

Bio-based strategies and roadmaps for enhanced rural
and regional development in the EU



ROADMAP FOR A BIOECONOMY STRATEGY IN COVASNA COUNTY

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INTRODUCTION

The European Commission defines the bioeconomy as a concept that covers “all sectors and systems that rely on biological resources (animals, plants, micro-organisms and derived biomass, including organic waste), their functions and principles. It includes and interlinks land and marine ecosystems and the services they provide; all primary production sectors that use and produce biological resources (agriculture, forestry, fisheries, and aquaculture); and all economic and industrial sectors that use biological resources and processes to produce food, feed, bio-based products, energy, and services. To be successful, the European bioeconomy needs to have sustainability and circularity at its heart. This will drive the renewal of our industries, the modernization of our primary production systems, the protection of the environment and will enhance biodiversity” (European Commission 2018).¹

Biomass is defined as "the biodegradable fraction of products, waste and residues from biological origin from agriculture (including vegetal and animal substances), forestry and related industries including fisheries and aquaculture, as well as the biodegradable fraction of industrial and municipal waste" (European Commission 2009).²

The bioeconomy has an enormous potential of creating new jobs in local contexts triggered by innovative businesses. These are based on the enhanced cooperation between academia, industry, policy, and civil society. The development of the bioeconomy contributes also to the achievement of the United Nations Sustainable Development Goals. Finally, the bioeconomy aims to set the basis for a healthier way of living both for humans and animals³.

The roadmap documents for Covasna’s bioeconomy strategy are intended to be integrated into the regional/national policy framework (e.g., regional/national Smart Specialisation Strategy, Bioeconomy Strategy etc.). The roadmap documents outline actions to be taken forward by a range of actors, e.g., businesses or cluster organisations. The individual actions depend on the regional context (i.e. available biomass streams, identified business models), though, the following aspects are addressed: business sector development; RDI capacities and activities; use of diverse EU, national and regional funding streams; synergies with other policy fields, notably related to rural and regional development, as well as smart specialisation strategies; education / information in relation to sustainability; international collaboration and sharing of good practices among regions⁴. The roadmap documents are developed with the strong ambition to feed into the mid-term review of the 2021-27 EU cohesion policy, rural development, and fisheries policies (ERDF, ESF+, CF, EAFRD and EMFAF) programmes and any mid-term updating of S3 or regional innovation strategies in the 2021-27 programmes.⁵

¹ BE-Rural, Deliverable 4.2., p. 8

² BE-Rural, Deliverable 2.5., p. 15

³ BE-Rural, Deliverable 4.2., p. 8

⁴ BE-Rural, Deliverable 4.2., p. 8

⁵ BE-Rural, Deliverable 4.2., p. 8

The process of co-creating a roadmap for bioeconomy strategy involves a complex interaction between regional and local actors. Also, the stages of such a process require the awareness and training of these actors.⁶

The European Commission foresees that the bioeconomy will play an integral role in spurring the EU-recovery from the COVID-19 crisis, for instance by improving resilience and competitiveness, providing long-term systemic solutions, and ensuring a just transition (EC 2020). On the other hand, the COVID-19 pandemic offers an opportunity to trigger systemic change on many levels, including one towards a sustainable and circular bioeconomy. However, for this potential to materialize, existing contradictory policy goals, e.g., in terms of long-term investments, need to be better understood and addressed.⁷

Covasna County is one of the Romanian promoters of bio-based industries and the region where the Institute for Economic Forecasting (IPE) has been involved in multiple EU projects. The bioeconomic potential of Covasna County lies in its biomass resources and its dense stakeholder network, consisting of business incubators and clusters and benefitting from the decade long action of three Local Action Groups (LAGs). It has a strong cultural identity still tributary to local traditions, which are carefully cultivated: thermal baths, mofettes (an opening in a region of extinct volcanic activity, through which carbon dioxide, nitrogen, and other gases pass) and traditional crafts. Covasna has a considerable potential for the development of bio-circular economy based on its economic structure: all primary production sectors (agriculture, forestry, fisheries, and aquaculture) are well represented in the local economy as well as green energy, livestock farming, woodworking and furniture, textiles, clothing and knitwear, food processing (meat and milk), and tourism.

The elaboration of the *Roadmap for a Bioeconomy Strategy in Covasna County* aims to strengthen the regional institutional capacities to improve decision-making and administrative performance, to increase the involvement of civil society and local actors for effective policy-making and implementation and to enhance cooperation and knowledge for an effective penetration of the bioeconomy principles in everyday life at public institutions, local SMEs, NGOs and by involved citizens to create and develop needs-based local applications.

The described best practices will provide relevant stakeholders in Covasna with a useful tool meant to support them in the challenging process of setting up the local bioeconomy strategy. Furthermore, they can be of use for any individual or organisation dealing with strategy-building processes. Finally, it shows that excellence can be found even in remote areas away from the European innovation mainstream⁸.

A particular note here is that strengthening the cooperation capacities of all stakeholders in the multi-level system is crucial to contribute to better policy coordination and mutual learning, which can align policies of different regions and increase knowledge. This is important in the field of circular and bioeconomy as it is a remarkably diverse, cross-sectorial, and wide-ranging area.

⁶ BE-Rural, Deliverable 4.2., p. 8

⁷ BE-Rural, Deliverable 5.2., p. 7

⁸ BE-Rural, Deliverable 4.2., p. 9

1 REGIONAL CONTEXT

1.1 Local conditions and bioeconomy potential

The articulation and deployment of a sound roadmap for bioeconomy strategy require a solid groundwork upon which upcoming planning and stakeholder involvement activities can be built. One of the first steps in laying out this groundwork is to closely observe the current state and dynamics of the macro-environment in Covasna region. Concretely, we refer to the examination of political, economic, social, technological, environmental, and legal conditions surrounding and influencing Covasna. During the first semester of the BE-Rural project, IPE engaged in a collaborative research exercise where all these factors were outlined and analysed using the PESTEL Analysis methodology.⁹



Source: BE-Rural Deliverable 2.2. Fig. 1 p. 10

Figure 1 Factors influencing strategy development and deployment

⁹ BE-Rural, Deliverable 2.2., p. 10

Covasna County is located in the South-Eastern part of Transylvania, within the Centre Region of Romania. It covers an area of 3705 km² and occupies 1.55% of the total area of Romania. The county has as residence the municipality of Sfântu Gheorghe. Covasna is among the smallest counties in Romania, comprising five cities and having a population of 220,840 inhabitants (1.04% of the country's population), of which 49.4% live in urban areas. Most of the territory is disadvantaged mountain area with one of the lowest average population densities compared to national average, and strong traditions which make locals keen to retain their historical and economic features and preserve their natural habitat. Covasna County benefits from a series of natural resources, which support the promotion of the bioeconomy, such as: abundance of mineral water, wood, rapeseed, grains, livestock, and resources for textiles.



Source: <https://pe-harta.ro/covasna/>

Figure 2 Map of Covasna County

Economic conditions

In Covasna County, 87% of the area is rural, while 13% is urban. The county lost 12% of its population between 1990 and 2020. According to the latest statistics, in 2019 there were eighty-two thousand employees, out of those eighteen thousand worked in agriculture and forest management, twenty-six thousand in industry, mostly in light industries such as textile and food industry. The strongest food industries are dairy products, meat production and mineral waters. Over eleven thousand working in commerce about four thousand employees in transportation and three thousand in tourism. The rate of unemployment in Covasna County is about 4%, which is in line with the national average.

In 2018, Covasna County's GDP per capita represented 46% of the EU average and 71.1% of the national average and 75% of the regional average. Covasna County has an important and diversified tourism potential, with several sub-domains in which it enjoys a certain advantage: mountain tourism, spa tourism, cultural tourism and agrotourism. Agriculture and forestry significantly reduced their share in gross value added at county level from 7.8% in 2008 to 4.5% in 2017, and the share of construction decreased from 10.6% to 5.5%.

At the level of Covasna County, the largest amount of industrial waste resulted from wood processing, followed by agricultural waste, respectively municipal waste. Covasna is one of the most important spa areas in Romania. The Romanian network of tourist reception units is unevenly spread, the highest concentration being registered in Brasov County (17.9 in 2018), and the lowest in Covasna County.

Social conditions

Covasna County is characterised by high territorial disparities in terms of social living standards in rural and urban areas, the social and economic development of rural areas is lower compared to urban areas. In rural settlements there are 9-12 entrepreneurs per 1000 inhabitants, while over thirty entrepreneurs per 1000 inhabitants are in urban areas. The rural settlements are characterized mostly by primary sectors, with lower availability of services, lack of modern infrastructure, and high number of inhabitants who are not considered as unemployed, but they are living independently based on self-sufficient farming.

Another significant social problem in the region is population decrease due to migration of the young people to cities to study or abroad to work. In Covasna County there is no significant university centre, therefore the young people are moving to study in bigger cities such as Cluj-Napoca, Brasov, or Bucharest. Later on, especially educated individuals are not returning to their hometown. This so-called “brain drain” creates serious issues locally.

According to 2011 Census¹⁰, educational attainment in Covasna County was distributed as follows: 10% of the population held a graduate degree, 46% completed secondary education, 28% completed primary education, 15% had incomplete primary education and 1% had no school education.

Covasna’s labour market has an acute need of skilled workforce and technical expertise and training; however, people are thinking that vocational schools have less prestige. The availability of technical workforce and well skilled human resource is essential for the sustainable development of the circular economy in Covasna County. With regard to silviculture and forest management, there is a long tradition in regional vocational and theoretic high schools, while suitable workforce is available, but not for bio-based and bioenergy circular bioeconomy applications. Among the citizens, after a painful experience during the socialist era, there is an extremely low acceptance or willingness to participate in cooperatives or associated business groups.

Technological conditions

In Covasna County, there are available technologies to support bioeconomy and circular economy developments. In agriculture, for instance, the medium sized and larger farms are equipped with state-of-the-art technologies thanks to intensive agriculture developments with EU and national funding measures. However, in some respects, due to the underdeveloped transportation infrastructure and limited inter-regional connectivity, the modernization of the rural economy is slowly progressing.

