitation of side streams and residues from biomass production and processing for coupled and cascade usage.

The value chains selected by the national stakeholders are:

- Facilitate the conversion of municipal sludge to biogas. Additionally, enable the collection of food waste through recycling in cities to be an additional source for biogas.
- Stimulate the conversion of manure to fertilizer to replace chemical fertilizers and revitalize soil richness.

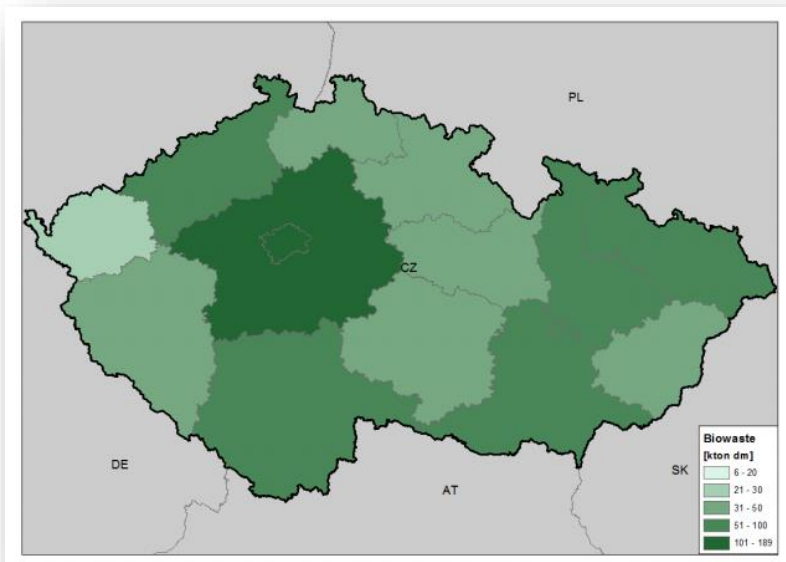


Figure 7 Biowastes in Czech Republic regions

Figure 7 Biowastes in Czech Republic regions illustrates the concentration of biowastes in Czech Republic regions

Understanding the ecological boundaries of the bioeconomy

Land use change

Land use is related to raw material production. Emissions from land use change can be significant in some circumstances, however, the simple notion of land use change emissions is not sufficient reason to exclude biomass from the list of worthwhile technologies for climate change mitigation, bioeconomy and circular economy.

The value chains selected for the Czech Republic bioeconomy comprises residual and waste fractions so there is no risk expected from their mobilisation and future exploitation.

Biodiversity

Forest biomass: High risks can be anticipated. After the harvesting of bark-beetle damaged trees, the replanting of forests in an accelerated manner would best be served to incorporate a diversity of tree varieties. This is not to say that spruce trees, a prime target of the bark beetle, should not be included in this biodiversity mix, as spruce is an important source of timber for construction.

Loss of dead wood and stumps may negatively influence species diversity and soil fauna. Contrary to this, leaving them all on the ground may result in increased fertilisation (N and wood ash) and negative impacts on vegetation

Agricultural biomass: high risks can be anticipated without sustainable practices. The Czech Republic has a lack of biodiversity due to greater mass-scale farming – leading to higher pesticide use, which means more chemicals in consumer products, food and beverages. The absence of fertilisation from animal manure, and wide-spread use of chemical fertilizers, has led to reduced microbiological activity.

Biowastes: Positive in regions where it avoids landfill, although landfill practices are still widespread.

Soil & Carbon stock

Forest biomass: Increased risk of soil erosion. More forests are being clear cut due to the bark beetle calamity, soil and carbon stocks are at risk, without proper re-planting. Competing grass and scrubs will out-compete the newly planted trees. A common solution is the use of herbicides to kill grass and scrub, but this process leads to unnecessary soil and ground water contamination. The solution is to plant new trees sooner and clear cut less.

Some forest fellings should remain on the ground to retain water and nutrients. The amended Forest Act mentions a certain amount of fellings left on the ground, but does not specify how much. This needs to be standardized, implemented, and monitored.