The regional industry is mostly based on fossil fuels such as natural gas, however the energy supply is depending on national grids, because there is no significant power production capacity in Covasna County. At the same time, due to powerful project implementation from Green Energy

¹⁰ <http://www.recensamantromania.ro/rezultate-2/>

Innovative Biomass Cluster and its member companies, several small-scale bioenergy projects are in operation, while the technology is manufactured also in Covasna County. Also, a few local public authorities implemented solid biomass-based space heating and energy supply systems such as:

- Local solid biomass value chains from harvesting of biomass from mountain pasture cleaning, converting into biomass and supply of biomass consumers, e.g., Estelnic, Chichis, Bodoc, Malnas, and Zagon.
- Local biomass deposit and logistic centre collecting biomass wastes from the municipality and supplying the local public buildings with biomass fuel, e.g., Ghelinta.
- Biomass based micro- and small size district heating systems at different companies e.g., greenhouses, bakeries, and residential districts, e.g., Zabola Estate, and Locodeni.
- Balvanyos and Tusnad tourist centre has explored thermal energy potential beyond its existing springs, reaching a total thermal power from the springs and additional holes of 2 MW.

The small-scale renewable energy facilities from Covasna County, could either be expanded as part of the local bioeconomy development or serve as a model to be multiplied in Romania and abroad.

Among the member companies of Transylvanian Textile and Fashion Cluster, the new products of the cluster are manufactured taking in consideration the principles of sustainability and the circular economy. Significant textile waste is collected and reused, while clothes out of textile by-product materials were presented at national and international exhibitions.

Given the region's economic focus on forest-based industry, the most relevant applications of biotechnologies and bio-based products are:

- pelletizing and briquetting of e.g., wood residues and forest biomass for combustion
- gasification or pyrolysis (from the agricultural residues for production of biochar or energy)
- anaerobic fermentation for production of biogas from manure at livestock operations
- production of toys out of sawdust by 3D printers while sawdust is using as thread.

The regional food industry also produced bio-innovation products such as high protein energy drinks out of whey. Many dairy producer companies struggled with the main and biggest problem of the remarkably high protein content waste fluid, which on one hand may be very harmful to the environment, but also contains the high-value part of the milk. The developed beverage is recommended for athletes, as well as for those who adopted a healthy lifestyle, pointing out that the high protein level helps improving health when used as dietary supplements, specifically marketed to those involved in bodybuilding, weightlifting and athletics.

The regional agriculture sector can also significantly contribute to the circular economy and bioeconomy development, by applying adequate technology on harvesting hay, straw and corn stalks or corn cobs. These by-products can be used in bio chain production as biofertilizer, energy production for local citizens, etc.

Political conditions

Romania does not have a national bioeconomy strategy, but the Centre's RIS3 (2021–2027) addresses five cross-sectoral themes, including the theme of sustainable economy, with the following three subdivisions: a) collaborative economy, b) circular economy, and c) local value chains. In addition, references to the bioeconomy are made in the Regional Development Plan of the Centre region 2021–2027. This cross-sectoral regional trend is in line with national efforts, in which several government institutions are getting involved, such as the Government Department of Sustainable Development, the Ministry of Agriculture, the Ministry of Environment and the Ministry of Economy. In addition, there are also national bioeconomy-related strategies: the Strategy for the development of the agri-food sector on medium and long-term 2020–2030 and the Romanian Strategy for Competitiveness 2021-2027. Furthermore, in the context of the wider macro region, Romania is part of the BIOEAST initiative for knowledge-based agriculture and forestry in the bioeconomy.

Environmental conditions

The main part of the relief consists of mountains from the Eastern Carpathians group. Most localities can be found in the valleys and depressions located along the different rivers crossing the county. The main river is Olt River; along its banks lies the capital city Sfântu Gheorghe.

Covasna County climate is temperate continental, influenced by the mountain climate - this means long, temperate summers and extremely low winter temperatures. The average annual temperature is 9°C. The region's temperate rainfall of 500 – 700 mm/yr is a significant asset to agriculture. The agroclimatic conditions offer adequate parameters to grow grain, potato, sugar beet, but in later years also rapeseed and corn on large surfaces. The agricultural areas are extended also with mountain pasture lands where livestock breeding is the major agriculture activity in many rural settlements such as in Biborteni, Varghis, Estelnic, Zagon, Intorsura Buzaului, etc. The agriculture sector is the second biggest producer of solid biomass waste (manure and organic waste).

Engagement of regional and local stakeholders for circular bioeconomy

Starting from the principle of circularity and considering the regional competences, ADR Centre considers that the potential of the circular economy and bioeconomy can be developed, with the support of the partnership between the regional stakeholders from private and public areas. ADR Centre organized an international conference on circular economy in 2020, where the participants tried to bring closer to the communities represented both the university-community collaboration models, but also the concrete solutions, applied in other regions, for the development of the circular bioeconomy.

The development strategy of the region assumed the goal of becoming “a clean region, attractive for its inhabitants and for its sustainable tourism, with a competitive economy, based on knowledge and innovation, in which the care for the exploitation and sustainable use of resources to it is in the attention of every citizen.” This objective can be achieved by implementing the

projects in the Regional Operational Program for the period 2021-2027. The circular economy is one of the development priorities of the region, being also a topic carefully analysed in the process of preparing the 2021-2027 programming period. As such, the concept of circular economy is included in the two regional planning documents: in the Regional Development Plan and the Smart Specialization Strategy of the Central Region.

ADR Centre aims to finance the adaptation and replication of the best models through the Regional Operational Program or other funding programs available in the next period. In the past 15 years, more than three hundred projects have been coordinated in the Central Region, with a total value of over 750 million euros, through which local communities benefited from non-reimbursable European funds for socio-municipal works. The investments were both for development of green infrastructure, promotion of energy efficiency, sustainable urban mobility, and for development of innovative solutions in the field of circular economy or adoption by companies of technologies and processes that involve low energy consumption, efficiency production processes in accordance with environmental objectives.

Through the future ROP for ADR Centre 2021-2027, the only program with regional allocation, coordinated directly at regional level, initiatives that contribute to the development of the circular economy and the transformation of localities in the Region into sustainable communities will be funded. All these regional and local development plans focus on gathering “clusters” in the agricultural sector and industry that can increase the employment rate in rural areas. Conditions for agricultural development are present in the region, but not yet sufficiently used toward faster economic development.

The PESTEL Analysis methodology is used to examine the macro-environment in Covasna region. Through a synthesized graphic summary (Table 1), PESTEL provides a snapshot of the situation as regards political, economic, social, technological, environmental, and legal conditions as well as biomass potential and foreseeable barriers to its exploitation. The objective of this analysis is to set the backdrop for the market assessment and business model design activities.¹¹

¹¹ BE-Rural Deliverable 5.1, p. 11

Table 1 PESTEL Analysis results for Covasna County

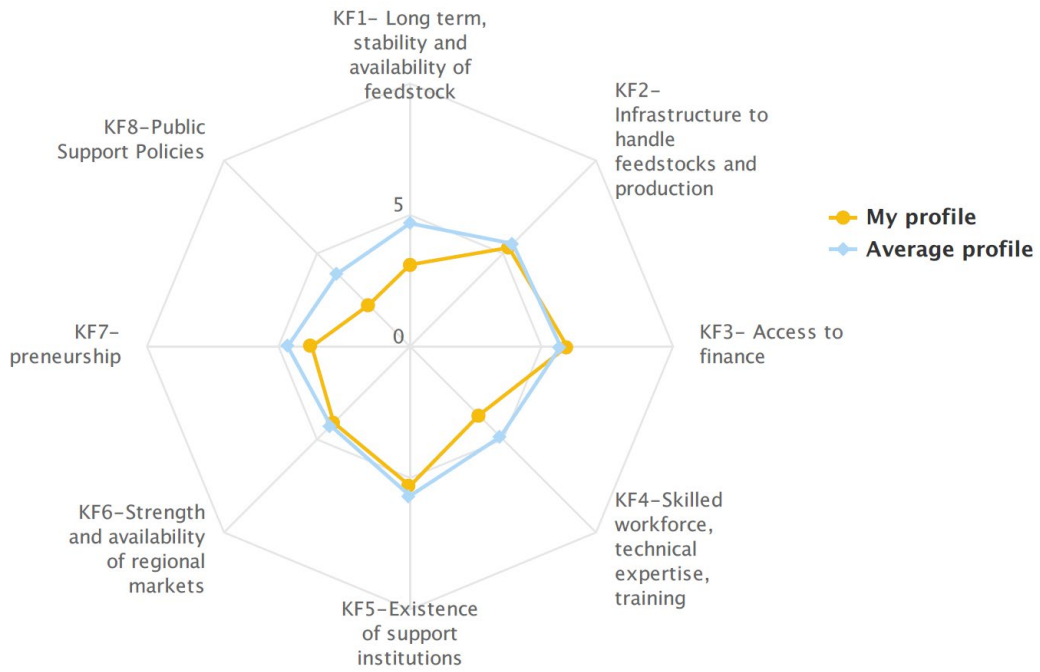
Political Conditions	Economic Conditions	Social Conditions	Technological Conditions
<ul style="list-style-type: none"> • There is no specific national or regional bioeconomy or bio-based industry strategy. • The National Strategy for competitiveness 2014-2020 and the National Research Development and Innovation Strategy 2014-2020 stipulate the bio-economy as a smart specialization sector. • Romania's Smart Specialization Strategy for 2014-2020, the Regional Smart Specialization Strategy (RIS3) of the Central Region and the 2010 Master Plan for Biomass and other policies in preparation, have links to bioeconomy. • The Sustainable Development Strategy of Romania 2030 contains chapters with measures for climate change, circular economy, waste management, protection, and conservation of forestry eco-systems. • The National Plan for Rural Development 2014-2020 focuses on the forestry and agriculture sectors. • At the Covasna county level, the bottom-up initiative "1 village 1 MW" aimed to implement small scale bioenergy projects to supply local public buildings • Public subsidies favour projects related to e.g., bioenergy production and use of local bioresources 	<ul style="list-style-type: none"> • Most important bioeconomy sectors in Covasna: forestry, followed by agriculture (rapeseed, grains) • Most important industrial sectors: wood manufacturing, automotive components, textile, green energy, metalworking, mechanical engineering, and tourism • Other promising sectors: agro-foods, forestry products, and textiles • GDP per capita and GVA of Covasna in upward trend, in line with the Centre Region and Romania. • Changes in the forestry code (2018) have had an impact on the quantities of harvested wood and on its price. Consequently, the wood industry has begun importing logwood from neighbouring countries. Overall, it has had a negative effect on the price of Romanian wood panels • Most promising sector for the future is bioenergy (heat & electricity), particularly from wood industry's waste and shrub (or energy) willow, for use in domestic companies and at national level. • Covasna is already home to Romania's largest combined heat power plants (CHP) in Reci with a total of 60 MW (15 MW electricity, 45 MW heat) • Strong cooperation among bio-economy relevant stakeholders in the region (clusters-universities-local public authorities-educational institutions-civil society) 	<ul style="list-style-type: none"> • Covasna is predominantly rural: >50% of the population lives in rural settlements with no significant core urban area for industry. As such, the region faces challenges such as low investment in basic infrastructure, inefficient supportive and advisory structures, and emigration (national and abroad) • Low population density, though relatively younger than other areas of Romania: 59% between 15 and 59 years • Demographic decline is predicted to continue until 2050, leading to an aging population and associated social problems such as a higher demographic dependency and further reduction of educational services for the young • Share of higher education graduates is trending upwards, while the percentage of illiteracy has decreased. • High unemployment rate of 5% (ca. 20% above national average, downward trend), linked to layoffs in nearby mines • Civil society organizations in every settlement; well-developed networks between them 	<ul style="list-style-type: none"> • Most relevant technologies related to forestry and biomass: e.g., modern biomass boiler technologies (households and business) • Innovations in the agri-food sector have resulted from research in the Covasna County: a whey-based energy drink and a fiber-rich, gluten free drink • CNC-Technology used in the auto-part and wood manufacturing, as well as furniture industry • Six clusters of different sectors present in the region: renewable energy and environmental technologies, forest-based industry, agriculture and food industry, clothing and fashion, and mechanical engineering

Environmental Conditions	Legal Conditions	Biomass Potential	Barriers to Biomass
<ul style="list-style-type: none"> • Covasna is covered by distinct types of forest • Wood is the most widely used biomass for household heating in the region. • In spite of existing efforts and regulations, illegal logging of public or protected forests is increasing both in number of cases and volume. With this, deforestation is becoming a concerning issue in Covasna County. • Awareness of population regarding illegal logging is increasing and online reporting mechanisms allow for public participation in the enforcement of policies • Environmental state of public forests (ca. 50% of total) monitored and controlled by state-owned Romsilva company 	<ul style="list-style-type: none"> • Diversification of agriculture supported by Agriculture Ministry. However, legislation regarding energy willow plantations has been updated in 2018. Since then, short rotation crops (SRC) are only allowed in degraded soils. Thus, biomass production is not allowed in agricultural land • Harvesting is limited or banned in Romania for high conservation value forests. However, illegal logging is very widespread due to low enforcement • The National Plan for Waste Management approved in 2017 regulates waste generation and promotes circular economy concepts. 	<ul style="list-style-type: none"> • Most bioeconomy potential in forestry sector • Waste from agri-food sector also relevant: already being used as a source for fertilizers, but it could also be used for the production of chemicals with a wide range of applications • Enough biomass resources are available for small-scale bio-based industries: while biomass is already used for pellet and wood chip production (energy production), unused feedstocks can be available for other such industries, e.g., textiles • Regional grant programs are supporting innovative start-ups • Easy access to finance by private companies through banks (public and private) • Existing clusters in biomass sector offer good potential for networking and strengthening entrepreneurship 	<ul style="list-style-type: none"> • Infrastructure for biomass transport and handling has room for improvement • Skilled workforce for biomass procurement activities exists. However, due to a lack of vocational training in the region, it is challenging to find skilled personnel for the implementation of bio-based industries • Public support policies for new businesses in this field is lacking at various levels • Entrepreneurship is weak, and the biomass market is still not fully developed, although there are several biomass suppliers from forestry and agriculture

Source: BE-Rural, Deliverable 5.1, p. 23

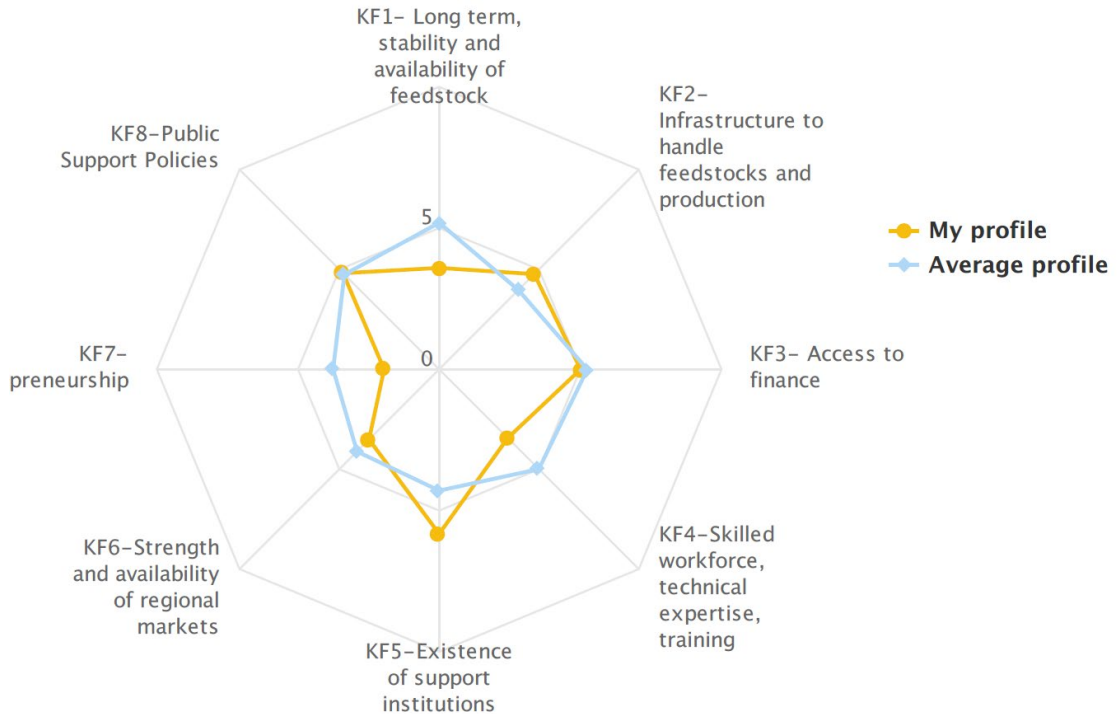
Bioeconomy potential

The bioeconomy potential of Covasna region was assessed using the Self-Assessment Tool (SAT) launched by the European Commission. The SAT is an online tool composed of two sets of questionnaires, which identifies biomass and waste as alternative raw materials and are based on eight Key Factors. The results of the SAT (Figure 5 and Figure 6) become highly relevant when it comes to designing the roadmap for the development of the bioeconomy strategy in the region and to engaging stakeholders and encouraging bio-based investments.



Source: BE-Rural Deliverable 2.3 Figure 6, p. 19

Figure 3 Biomass spider chart of Covasna



Source: BE-Rural Deliverable 2.3 Figure 7 p. 20

Figure 4 Waste spider chart of Covasna

In Covasna County the most significant potentials for bioeconomy developments are the following:

1. According to GIS-supported biomass potential assessment, the most promising organic feedstocks are available from forest-based sources, agriculture, and livestock breeding, agrofood industry and municipal waste management sectors (Benedek, 2018).
2. Sustainable economic exploitation of the regional forests as the surface of Covasna county is comprised of forest up to 46%.
3. Regional municipal waste management logistic centre, which achieved over 50% recycling rate as first in Romania
4. Secondary material flows in food industry, as one of the main industrial sectors in Covasna County
5. Secondary material flows in textile industry, as another main industrial sector in Covasna County
6. Large potentials in mineral water and medical water sector as well as in balneology sector.

The focus will be on the use of biomass materials generated in forest-based industry, agricultural operations, including crop residues and by-products of processing in food industry.

1.2 Drivers and barriers of bioeconomy development in the region

Drivers

In Covasna County there is no existing bioeconomy strategy or policy, the topic is not addressed in other regional documents. However, the county development strategy is going to be elaborated until 2022 for the next period 2022-2030. In the new strategy the topic of the circular bioeconomy will be mentioned in connection with the biobased economic cycles and the transition to climate neutrality.

Circular economy describes the way to use renewable resources sustainably and how to ensure environmental protection. The circular economy strategy also addresses that R&D is important for the implementation of a rural bioeconomy. Innovative technologies can also be used for valorisation of agrobiomass residuals for production of new bioproducts in agriculture. In this sense bioeconomy can be seen as a central driver for sustainable development in rural areas.

In a circular economy, the goal is often to transform linear industrial processes into circular ones. In this context, the aim is also to build a climate-resilient economy in agriculture, forestry, and the food sector (Rizos, 2017).

Barriers

For the energy sector, when trying to recycle wasted energy, in many industries or at different facilities, the thermodynamics law states that all spontaneous processes irreversibly disperse energy and, as a consequence, matter into ever more chaotic states, resulting in loss of quality

and quantity of substances and making a complete closure of loops hardly achievable (Bechtel, 2013). The certain pursuit of circular and bioeconomy objectives, i.e., using 100% renewable energy, may also be in contradiction with other principles related to resource efficiency: for instance, the expansion of solar energy with today's technologies uses more scarce resources, while using only renewables in the national power grid is not feasible because some types of renewables are characterized by fluctuation (wind, solar). The development of a smart grid requires additional investment in power supply infrastructure. In Covasna County, there is a number of households without connection to the national grid, so the basic infrastructure should be developed first for all citizens before moving towards smart grid solutions.

In today's recycling processes impurities of used materials can only be removed to a certain extent while the costs are increased. The European Commission attempts to frame a Circular Economy directive, setting the long-term recycling objectives up to 70%, the remaining 30% being considered as non-recyclable materials. On the other hand, non-recycled plastic packaging is still more cost-efficient than packaging from recycled plastics or biodegradable materials. If the use of plastic is limited by law, the end prices for packaging increases significantly and the citizens would have to pay increasingly.

In the current situation, trying to reach a 100% recyclability rate might prove counterproductive, if for instance, the price of recovery remains higher than the value of the materials recovered. Lack of incentives in the existing regulatory landscape does not necessarily make it desirable for all to pursue a circular economy objective.