Agricultural biomass: High risk to loss of soil organic carbon when overharvesting crop residues; risk to lose nutrients when overharvesting. Mass-scale farming contributes to soil nutrient depletion, which means less productive land over the long-term period. Soil and water management should be considered before using biomass for energy (eg. corn conversion to biogas). Energy production from field crops, would be better served with intercropping. Absence of fertilisation with animal manure reduced soil organic matter and soil nutrients.

Biowastes: Positive in regions where it avoids landfill; Digested organic waste is a source of soil improving material.

Water

Forest biomass: No effect on the quantity due to forestry practices. The major impact on water table sustainability is from the agricultural practices; If no removal leads to increased fertilisation, the leaching on N to water may increase.

Agricultural biomass: High risk due to unsustainable farming practices. Plot size is generally very large, with the use of massive farm harvesting equipment. This leads to a soil compaction, and water retention is severely hampered. Moreover, the lack of trees over such a large land mass, does not allow for uptake of water as it runs off into nearby creeks and streams. The run-off water not only contains the soil nutrients but also the chemical fertilizers and pesticides, which are contaminating waterways.

Biowastes: Lower risk of water pollution in regions where it avoids landfill, however landfill is commonly used, as little biowaste is recycled.

Potential ecological concerns for agriculture include:

Poorly conceived bioeconomic activities which do not consider the sustainability risks (eg. corn to biogas)

Risks to biodiversity, water erosion, deterioration of soil conditions, poor water management in the case of some crops intended as the primary source of materials for the bioeconomy.

Lack of biodiversity and greater mass-scale farming – leading to higher pesticide use, which means more chemicals in consumer products, food and beverages.

Mass-scale farming contributes to soil nutrient depletion, which means less productive land over the long-term period.

Soil and water management should be considered before using biomass for energy.

Energy production from field crops, would be better served with intercropping

Potential ecological concerns for forestry include:

Unsustainable large-scale farming - can pose a medium to high risk for all mentioned elements (biodiversity, soil, water). The agriculture Act must address the sustainability of farmland management, from a soil nutrient and water erosion perspective.

Excessive use of chemistry (eg. pesticides, herbicides) could mean a high risk for all mentioned elements (biodiversity, soil, water).

Large clear cutting of trees without timely re-planting of forests, will not allow for newly planted tree growth. Competing grass and scrubs will out-compete the newly planted trees. A common solution is the use of herbicides to kill grass and scrub, but this process leads to unnecessary soil and ground water contamination. The solution is to plant new trees sooner and clear cut less.

Some forest fellings should remain on the ground to retain water and nutrients. The amended Forest Act mentions a certain amount of fellings left on the ground but does not specify how much. This needs to be standardized, implemented, and monitored.

Biodiversity challenge with re-forest. Diversification of the forest re-planting approach is vital. Spruce trees need to be included in this biodiversity mix, or the market for productive wood will not be viable.

Potential ecological concerns for biowastes include:

Working in an uncoordinated manner, without a long view, nor a strategy to implement goals is a very high risk. The first step would be to have the Czech Republic declare its support for the European Green Deal.

Inability to reduce per capita eco footprint. Inability to meet the required CO2 emissions limits.

Inability to meet biodiversity targets.

Inability to meet the 2030 agenda for SDGs.

Inability to halt soil degradation and thus failure to transform the economy to zero carbon by 2050.

4. Value chains for the Czech bioeconomy

This section provides facts tailored to each value chain in terms of current exploitation of raw materials, future actions that could steer innovative and resource efficient market uptake for biobased products, potential interventions and expected added value. This information has resulted from the consultation with national stakeholders within the duration of the project. This section includes information on the relevance to the UN Strategic Development Goals (SDGs), selected relevant projects and markets for the biobased products that will derive from each value chain.