Powerfully based on environmental sustainability, the circular economy framework lacks an elaborated description of the social dimension of sustainability (e.g., the fulfilment of local citizen's needs, involvement of local communities). If the circular economy and bioeconomy principles are formulated only from a business point of view, the social aspects are going to remain secondary aspects. It is essential, however, that additional manufacturing processes in a circular economy and bioeconomy – harvesting biomass or agrobiomass from the field or plastic recycling – demand more labour, while these activities cannot often be standardized. If this can create employment opportunities it is not certain that the jobs are created locally e.g., in Covasna County. Large, centralized recycling facilities that are most cost-effective could be based on the other side of Romania or abroad. Even if this approach aims to have an outcome in line with the circular economy principles, it is lacking the potential of local job creation while encouraging more transport and more centralized industrial activities.

Covasna County has a powerful agriculture sector concentrated in the largest intramountain depression in the county. In regional agriculture, engaging in a circular economy strategy may bring in difficult trade-offs. When trying to valorise more the by-products from agriculture, that would decrease the organic materials remaining on the field which have a powerful role in humus creation in soils, thus the agriculture sector itself is going to become less sustainable. On the other hand, selecting materials, e.g., non-hazardous ones, in a production process based on circular economy and bioeconomy principles might exclude not fully recyclable materials. However, certain materials might have environmental benefits but are generating not balanced material flows in certain economic sectors (CA, 2021).

1.3 SWOT analysis

Strengths	Weaknesses
<ul style="list-style-type: none"> • Long tradition in forest-based industry, textile, and fashion, agrofood and agriculture sectors • Intensive agriculture activities • Competitive private agricultural farms • Existence of a business incubator house and NGOs that are active actors in circular economy • Availability of higher educational facilities in the field of agriculture, forest-based industry, and food industry • Strong policy support for agriculture and sustainable rural development • High fertility of arable land, large volumes of agro by-products • Well-established biomass value chains and high number of local bioenergy projects • Introduced digital technologies that provide opportunities to improve access to services and monitor the business • Digitalization of rural education infrastructures • Increasing industrial capacities in agrofood industry 	<ul style="list-style-type: none"> • Aging in rural areas • Small average farm size (4 ha) and small size agriculture lands, inefficient farming • Intensive emigration of young generation • In rural areas, the agriculture sector is less and less attractive for young people • Outdated and low efficiency technologies • Low integration of agriculture and agrofood chains and lack of interest for vertical integration • Low willingness to be part of an association of farmers and other stakeholders groups • Farmers produce only raw materials for food industry without added value - unprocessed or semi-processed products for exports • No minimum quality standards and insufficient quality protection in the agrofood sector • No involvement of R&D entities, no collaboration between farmers and R&D • Low material efficiency, by-products considered as waste • No applied cascading principles in forest-based industry • Lower incomes in rural areas (50% of national average)
Opportunities	Threats
<ul style="list-style-type: none"> • Increasing environmental awareness • Social support for climate actions • Strong deployment of EU and national funds for circular economy and bioeconomy investments • Innovative technologies for recycling, upcycling, energy saving and renewable energy production • Use of solid wastes for energy production in rural settlements • Fast increase for rural tourism based on domestic market demand • Green Deal and Circular Economy Action Plan launched in 2019 • Digital links between rural and urban citizens e.g., short supply chains • Serious issues with global supply chains, more market opportunity for local products • Presence of sectorial clusters, providing professional support for circular economy developments in the fields of renewable energies, textile, and fashion, agrofood, forest-based industries, etc. 	<ul style="list-style-type: none"> • Lack of specialized labour in rural areas • High competition with strong companies from EU member states on food market, furniture market, etc. • Decreasing capacities in regional textile industry • Increased production costs for agrofood products • Prolonged negative impact of COVID-19 and the possibility of other global market disruptions • Global climate change and the risks associated with natural disasters, undiscovered infections in forests, agriculture, and nature) • Slow procedures in implementation of public funded projects

1.4 Relevant bioeconomy initiatives in Covasna County

The main objective of this sub-chapter is to gain a good knowledge and, when possible, to capitalize results from the pre-selected EU-funded projects that are related with circular bioeconomy and/or sustainable rural development.

In our target region we can identify Horizon 2020, Interreg Danube but also Cosme and UEFISCDI projects which supported the local initiatives and enlarged the mindsets of the local stakeholders with respect to the circular economy principles.

A handful of projects have a focus on the deployment of the circular economy in Covasna County, while some of the outputs can be used as inspiration or even guideline to understand and gain insight about the novel approaches in circular economy principles.

Pre-identified projects:

- **GoDanuBio:** 'Participative Ecosystems for fostering the revitalization of rural-urban cooperation through governing Danube Circular Bioeconomy' Period: 01.07.2020-31.12.2022
- **FORESDA:** Forest-based Cross-sectoral Value Chains Fostering Innovation and Competitiveness in the Danube Region, Interreg Danube Transnational Programme, Project Implementation Period: 01.04.2019-31.03.2022
- **AgroBioHeat:** Promoting the penetration of agrobiomass heating in European rural areas, Grant agreement: 818369, Project Implementation Period: 01.01.2019-31.12.2021
- **STRING:** Strategies for Regional Innovative Food Clusters, Interreg Europe, Project Implementation Period: 01.01.2017-30.06.2021
- **Bioenergy Villages (BioVill)** – Increasing the Market Uptake of Sustainable Bioenergy, Grant agreement ID: 691661, Project Implementation Period: 01.03.2016-28.02.2019

Next we present some of the essential elements of some of the listed projects.

GoDanuBio - Participative Ecosystems for fostering the revitalization of rural-urban cooperation through governing Danube Circular Bioeconomy

The project consortium discovered that the Danube regions and cities face major societal transitions regarding demographic change. The emigration of young people is a major challenge also in Covasna County. Mostly young professionals from this region emigrate looking for better employment and more perspectives for a higher quality of life in cities or western countries. This phenomenon leads to depopulated areas leaving behind an aging and increasingly unskilled population.

However, rural regions can make a significant new beginning by applying circular economy and bioeconomy principles. The project aiming to facilitate the participative governance approach and increase the institutional capacities to pool existent excellent competencies and development potentials. Co-creating future strategies to increase the attractiveness of rural areas is the key to give the youth new incentives to revive rural areas. Circular-Bioeconomy is used as a tool, which promises to foster regional development: It is a concept focusing on the transition of a fossil-

resource based economy towards an economy making use of sustainable production of biological resources and processes to develop new bio products, thus setting rural areas and their development into focus. The concept catalyses interdisciplinary cooperation also between different policy areas/levels to actively address demographic change, by enhancing value creation through new collaboration, business models and value chains raising the attractiveness to stay and even move to rural areas. Long term goal of the project is to enhance the socio-economic status of the regions, contribute to environmental, climate and resource protection as well as foster development of rural areas. An ecosystem for systematic multi-level governance with actors from the interested public, academia, industry, and political decision making will be developed. That ecosystem gives space for co-creation and new forms of integrated urban-rural cooperation leading to increased institutional capacity to tackle and develop the circular bioeconomy sector.

FORESDA - Forest-based Cross-sectoral Value Chains Fostering Innovation and Competitiveness in the Danube Region

Covasna County is comprised of forests up to 46%, while the forest-based industry is one of the most embedded economic sectors in this region. There is long tradition on wood manufacturing, wood constructions, furniture production but also applying circular economy and bioeconomy approaches in wood industries. The project aimed to transform the local forest-based industries (FBI) into attractive and sustainable industry sectors. This is possible by developing innovative products and services, identify material flows and close circles, which come as a result of the cooperation with R&D entities and another economy sectors, such as agriculture, construction, pharmaceuticals, etc. This is the so-called cross-sectoral approach.

In order to achieve this, the project partners supported and improved the innovation culture of their SMEs and strengthened collaboration among companies, faculties, and universities, research institutions, clusters etc.

In the frame of the project, stakeholders have elaborated the Joint Action Plan for Innovation and set a list of actions to address the identified needs within the region for the development of the supporting environments of wood sector in Centre Development Region of Romania.

Since in Covasna County are over 150 SMEs in forest-based industries, some of them were engaged in the elaboration of the Joint Action Plan, as well as in the Foresda Project Working Group. Afterwards, based on the identified needs, the development of the supporting environments related to the possible FBI cross-sectoral activities were addressed.

The national project partner of FORESDA project, namely the PRO WOOD Cluster organized the benchmarking of the separate groups of stakeholders (SMEs, academic area, public authorities, and consulting companies). The Pro Wood Cluster involved in the FORESDA project several other stakeholders from different areas, such universities and R+D institutions from academic areas, national and regional public authorities and forest management public and private entities, consulting companies in order to understand the ongoing challenges in the wood processes and local SMEs from the wood industry.

The gained results have been already capitalized in the elaboration of the Regional Development Strategy for 2021-2027.

AgroBioHeat – Promoting the penetration of agrobiomass heating solutions in European rural areas

AgroBioHeat is a Horizon 2020 project running from 01.01.2019 to 31.12.2021, aiming to produce a mass deployment of improved and market ready agrobiomass heating solutions in rural regions in Europe.

In Covasna County agrobiomass is a large, underexploited resource, considered as by-products which can support the rural development of circular economy and bioeconomy. Local farmers and citizens from rural settlements participated in the AgroBioHeat project events. In order to gain the trust of local market actors, the AgroBioHeat project identified the potential early adopters even from Ghelinta. Local stakeholders had the opportunity to participate in engagement and matchmaking actions where technology providers, ESCOs, and other consultancy companies took part and collaborate with the aim to set up agrobiomass for heat projects.

The BE-Rural project team together with the stakeholders from Covasna participated in several seminars organized within the AgroBioHeat project on common topics of interest.

Strategies for Regional Innovative Food Clusters (STRING)¹²

STRING¹³ is an INTERREG Europe project that ran between 2017 and 2021, aiming at improving the performance of regional development instruments and programmes in building strong agri-food innovation systems across Europe. The starting point was the identified need to improve the policy instruments related to the agri-food innovation ecosystem, to tackle efficiently the cluster integration problems of the SME`s, and to profit from the flow of information.

The objectives were:

1. to improve the performance and implementation efficiency of **development policies** related to food R&D&I
2. to promote innovation, to deepen food cluster integration and to create **more added value**
3. to stimulate interregional learning, **knowledge exchange** and inter-cluster cooperation and the corresponding activities:
 - i) identifying the **learning needs** in each region
 - ii) compiling a collection of **good practice examples**
 - iii) study visits and staff exchange programmes
 - iv) stakeholder **involvement** in all activities
 - v) preparing an **action plan** to improve the regional and national policy instruments related to the agri-food innovation ecosystem.