Agriculture

Main aim of the selected value chains is to:

- Support livestock and crop production; Involvement of rural citizens in rural development
- Exploit high straw residue potential; Local food processing industries offer opportunities as the negative balance of food export and import is growing

Forestry

Main aim of the selected value chains is to:

- Development of rural business activities by mobilising new value chains in the context of circular economy
- New legislation divides State and non-state forests and makes access to funds from state easier
- Research and Innovation activities towards higher added value products from forest biomass and to increase the share of RES

Wastes

Main actions:

- Increasing efficiency of waste recovery methods in municipalities

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Utilization of agricultural residues for novel technologies and products

Value chain	SDGs	Examples of relevant projects
Develop facilities to enable novel bioeconomy related engineering. The Czech Republic has the tradition, and relevant experience to enable the automation of various facets of the bioeconomy, spanning agriculture, forestry, waste, and new bio-based industries.		

Current exploitation of biomass raw materials

- Existing agricultural biomass is not systematically regarded for use. Although cereal straw is generally used for animal bedding, soil reincorporation, and burned for heat – a more organized and efficient utilization of this vast resource is warranted.

Future actions

- Engineer new technologies and equipment to facilitate the advancement of the bioeconomy (eg. new harvesters, automated planting machines, and drones with novel sensors).
- Promotion of efficient, sustainable use of natural resources respecting ecological burdens
- Optimise the efficient use of straw to convert to packaging materials or in construction
- Displace fossil-based resources in the agri-food supply chain
- Stimulate the usage of agricultural residues

Potential interventions

- Extension of regulatory and funding instruments of the Ministry of Agriculture for rural areas for the bioeconomy.
- Further development of technologies for the conversion of straw to higher value products
- Investors could encourage small entrepreneurs, but subsidies from public are not acceptable
- Connecting point with consulting and funding support (bioeconomy voucher programme).
- Inter-ministerial working groups led by an independent agency to set bioeconomy strategy
- New RIS3 strategy formulated
- Regulations to stimulate the bioeconomy
- Examine the calculations for crop residue reincorporation into soil

Expected added value

- Replace plastics with bio-based agricultural residues
- Invent novel engineering devices to stimulate the bioeconomy (globally), and create jobs locally
- Securing the supply of raw materials for a sustainable circular bioeconomy and exploiting future-oriented opportunities for creating added value and employment in rural areas.
- Contribution to the reduction of greenhouse gasses and other pollution environmental, social, economic benefits

Product Group	Market size Europe
Agro-chemicals	1,000 – 10,000 kt
Fertilisers	
Sustainable Energy	>10,000 kt

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Industrial crops in marginal land

Value chain	SDGs	Examples of relevant projects
<p>Increase the cultivation of technical hemp, particularly in nutrient depleted lands, e.g. mining sites. Moreover, the hemp fiber can be used to support the abundant automobile manufacturing value chain (car interiors), and well as the expertise in novel textiles.</p>		<p>GRACE Web site http://www.grace-bbi.eu</p> <p>Magic – Marginal Lands for Growing Industrial Crops (magic-h2020.eu)</p>

Current exploitation of biomass raw materials

- The customer demand for hemp derived products is robust within the Czech Republic, however most of the technical hemp is imported.
- Currently the automobile industry is a dominant player within the Czech economy. The introduction of hemp incorporated products as substitutions for interior automobile mouldings should be considered.
- The textile industry within Czech Republic is very mature, thus hemp should be incorporated within the textile and weaving processes, as a more sustainable bio-based product.

Future actions

Increase the cultivation of technical hemp, particularly in nutrient depleted lands, e.g. mining sites. Moreover, the hemp fiber can be used to support the abundant automobile manufacturing value chain (car interiors), and well as the expertise in novel textiles. Czech Republic has a robust car manufacturing industry, and textiles are very advanced, yet most hemp is imported from other countries, including those outside of EU.

Potential interventions

- Create tax incentives to support such action and raise the public awareness of the traditional/historical cultivation of hemp in the region and tout its benefits.

Expected added value

- Land will be brought back to use; new industries created; lower carbon-footprint by growing locally; replacement of non-biodegradable products (auto plastic interiors).

Product Group	Market size
Cosmetics	S <1,000 kt
Paints & coatings	
Plant based-chemicals	M 1,000 – 10,000 kt
Fertilisers	
Sustainable Energy	L >10,000 kt

Forest based value chains

Value chain	SDGs	Examples of relevant projects
<p>Conversion of excess wood and its residues. Wood for eco-innovation/ construction, furniture, fertilizers, and bio-degradable packaging materials.</p>		<p>Web site https://www.bioforever.org</p>
<p>Local wood processing facilities need to be established in several regions in the country, on a small and sustainable scale, to enable wood and timber processing.</p>		<p>Web site https://www.luke.fi/efforte/</p>

Current exploitation of biomass raw materials

- A long tradition in forest management, uniform forest management system
- Ownership structure in Czech of land:
 - For state forests, relates to a management model which is not agile enough. For example, contracts for labour are not adjustable. State ownership is not flexible, as typical contracts are 5 years and must insure the lowest price, without respect to quality.
 - Private ownership of small properties (~100,000 owners across country). Owners have no standardized approach to land management, and don't maintain land in general, as the average plot is small (one hectare). And there are legislative obstacles to forming a larger group collective of private owners.

Future actions

- Development of regional action plans for utilisation of forest biomass
- Establishment of regional/local biomass logistic centres
- Promotion of efficient and effective biomass generation and bioeconomic value creation chain through digital options in the areas of forestry
- Developing suitable concepts for harvest, decentralised processing, logistics and warehousing, minimizing post-harvest losses, and ensuring that biomass quality is maintained during storage and processing.
- Integration of R&D activities related to paper industry waste into Regional Innovation Centres for clean technologies in the field of circular bioeconomy
- Promote innovation - improvements in wood production, more environmentally friendly management, better wood processing. New sources of funding for forestry.
- Sustainable management, long-term sustainable wood production
- Increasing capacities (ideally local) for wood processing (lumber, furniture) with higher added value, which will take into account the expected change in the wood composition.
- Use of logging residues - it is necessary to define how many residues must be left in the forest.
- Use of "calamity wood" - currently a surplus of wood on the market, which needs to be used as best as possible in a relatively short period of time

Potential interventions

- Forest Certification
- Introduce innovation financing for food SMEs and industries

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- Regulation on forest raw materials for bioeconomy
- Calamity wood (bark beetle damage) needs to be managed fast, and it can be used as normal wood, if the bark is removed, after cutting, the wood can be relatively undamaged.
- Creating demand for Czech wood, in the form of high-added value products.
- Increase the value to the primary wood source – small sawmills should be utilized to avoid transport of wood long distances or out of the country. Subsidize the local production and sawmills.
- Develop a ‘Made from Czech Forests’ label, for wood products. Which would create demand for Czech wood and for high-added value products.
- The state should support the use of wood for construction. Stimulate wood construction with a money-back voucher.
- Wood packaging materials should be subsidized.
- Biodiversity should be payed by the society. Devise a mechanism for the society to value and support biodiversity.

Expected added value

- Increase sustainable utilisation of biomass
- Reduction of air pollution, including PM10 and PM2,5
- Restoration of forests
- Reduced customer demand for non-biodegradable materials

Product Group	Market size
Cosmetics	<1,000 kt
Paints & coatings	
Plant based-chemicals	1,000 – 10,000 kt
Sustainable Energy	>10,000 kt

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Value chains based on biowastes

Value chain	SDGs	Examples of relevant projects
Facilitate the conversion of municipal sludge to biogas. Additionally, enable the collection of food waste through recycling in cities to be an additional source for biogas.		<p>Web site https://bferst.eu/</p> <p>Web site http://deep-purple.eu/</p>
Stimulate the conversion of manure to fertilizer, to replace chemical fertilizers, and revitalize soil richness.		<p>Web site http://www.percal-project.eu</p>

Current exploitation of biomass raw materials

Challenges –

- The cycle or circularity of waste must be addressed
- Waste must be reduced
- Particularly land-fill waste should be reduced

Policy gaps –

- Recycling is not emphasized or encouraged
- Ecological value of resources is missing