¹² BE-Rural Deliverable 4.2, p. 17-18

¹³ <https://www.interregeurope.eu/string/>

The project targeted the stakeholders from the agri-food sector in each region where the project was implemented (seven regions: North Brabant from the Netherlands, Alsace from France, Emilia-Romagna from Italy, Castilla y Leon from Spain, Northern Great Plain from Hungary, Midtjylland from Denmark, and Centre Region from Romania).

The outputs were: seven action plans addressing improvements in seven regional policy instruments related to the agri-food innovation ecosystem and the collection of best practices and their adaptation strategies in food innovation.

Some of the results were: improvement of the performance and implementation of regional development policies and programmes related to agri-food innovation; deepened intra- and inter-cluster collaboration serving the proper operation of food innovation value chains in the partner regions; strategies for creating added value are adopted and successfully used; improvement of the position of agriculture and food innovation in the regional development by a better harmonization of the policy instruments.

The active involvement in the elaboration process of the S3 of Centre Region for 2021-2027 – and the participation in the focus group for the agri-food industry represented an added value for the implementation of the project.

The lessons learned from the best practice examples presented were: 1) **Awareness** of our values – and to be able to promote these values (biodiversity, multiculturalism, tradition); 2) **Implementing best practice examples** by taking into consideration the local needs (innovation of tradition, Protected Designation of Origin/ Protected Geographical Indication policy mix); and 3) **Change is possible** – by active involvement of the stakeholders, together with local, regional, and national policy makers.

The hardest part was to put the policy makers at the same table with the stakeholders, and to change the companies' approach towards enhanced cooperation.

Together with the National Research and Development Institute for Food Bioresources – local SMEs in Covasna County identified secondary material flows with by-products and evaluated what type of new products can be produced out of by-products. Via this approach new products were launched such as an energy drink out of whey – as by-product in dairy producer companies, briquettes for biomass heating systems out of bakery residuals, etc.

The BE-Rural project team was also up to date with the actions undertaken within another HORIZON 2020 project in the field of circular economy and bioeconomy strategies, namely BioEastUp Project¹⁴. Collaboration with Romanian representatives from BioEastUp Project in the framework of the BIOEAST Initiative and the contribution to the Bioeconomy Concept Paper (under the coordination of the Agriculture Ministry from Romania's side).

¹⁴ <https://bioeast.eu/bioeastup/>

1.5 Good practices / Bio-Innovators. Green Clusters

The combination of academic and applied research is one of the main assets of the BE-Rural project. The project set up awareness-raising processes for all categories of local actors on the need to strengthen the bioeconomy at local level and generate positive economic, environmental, and social prospects based on regional potentials. Given the above, BE-Rural has organised a series of face-to-face interactions between the pilot regions, which engage in the project: Stara Zagora in Bulgaria, Vidzeme and Kurzeme in Latvia, Strumica in North Macedonia, Szczecin and Vistula Lagoons in Poland and Covasna County in Romania. These interactions took place during webinars and conferences that aimed at facilitating the exchange of good practices and at enabling individual and institutional learning processes in partner regions.¹⁵

Examples of good practices in Covasna County

1. Bioenergy villages in Ghelinta and Estelnic Communes, Covasna County

The bioenergy village concepts of Estelnic and Ghelinta Communes in Covasna County were presented extensively in the European project Bioenergy Villages (BioVill). They refer to the meaning of a bioenergy village concept: “A bioenergy village is a village, municipality, settlement or community which produces and uses most of its energy from local biomass and other renewable energies.”¹⁶

An integrated model of a community-scale-energy system called 1 Village – 1 MW was developed in the Estelnic and Ghelinta Communes.

Small-scale bioenergy systems are plants of up to 1 MW of energy generating capacity. They have the advantage of being able to be distributed throughout a community.

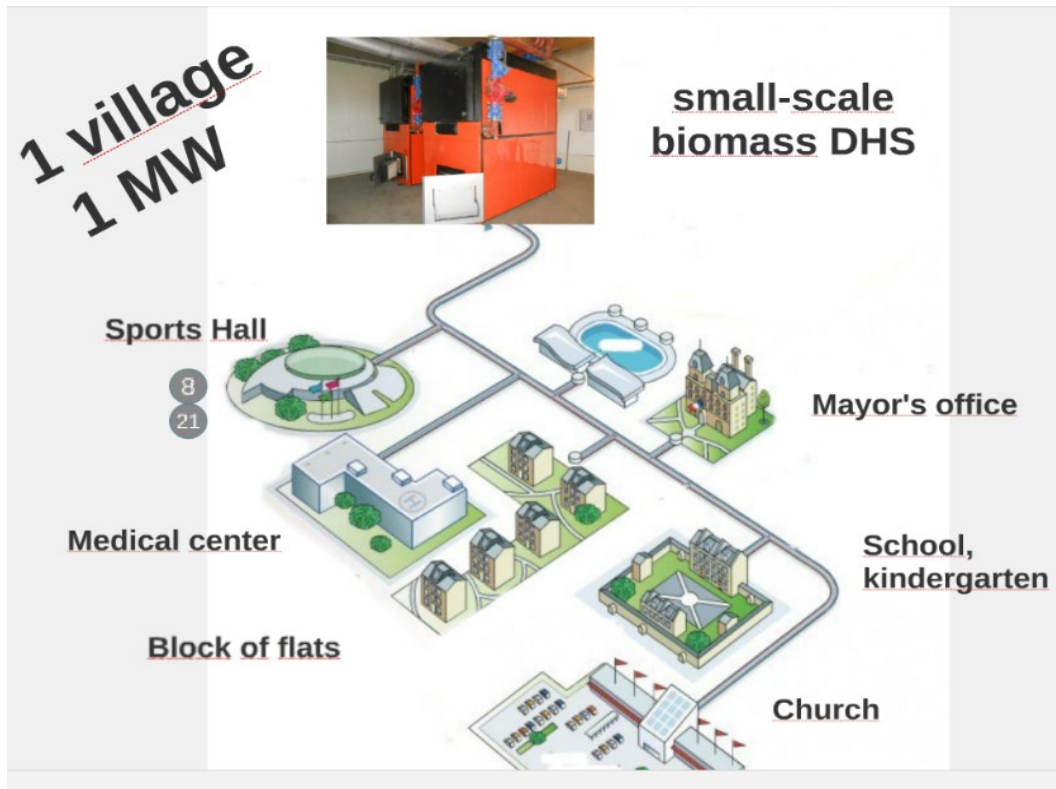
Many South-Eastern European countries have high biomass potentials, but these are often not or only inefficiently used for local energy supply and regional economic development. Thus, the overall objective of the BioVill project (Horizon 2020, ran 2016-2019, biovill.eu) was to support the development of regional bioenergy concepts and the establishment of bioenergy villages in Croatia, North Macedonia, Romania, Serbia, and Slovenia. This has been achieved by identifying suitable biomass value chains according to local and regional needs and transferring existing experiences in Austria, Germany, and other European countries to the South-Eastern European partners. Thereby the market uptake of domestic bioenergy supply chains increased and the role of locally produced biomass as a main source of energy supply and added value for the local and regional economy has been strengthened.

Major beneficiaries of the BioVill project were bioenergy villages in the target partner countries (Romania, Serbia, North Macedonia, Croatia, and Slovenia) up to the investment stage for physical infrastructure, raising public acceptance and awareness of a sustainable bioenergy

¹⁵ BE-Rural, Deliverable 4.2. Executive summary

¹⁶ <https://ec.europa.eu/inea/en/horizon-2020/projects/h2020-energy/biofuels-market-uptake/biovill>

production and its commercial opportunities as well as increased capacities of users and key actors in business and legislation to sustainably manage bioenergy villages and to enact national and EU legislation. Altogether, the BioVill project contributed to the expansion and sustainability of the bioenergy markets in Europe and the European Union.



Source: Designed by Tihamer Sebestyen within the Biomass - the green business¹⁷

Figure 5 The 1 village – 1 MW model

In the framework of the BioVill project, there were seven bioenergy villages presented in the target countries, such as Estelnic and Ghelinta in Covasna County in Romania. There were installed of up to 2 MW bioenergy capacities in Estelnic and Ghelinta at private businesses, public institutions, and were established two local biomass supply value chains. These investments have been realised by the involved local stakeholders, e.g., by procuring wood harvesting, biomass production and transportation equipment as well as preparing specific areas for gathering wood residues and relevant analyses, studies and permissions have been financed.

The outcomes and outputs of the Biovill project was presented to EU parliament deputies, to Romanian parliament deputies as well as to local rural municipalities. Moreover, in the frame of

¹⁷ Green Energy Association (2015): "Biomass - the green business", URL: <https://eeagrants.org/archive/2009-2014/projects/RO17-0030>

the BioVill project the commune elaborated a long-term action plan, called Local Bioenergy Development Strategy 2020-2030 in Gheliuța commune.

The main lessons learnt from the BioVill project include the importance of identification of key stakeholders; the engagement of local stakeholders is the key for a successful implementation of the project. Another success factor was the multistakeholder approach fostering the involvement and active participation of the citizens and all relevant stakeholders in the planning and implementation process.

2. Small-scale technology options for regional bio economies¹⁸

The output of the mobile wood chipping unit produced by Erpék Ind SRL (Figure 5) is wood chips and is serving forestry, wood industry, agriculture, municipalities sectors.



Source: BE-Rural Deliverable 2.1., p. 39

Figure 6 Mobile wood chipping unit (Erpék Ind SRL)

Erpék Ind offers a mobile wood chipping unit which can be fed with wood based raw material from forest industry, agriculture, and municipalities. The woodchipper is mounted on a trailer chassis because it is highly flexible and suitable for different surfaces. Since the woodchipper is driven by an integrated 60 HP diesel engine, it can work autonomously without any external power. The feeding of the chipper is done manually, and the unit is designed for branches from orchards, forest residuals, Christmas trees from urban areas, branches from urban parks and so on. In one hour, up to 15 m³ of chipped biomass can be produced. The volume of the raw materials can be reduced to 25 % whereby the transport and logistic process of wood materials becomes simpler

¹⁸ BE-Rural Deliverable 2.1., p. 39-40

and cheaper. The performance of the machine depends strongly on the quality, size, and type of input material, as well as on the labour force involved in the wood chipping process (IPE 2019).

Since a lot of woody biomasses from different sectors remained un- or even underused in Covasna County, Erpék Ind developed a small and mobile wood chipping unit for Romanian stakeholders at an affordable price. Originally this unit was a spin-off from Erpék Ind's small and medium size boilers which required biomass that was identified in wood chips in this case (IPE 2019).

The woodchipper requires only a small investment of about EUR 17.000 (including trailer chassis, Kubota diesel engine, chipper, hydraulic engine, pump, and pipes). The operational costs depend on influence factors like fuel costs, labour force and maintenance. The payback can be reached after running 900 h (IPE 2019).

Sustainably produced (including harvesting) wood chips have the potential to reduce fossil carbon emissions. Wood chips are an alternative to fossil fuels regarding thermal energy production for households and industry. Moreover, the burning of wood chips is typically performed in a controlled environment, which leads to less greenhouse gas emissions compared to uncontrolled on-site burning. Since the raw materials of wood chips are widely spread, wood chips can be produced and consumed locally in many cases, which leads e.g., to a reduction of transportation emissions (IPE 2019).

Wood chipping can help to valorise un- and underused raw materials and thus create new jobs and income streams in the fields of harvesting, manufacturing, logistics, etc. (IPE 2019). Moreover, the costs per MWh are significantly lower for wood chips than for heating oil and natural gas (C.A.R.M.E.N. e.V. 2019).

Since wood chipping is a remarkably simple technology with a high replication potential, it is suitable for various locations including rural areas. New income streams can be implemented easily with low investment costs. Moreover, wood chips cover a wide field of application (solid fuel, wood pulp production, mulch, etc.) (FNR n.d.), making them particularly useful for rural areas.

Bio-Innovators

As BE-Rural progressed, the project team identified in Covasna County a series of Bio-Innovators, whose achievements were presented at the February 12, 2021, SWG meeting. Once again, the importance of bio-innovators for the sustainable bioeconomy development in Covasna region was obvious.

Just to emphasize their importance, fifty-four innovative ideas of entrepreneurs from Covasna have already been funded in various projects. Their products/services offer solutions for green bioeconomy-sustainable exploitation of forests, biomass growth etc; blue bioeconomy-water recycling, sustainable use of water ecosystems; new value-added solutions; touristic spa services etc; food chain-circular economy within a food system, digital technologies in the food value chain etc.

Table 2 presents Covasna's innovative bio-products (detailed below) organized as thematic clusters:

1. VÂLCELE medicinal water (www.Vâlcele.eu) with a high iron content uses an innovative inert gas bottling technology to keep the structure of the water directly from the spring unaltered. The innovative product was presented at the World Expo in Dubai in October 2021 with the topic: "Connecting minds, creating the future" which will last 6 months and will be attended by 190 countries. The exhibition will connect future generations of bio-innovators, original and pioneers' ideas.
2. REVOLVE product (www.meotis.ro) is a tonic drink obtained from whey. Dairy waste management is a priority for MEOTIS company which collaborated with the AGRO FOOD cluster and the National Research-Development Institute for Chemistry and Petrochemistry-ICECHIM. The innovative product is present in the national network of agri-food stores.
3. Centre for personalized approach to lifestyle (www.mychangecenter.com) offers services through courses in smart nutrition, self-analysis of blood sugar levels, sustainable food system to ensure environmental protection, provision of innovative medical equipment for prevention etc.
4. Innovative projects to support social innovation in the rural areas through biomass heating systems. The company is a member of the Green Energy cluster (www.greencluster.ro) Initiative 1 village 1 MW is an example of good practice for other rural areas in Romania, such as Borlesti commune in the Northeast region.
5. Wooden Intelligent Eco-friendly bot WIEB TOYS (www.wiebitoys.ro) are intelligent robot toys, made of nature-based wood-based materials. The Wieb Toys brand was created through an innovative educational approach, regarding the recycling of wood waste and the use of robotics by children, the product being unique on the market.
6. Ecological children's furniture "House in house" obtained from wooden waste, with a pleasant design based on children's creativity.
7. Innovative acacia wood products (garden furniture-ergonomic rocking chair etc.) treated with natural linseed oil, acacia being a fast-growing species.
8. Various innovative wood products obtained through a special digital technology, which preserves the local tradition, while the processed waste can be used for renewable energy.
9. Innovative products obtained from the recovery of wood waste from the forest (wild homes-single tree houses), sauna cabins, ecological houses etc.
10. Achievements of the Underwater Research Centre in Dalnic -Covasna county (underwater treatments with dolphins for children with autism; artificial plaque obtained from waste; bio-technology-use of micro-organisms or products derived from them, of plant and animal cell cultures for the production of substances useful in agriculture and in the food, pharmaceutical etc industry for the benefit of human activity).
11. Products obtained from combinations of organic cotton and linen and Mrs. Szabo Bernadette, fashion designer, presented her clothing collections from textile waste.

In the Annex 1 are reproduced the individual Presentation Cards for 13 Bio-Innovators.

Table 2 Covasna’s innovative bio-products organized as thematic clusters

BIO INOVATOR	NAME	COMPANY	PRODUCT/SERVICE
TRANSYLVANIA TEXTILE & FASHION CLUSTER	Gaszpor Edina	RE-TEXT STUDIO	Reuse, recycle of waste and textile materials
	Szabo Bernadette	DESIGNER	Reuse, recomposition of waste and textile materials
	Szabo Jenó	Underwater Research Centre Association)	Special therapist
PRO WOOD REGIONAL WOOD INDUSTRY CLUSTER	Kristó Kinga / Mihálcz Szende	WIEB TOYS	Interactive and educational toys
	Czine Zsolt-Attila	SPIRALWOOD	Spiral type twist elements
	Butyka Judit Boglárka	AUTHENTIQ SPACE	Ecological solid wood furniture
	Bagoly Miklós Levente	MONDOIMPEX	Acacia wood garden furniture
	Raymond Gheorghita	WILD HOMES	Natural resource houses
GREEN ENERGY INNOVATIVE BIOMASS CLUSTER	Sebestyén Tihár	BIOMASS NRG	Energy sustainable communities
	Rácariu Vasílica		Biomass
REGIONAL BALNEOLOGICAL TOURISM CLUSTER	Manole Silviu	WEGA INVEST	Bottling of ferruginous mineral water under inert atmosphere-controlled gas
	Toth Arpad / Matyus Eniko	ORVELL	Therapeutic mineral water
AGRO FOOD REGIONAL INNOVATIVE CLUSTER	Bako Zoltan / Fodor Klara	MEOTIS	Revolve – high zero protein drink
	Manole Silviu	WEGA INVEST	Fibro+ Gluten-free mineralized tonic drink
	Szocs Eniko	CHANGE CENTER	Lifestyle: food and movement. Health centre

Source: Lajos Vajda, seminar presentation

Clusters

Starting from 2010, the Business Incubator House in Saint George (Romanian: Sfântu Gheorghe) established several clusters as professional platforms. These clusters included in their mission the sustainable development of their economic sectors, increasing the circularity among their business networks, but also to apply new innovative technologies and solutions for bioeconomy developments which will be a key economic sector in Covasna County. The vision of these clusters is to establish a sustainable, competitive economy based on renewable raw materials, low carbon technologies and bio-based industries.

The clusters are highly interconnected and striving to become the best practice cases of the biobased economy on agrofood, textile and fashion, forest-based industry, green energy, and other integrated bioeconomy.

Their strategic objectives are:

- Dissemination and increase of acceptance of bioeconomy developments
- Creation of bio-based products and support for their promotion
- Establishment of new businesses and providing new jobs in the field of bioeconomy
- Establishment of best practice investments, pilot plants alongside of cluster's value chains.

Pro Wood Regional Wood Cluster

As it was already mentioned, Covasna County is the "land" (county / region / area) of woods. Located in the Carpathians more than half of the county's surface is covered in forest. With the PRO WOOD regional cluster, the region has an own cluster in the wood processing and furniture sector. Another opportunity lies in the use of wood waste for green energy.

The cluster is a bottom-up initiative of the Association of Small- and Medium Size Enterprises of Covasna County - ASIMCOV. The main point, the need for cooperation in order to solve common issues like trainings, innovative technologies, access to new markets, cascading approach, etc. PRO WOOD is the first innovative cluster in the wood processing and furniture sector in Romania. Its generation methodology has become a national model and has already been disseminated as best practice in several INTERREG, SEE, Horizon 2020 projects. Innovation and internationalization represent the main development vectors. The creation of a value chain and the integration into an international industrial chain based on cross-cutting cluster cooperation represent the main objectives of Pro Wood.

Green Energy Innovative Biomass Cluster

The identification of innovative solutions in the field of renewable energies is the object of activity of another cluster in the region, respectively Green Energy Romanian Innovative Biomass Cluster; the activities conducted by this cluster prove the concerns of local actors for obtaining and capitalizing on bioresources, especially for obtaining and capitalizing on biomass as a source of renewable energy.

Green Energy Innovative Biomass Cluster has been founded with the aim to raise the interest in the production and utilization of the biomass, the most important renewable energy source in Romania.

Green Energy Cluster is a social economy cluster that ensures the frame to develop solutions in the biomass field by emphasizing the technology, and ecological and social innovations. The aim is to define innovative solutions and synchronize the production and utilization of waste, solid biomass by-products, developing the biomass value-chain, establish energy communities and enhance cooperation among cluster participants.

Transylvania Textile & Fashion Regional Cluster

Aspects of the circular economy in Covasna County are also on the agenda of companies in the textile industry. It is noticeable the Transylvania Textile & Fashion Cluster which seeks creative solutions for the reintroduction of textile waste in the value chain, to extend the time in which a piece of textile material is used, according to Sustainable Development Objective 12 - Responsible consumption and production.

Transylvania Textile & Fashion is a regional cluster in the field of textile and fashion located in the centre region in Romania and was founded in 2013 and currently has forty-four members, thirty-two of which are small and medium enterprises. Besides the business-as-usual SMEs, universities, research institutions, consulting companies, city councils, in the cluster there are several workshops upcycling waste materials from textile industries and produce garment products out of leftovers and textile wastes applying the circular economy principles.

Agrofood and Bioeconomy Regional Cluster

However, Covasna also established itself on the market of traditional agri-food products, which favoured the development of the Regional Cluster of Products and Food Industry - AgroFood (AgroFood Regional Cluster Covasna County). Cluster's concern for strengthening value chains in agriculture and food industry helps create a regional brand of nationally and internationally known agricultural and agri-food products.

The AgroFood and Bioeconomy Regional Cluster was established in 2011 in the intellectual workshop of ASIMCOV. The main idea was to set up a wide professional partnership to support companies which provide agricultural and food products, to increase competitiveness, where the common knowledge and the innovative skills concentrate on the research-development capacities.