Future actions

- Acceleration of introduction of end of waste legislation to facilitate utilisation of some of biowastes
- Stimulate the turning of bio-waste, residues, and discards into valuable resources

Aim of actions –

- To view waste as a resource for the generation of energy, fertilizer, and other renewables
- Develop technologies for effective waste treatment
 - Technologies need to consider environmental sustainability along with profitability
 - Focus on support of local technology development
 - Selection of projects/patents for real application potential, in both top-down and bottom-up methodology
 - New technologies should allow for broad access, not exclusivity
- Address waste separation by purity, reuseability, and secondary municipal waste
- Waste treatment should be considered locally from the perspective of farms/cities

Potential interventions

- Incentives for the use of waste for biogas production (subsidies) and fostering the development of clean and renewable energy production. This could include penalties and rewards for energy production, depending on their environmental impact.
- National wide recycling and waste separation campaign and implementation of this type of education in the schools.
- Develop a strategy and action plan to move to zero-carbon waste and waste recycling
- Re-orient policies to consider the circularity of bio-mass, not only production, but re-use
- Policy gap- relates to taxation to incentivize re-use of materials. Carbon tax on fossil related waste at the point of production/extraction to the end-of-life.

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- Actions to be taken – coordinate among sectors. National policy in bioeconomy with taxes and regulate policy. With enforcement of policies, and not just paper strategies without actions.
- Aim of action, to have sustainable, productive soil, through diversified land-use, and reduced dependence on chemical fertilizers, and reduce the land-fill dependence.

Expected added value

- Increased use of urban/municipal waste, cleaner energy, reduced environmental impact, potential to improve revenue of all stakeholders
- Efficient system of urban waste collection, improvements possible in higher share of energy utilisation (biogas)
- New opportunities for eco-construction options in integration of renewable energy
- Cross-sectoral value chains need to be identified. Recycling is the first step and separated into waste that can be re-used in other industries. Waste that can be organically processes to be linked in the bioeconomy, eg. fertilizers. Non-bio waste which needs to be assessed for toxicity and safety, could be reused in construction, re-furbished plastics, and electronics. Can these processes be scaled, large or small, urban vs. rural.

Product Group	Market size Europe
Cosmetics	S <1,000 kt
Paints & coatings	
Plant based-chemicals	M 1,000 – 10,000 kt
Fertilisers	
Sustainable Energy	L >10,000 kt

5. Implementation plan

Agriculture

Policy

Have the ministries cooperate on the overall/holistic approach to bioeconomy.

Avoid the misuse of subsidies and negative unintended impacts that will undermine the confidence of individual actors. On the contrary, present positive examples and sustainable impacts.

Incorporate the topic of bioeconomy (specific challenges to ensure the sufficiency of biological renewables, new technologies and innovations, research) in the preparation of the subsidy programs 2021-27 (within the relevant ministries).

Society

Showcase good examples through proper targeted PR; Local politicians should also spread the examples and messages of bioeconomy. We need to work with them to raise awareness.

Broaden the involvement of society, encourage and involve local players, politicians, academia, private investors and entrepreneurs - support start-up and spin-off companies.

Economy

SMEs should be supported, preferably from private money.

Technology

Development of precision agriculture, new breeding technologies. Hemp fibers and new technology for harvesting

Spin-offs and start-ups to develop technological solutions to bioeconomy problems.

Environment

The opportunity for the Czech Republic could be to have the big farmers adopt the bioeconomy/green deal agenda, it could turn public opinion around.

Forestry

Policy

Develop policies to recycle wood.

Instate a land-fill tax or ban on wood in landfill.

Incentivize new business ideas to bring wood products to the market (grants, vouchers, etc.)

Society

Develop a ‘Made from Czech Forests’ label, for wood products. Which would create demand for Czech wood and for high-added value products.

Economy

Establish a better setting for subsidies to support the concept of bioeconomy. An economically viable solution should be proposed to enable sustainable forestry and high-quality wood products.

Incentivize new business ideas to bring wood products to the market.