Under this collaborative platform, cluster members identified scientific solutions for valorisation of by-products through new bio-based products. The cluster harmonizes in this partnership the interests of the entrepreneurs, the research sector, the local government, consulting firms and partner institutions, first among all in the Carpathian Curve, but also among the national and international cluster associations.

Table 3 Activities of clusters in Covasna County and the thematic area of UN SDGs

 <p>W PROD</p> <p>15 LIFE ON LAND</p>	 <p>Cluster Transylvania Textile & Fashion</p> <p>12 RESPONSIBLE CONSUMPTION AND PRODUCTION</p> <p>3 GOOD HEALTH AND WELL-BEING</p> <p>15 LIFE ON LAND</p>
 <p>GREEN ENERGY Romanian Innovative Biomass CLUSTER</p> <p>7 AFFORDABLE AND CLEAN ENERGY</p> <p>11 SUSTAINABLE CITIES AND COMMUNITIES</p> <p>HEATING OF PUBLIC BUILDINGS 1 VILLAGE 1 MW</p> 	 <p>7 AFFORDABLE AND CLEAN ENERGY</p> <p>Green Energy Innovative Biomass Cluster Implementations</p> <p>WE ACT SDGs</p>
 <p>3 GOOD HEALTH AND WELL-BEING</p> <p>12 RESPONSIBLE CONSUMPTION AND PRODUCTION</p> <p>15 LIFE ON LAND</p> <p>CLUSTER AGRO FOOD REGIUNEA CENTRU</p>	 <p>for 5 years</p> <p>REGIONAL BALNEOLOGICAL TOURISM CLUSTER TRANSYLVANIA</p> <p>3 GOOD HEALTH AND WELL-BEING</p> <p>17 PARTNERSHIPS FOR THE GOALS</p> 

Source: Vajda Lajos, seminar presentation

Transylvania Regional Balneotourism Cluster

Covasna County is also the “land” of mineral waters (Vâlcele, Perla Covasnei, Bodoc, Biborteni, Sugas, Malnas etc). Carbon dioxide deposits are used in the spa resorts of Covasna County in the treatment of digestive diseases, nutritional diseases, and cardiovascular diseases. Thus, the bases of the Transylvania Regional Balneotourism Cluster were placed in Covasna County, which gradually exceeded the county's borders, becoming active in the Centre Region.

The most important achievements in research of this cluster are:

- “Therapeutic benefits of Natural Factors in Băile Tuşnad Resort for the Rehabilitation of Patients with Parkinson’s Disease” presented at the 40th World Congress of the International Society of Medical Hydrology and Climatology – ISMH, 24 Brazilian Congress of Mineral Industry – Brazil 2015.
- Clinical Study of the Effectiveness of Natural Therapeutic Factors in Băile Tuşnad Resort in the Rehabilitation of Post-Stroke Patients, Brazil 2015

Building on existing partnerships and clusters, there is still a large potential to further develop the industry and use regional resources sustainably and more efficiently.

2 METHODOLOGY

The strategic analysis of the sectors previously described allowed us to develop an objective, clear image of the bioeconomy potential in Covasna County. However, in order to correlate the results of the analysis with the existing trends at the community level and to provide local explanations for the existing phenomena at the community level, qualitative research, which took place during a series of public consultations with local stakeholders, was also conducted.

In a first step, IPE has developed a stakeholder database with the help of the Romanian Association of Clusters (Clustero) and the Association of Small and Medium-Sized Enterprises in Covasna (ASIMCOV). The structured identification of relevant stakeholders in Covasna County was the basis for the implementation of the stakeholder processes. The comprehensive stakeholder mapping exercise conducted afterwards, resulted in building the regional stakeholder database. The organisations and individuals that have been identified were ranked according to their perceived interest in and influence on the further development of the regional bioeconomy. Many of them have participated in Covasna's BE-Rural project activities. In this way, effective cooperation, and networking between all relevant local stakeholders for the roadmap development process in Covasna County was achieved as part of the BE-Rural project.

Several consultations were conducted with local stakeholders, which were attended by a substantial number of representatives of all stakeholder categories: academia, business, administration, and civil society (as shown in the table below). After each stage of consultation / event, the data and information obtained were used to update the bioeconomy roadmap documents of Covasna County, so that they truly reflect the perspective of the local community.

However, the public consultation of the stakeholders was complementary to regular consultations with the Covasna Stakeholder Working Group (SWG), set up precisely to ensure the continuity of the information processing work.

Regarding the establishment of the regional SWG, the first step was to involve the network structures dedicated to bio-based industries, which were established a few years ago in Covasna area, and to have some discussions with local authorities about the necessity for building strong institutional capacities related to bioeconomy.

The stakeholder database was used throughout the process of setting up the regional SWG. The database was the way for IPE to announce important initiatives and to send out invitations to events ensuring a good representation of participants from all categories. The database also helped getting faster responses to surveys and feedback from people who participated in events and to reach the right audience for communication campaigns and accurate delivery of information.

Given Covasna's characteristics (mountain area, poor, incredibly low density and ageing population, low internet connection), the BE-Rural's key principles for participatory roadmap development, namely co-creation, openness and inclusiveness, sustainability, and transparency, were applied by the local actors. The local people are familiar with public consultation actions given the elaboration of previous regional and national strategies. For instance, the development

of the Regional Smart Specialization Strategy was based on a bottom-up exploratory program coordinated through the Entrepreneurial Discovery Mechanism conducted by the CENTRU Regional Development Agency.

The development process of the bioeconomy roadmap was based on a participatory approach relying on the involvement of the local/regional stakeholders, having thus a strong qualitative character, based on the principle that “peers” know better the relevant aspects of their own competence field and region than statistical data, which bear the disadvantage of being already old by the time they are needed. Nevertheless, statistical data related to the regional bioeconomy potential have not been neglected and have been used to validate the qualitative results. The approach “quantitative follows qualitative” contributes also to building up the team spirit and the responsibility of the stakeholder group whose role is crucial in the implementation, continuous monitoring, and evaluation of the roadmap.

The development of the bioeconomy roadmap encompassed three phases, covering a period of one year (September 2020 to September 2021):

1st phase: Kick-off Workshop, St Konstantin & Elena Resort, Bulgaria, 28.09.2020

The process was kicked-off by a first workshop that was organized in the context of an international conference¹⁹ that focussed on the topic of bioeconomy as a driver for green, sustainable, and inclusive growth. It was conceived as an interactive meeting through an online communication platform that would facilitate the sharing of knowledge and expertise on best practices in different EU region’s bio economies. The workshop focused on collecting ideas and exchange of knowledge among European regions in order to facilitate the elaboration of regional bioeconomy strategies. The workshop was organized like a brainstorming game about the specific topics of bioeconomy. For example, to convince local producers to turn to bioeconomy, the participants identified the following solutions: providing financial incentives; support them in the elaboration of a viable business plan; implementation of appropriate public procurement policies; and providing best practice examples.

As part of the workshop, the following long-term objectives have been defined: New value chains an access to new markets; Circular Economy; Multidimensional resilience of the human society; Food security; and Achieving 100% biotechnology till. These results represented initial inputs for the second phase, the “Peer Review Workshops.”

2nd phase: Peer Review Workshops

During the second phase, several SWG meetings have been organised in order to elaborate a logical matrix (see Annex 2), which represents an auxiliary tool frequently used in the process of developing strategic documents. As the necessary inputs were completed, a synthetic picture for Covasna County with respect to objectives, reference period, indicators, references, and

¹⁹ <https://be-rural.eu/event/bioeconomy-as-driver-for-green-sustainable-and-inclusive-growth-clusters-and-their-role-as-key-players/>

prerequisites was obtained. The logical matrix combined the impact rate with the importance rate of these elements. The participants of the SWG meetings have been asked to distribute three votes among the most important, respectively impactful elements of the matrix, mentioned above. After processing the vote, the inputs necessary to complete the logical matrix were obtained. Moderated by IPE, the events were dedicated to the formulation of the objectives, activities, outputs, outcomes, assessment of risks and monitoring measures.

According to the logical matrix methodology, the objectives were identified during a Sfântu Gheorghe Business Incubator face-to-face SWG meeting, organized on June 15, 2021. Participants have been asked to distribute three votes among the most important, respectively impactful objectives. According to the votes, the general objective (Level I) of the roadmap in the field of bioeconomy is **"A qualitative and sustainable way of life"**.

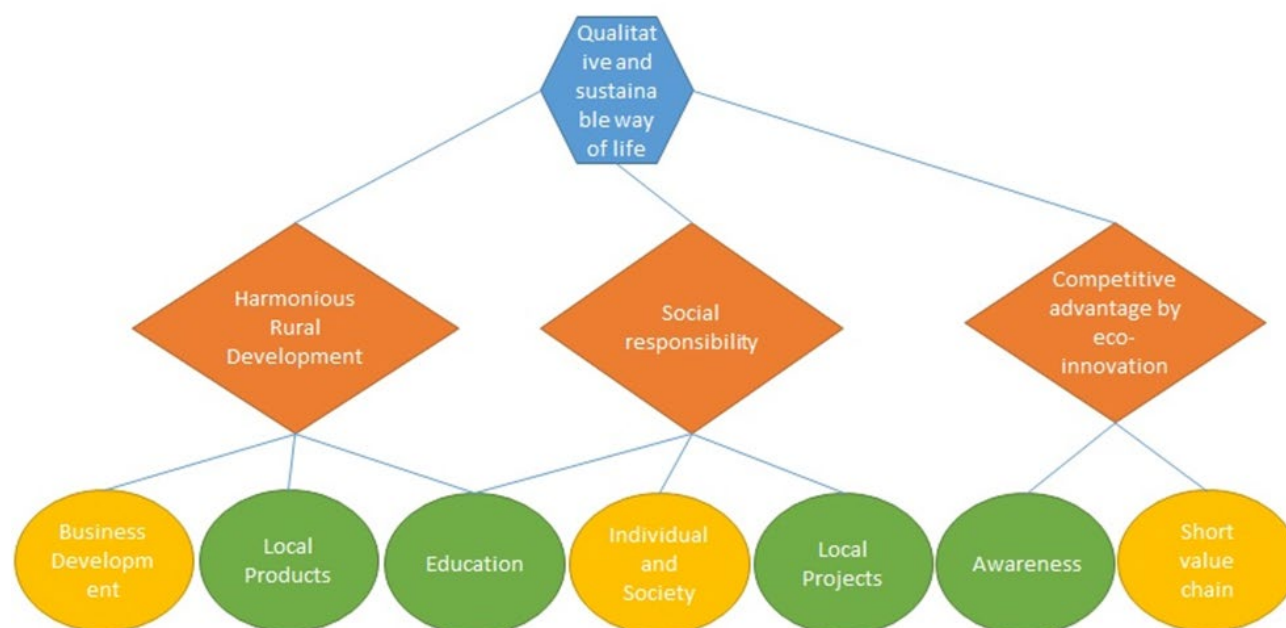
Figure 7 SWG meeting on roadmap development



From the objectives mentioned above there were further selected the strategic objectives (Level II), as it follows: **harmonious development in rural areas, social responsibility, and economic competitive advantage through innovation in the field of circular economy.**

The following SWG meeting was held on August 3, 2021, in Sfântu Gheorghe, Covasna (Figure 7) and built upon the results of the previous SWG event, allocated a separated discussion to each strategic objective in order to establish the operational objectives (Level III): a) **Develop bioeconomy business models** ("1 village 1 MW" based on a small-scale technology option ensuring the autonomous energy supply for civil and industrial needs); and b) **Support education**

and cooperation culture for the implementation of regional bioeconomy processes. The discussion continued during the SWG meeting held on September 22, 2021.