Technology

Innovations aimed at promoting sustainable forest management, better assortment, processing of lower quality wood.

Use harvesters more than we do or increase their efficiency.

To move to more small scale, not large-scale sawmills, with the incorporation of new technologies.

Environment

Promote the integration of ecosystem services. The current practices, particularly in agriculture, leads to forest dryness, as water tables are depleted.

Waste

Policy

Need for a national level framework to the endorsement of the European Green Deal.

Set policies to establish the Czech bioeconomy action plan, based on zero-carbon principles

Government Plan in the form of a roadmap with targeted goals are needed.

Policy needed to reduce the ecological footprint of per capita in Czech Republic (currently double of EU average).

Policies must have long-term objectives, beyond the political cycle

Strategy – An independent working group should lead the bioeconomy strategy, in concert with relevant ministries (linking an inter-ministerial working-group). The independent body should own the agenda

Society

Education at the level of municipalities (cities) via workshops.

Private sector actors need to make visible that they are engaged in bioeconomy (eg. national certificate label).

Economy

Research centres should directly contribute via supported innovation hubs (eg. AIT in Austria), in effect solving waste challenges through new projects.

Technology

Development for small, medium and large scale sustainable and eco-friendly waste centre within the country (waste sorting, filtering of toxins, processing, distribution).

SMEs together with research centres should engage to develop new technologies



























Environment

Concrete actions needed to ensure high air and water quality standards meeting the European targets

Development of waste to fertilizer actions will increase biodiversity through use of organic fertilizer, which will lead to increased soil richness.

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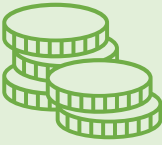


Actions, actors involved and funding instruments

Action ⁴	Actors involved	Funding instruments
Pilot, demonstration actions at small-scale, with technological pathways that can be flexible (modular) and adaptable for various domestic sources (T)	 	Eco-Fund: Loan, subsidy and tender for RES-E RES-H new building obligation
Development for small, medium and large scale sustainable and eco-friendly waste centre within the country (waste sorting, filtering of toxins, processing, distribution) (T)	  	Next Generation EU Action Plan on financing sustainable growth
Restoration of marginal land (Env)	    	Action Plan on financing sustainable growth CAP
Increasing private financial lever for supporting investments in biobased technologies, in particular seed investments and venture capital (Econ)	  	
Informed citizens that are aware of the need to reduce dependence on fossil fuels and favors bio-based alternatives (S)	   	Action Plan on financing sustainable growth
Incorporate the topic of bioeconomy (specific challenges to ensure the sufficiency of biological renewables, new technologies and innovations, research) in the preparation of the subsidy programs 2021-27 (within the relevant ministries (P)	   	Action Plan on financing sustainable growth
Encouraging development of bioeconomy clusters (P)	    	Action Plan on financing sustainable growth

⁴ T: Technology; Env: Environment; Econ: Economy; S: Society; P: Policy

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6. Socio- economic impact of Czech Republic Bioeconomy Action Plan

 <p>JOBS</p>	<p>Create 3,000 new jobs in agriculture, forestry and food processing industry</p>
 <p>LEVERAGE INVESTMENTS</p>	<p>Leverage 100 million € private investments within ten years</p>
 <p>FOSTER COLLABORATIONS</p>	<p>Cluster creation At least five new collaborations between raw material providers and industrial actors</p>
 <p>BOOST INNOVATION</p>	<p>Five new biobased value chains embedded in agriculture, forest industries and biowastes. Produce five new patents and IP rights, Support the creation of ten spin-offs and start-ups.</p>

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7. Environmental impact of the Czech Republic Bioeconomy Action Plan

	<p>Reduce emissions in agriculture by 30%</p> <p>Restore 50% of marginal land.</p>
	<p>Contribute to the sustainable management of natural resources and foster efficient water use.</p> <p>Support a circular and sustainable bioeconomy in Czech Republic</p>
	<p>Biodiversity</p>
	<p>Local resources for products, energy and fuels</p>