Source: Own processing

Figure 8 The objectives of the Bioeconomy Roadmap according to the Logical Matrix

From a methodological point of view, the discussion was moderated as follows:

- Each participant has been asked to think about the ways to achieve the respective strategic objective and write them on a card.
- Cards were clustered in form of potential objectives
- The prioritisation was made based on a voting principle. Participants have been asked to distribute three votes among the most important, respectively impactful objectives.
- The highest scoring objectives were kept for further development into activities.

The finalisation of the logical matrix, which represents the skeleton of the roadmap for bioeconomy strategy development, has been completed during the SWG meeting held on September 23, 2021 (Figure 8)

The following approach was used:

- Revision of the vision, strategic objectives and operational objectives as defined during the previous SVG meetings
- Revision of the indicators discussed during the first face to face workshop which took place in St Konstantin & Helena Resort, Bulgaria, on September 28, 2020
- Moderated discussion on the activities, indicators, monitoring references and risks.

In parallel to the peer review workshops, other events such as knowledge and capacity-building seminars and educational events were organized in the frame of BE-Rural project, which contributed to the substantiation of the bioeconomy roadmap.

3rd phase: Elaboration of the Bioeconomy Roadmap

Based on the logical matrix, the roadmap document was drafted. It takes account of the current situation of the circular bioeconomy in the county of Covasna, describing in detail the action plan for the achievement of the goals as well as the monitoring and governance. An overview of the individual meetings is presented in Table 4.

Table 4 Individual meetings for elaboration of the Bioeconomy Roadmap

Topic of the meeting	Date	Participants
1 st face to face workshop, St Konstantin & Elena Resort, Bulgaria	28-Sep-2020	6
SWG on principles and objectives of the strategy/roadmap for strengthening the bioeconomy in Covasna County; presentation of the development Matrix. Sfântu Gheorghe, Covasna County	15-Jun-2021	23
SWG on principles and objectives of the strategy/roadmap for strengthening the bioeconomy in Covasna County; Matrix for identifying the strategic and operational objectives of the Bioeconomy Strategy/Roadmap in Covasna (first operational objective). Sfântu Gheorghe, Covasna County	3-Aug-2021	33
SWG on Matrix for identifying the strategic and operational objectives of the Bioeconomy Strategy/Roadmap in Covasna (second operational objective); Best practices of green economy in Ghelinta Commune. Sfântu Gheorghe, Covasna County	4-Aug-2021	30
SWG on monitoring the activity through indicators, and for all objectives, each type of action, according to the logical matrix for assessing the impact of the bioeconomy strategy/roadmap in Covasna County. Sfântu Gheorghe, Covasna County	22-Sep-2021	63
BE-Rural World Café on Covasna's County bioeconomy potential; presentation of roadmap documents developed in the framework of BE-Rural project; debate with public on the presented documents. Sfântu Gheorghe, Covasna County	23-Sep-2021	68
SWG on reflection on feedback from BE-Rural World Café on Covasna's County bioeconomy roadmap documents. Sfântu Gheorghe, Covasna County	23-Sep-2021	39

Source: Own processing

Eighty-three stakeholders participated in the meetings and contributed the development of the regional bioeconomy roadmap, and a total of one hundred eighty-one regional stakeholders participated in the wider project activities (listed in the Annex 3), including capacity-building seminars and business model development activities, which framed the roadmap development process.

The stakeholders attending the mentioned events expressed their interest in participating in the development of the roadmap for the bioeconomy strategy, given that there is already a strategy in bio energy that does not address some specific issues related to the environment and socio-economic sustainability, security food, green economy, industrial transition, organic products, organic agriculture etc. The impact of the roadmap would consist in offering innovative solutions to some challenges of sustainable development in the rural environment from Covasna County.

BE-Rural World Café in OIP Covasna took place in the frame of the European Sustainable Development Week, where the actors of the regional innovation ecosystem were organising a series of events aimed at highlighting the importance of bioeconomy in the regional development.

In the context of the thematic events initiated by the Covasna local community during the European Sustainability Week, from 21 to 27 September 2021, the BE-Rural World Café was organized on September 23, 2021. On this occasion, the project team aimed to provide the general public with a framework for expressing opinions on the Bioeconomy Roadmap documents drafted for the Covasna County in the framework of the BE-Rural project.

This discussion between all categories of regional stakeholders represented the culmination of the intense consultative process, conducted in the last two years in order to elaborate the Bioeconomy Roadmap documents for Covasna County. The inputs received on these discussions during the BE-Rural World Café contributed decisively to the completion of these documents. The Annex 4 includes some snapshots.

3 ACTION PLAN

3.1 Objectives and related actions

General Objective: *Qualitative and sustainable way of living in the region*

According to the results from SWG meetings organized in Covasna during 2021 (Table 4), the most important objective was: “Qualitative and sustainable way of living in Covasna County”. The adequate living conditions and sustainable development becomes the most important objective among the citizens, aiming to have ambitious standards on civil infrastructure. Quality of life is an increasingly important measure to understand, characterize, and apply effectively in Covasna County.

Specifically, the challenge of assuring a qualitative and sustainable way of living in the region must be addressed both in its economic component by means of developing circular bioeconomy business models, but also in the strengthening of the human capital and in supporting the cooperation culture as a prerequisite for the implementation of the circular bioeconomy. Furthermore, there is a need for a harmonious rural-urban development, updating the infrastructure of all kinds, speeding up inclusion of Roma minority, supporting the social responsibility and social innovation initiatives.

Strategic Objectives

1. *Harmonious Rural Development*

Harmonious coexistence between humans and nature must be promoted in Covasna County. In order to achieve a more equilibrated rural development in Covasna County, the following measures and actions should be realized:

- *Increase the involvement of local stakeholders in the bio economization process*

The county is a typical rural region, away from the core economic centres, in many rural settlements people of active age have no job focusing on self-sustainability and dealing with agriculture on household level. On this level the sustainable agriculture activities are perfectly tangible, but since they have no job, no health insurance, and no social contribution, the individual will not have a pension and is characterized by high vulnerability. By bio economization these people can be involved in social enterprises, agriculture cooperatives aiming to produce bio-products, valorise local and regional by-products and close social and economic loops.

- *Establish bio-economy villages in Covasna County*

Stabilize the foundation of bio-agricultural and rural development based on circular bioeconomy.

In Covasna County only a few municipalities are characterized by industrialized agriculture and food production sector. In this region the agriculture activities are on small and medium sized farms, where the circularity can be more efficiently organized among the farmers and citizens on a local level.

- *Develop a circular economy / bioeconomy-based business sector by establishment of new start-ups*

Build and develop thriving businesses based on bioeconomy, by involving public funding measures. The population density in Covasna County is low, 26 capita/km², the settlements are close to forest and nature, with adequate landscape maintenance activities, it is possible to offer a pleasant living environment in rural areas. In order to achieve a more harmonized rural development, the education of the young generation is also essential, to develop the socialized etiquette and civility, effective governance, and a prosperous life.

- *Establish an efficient policy framework for prioritizing circular economy in rural Covasna where the traditional industries and economic activities such as agriculture, forest-based industry, agrofood industry can mobilize resources to support the harmonized rural development processes (i.e., priorities in personnel, resource, funding, and public service allocation).*

2. Socially Responsible Region

In order to develop a socially responsible Covasna County, the following measures and actions should be realized:

- *Establishment of Bioeconomy Villages in Covasna County, aiming to raise awareness, improve knowledge on products of local and organic origin and promote the applications and benefits of bioeconomy, the circular economy, and the sustainability, fostering dialogue, confrontation and sharing between the general public, researchers, and companies.*

In Covasna County many rural municipalities have the adequate parameters to become bioeconomy villages because the local economic and social patterns have been developed from long time ago. However, the local inhabitants are not aware how to display their bio-products and how to absorb public funds to increase their capacities, visibility and ensure sustainability. Therefore, best practice examples should be better publicized and thematic workshops and practical demonstrations organized. It is essential to show in a clear and engaging way, how the bioeconomy is increasingly part of the daily life for local stakeholders and to develop conscious consumer choices. These aspects can have a positive impact on the environment, the society developing a circular economy on local levels.

- *Establish social economic enterprises to develop the circular bioeconomy*

Circular bioeconomy could benefit from a more participatory approach, through the establishment of social enterprises that could involve people from the vulnerable layers of local society. Circular economy could be also developed through a more multistakeholder perceptions and negotiations of value among actors, such as local authorities and private companies, who have different value

priorities. Local business players and public authorities hold the power to shape the flows of value across spaces of production, exchange, and consumption therefore their involvement is essential (Małgorzata Lekan et al, 2021). Public authorities can prioritize their public procurements for local social enterprises if they understand the importance of these entities and local value flows can be establish such as local food in local educational institutes, energy out of local biomass wastes, creative workshops with local cloths. Such approaches would ideally call for more transformational societal and institutional changes from linear economy to circular economy and bioeconomy. In this way, social enterprises could also receive greater and well-deserved attention.

3. *Competitive advantage by eco-innovation*

In order to increase competitive advantage by eco-innovation in Covasna County, the following measures and actions should be realized:

- *Increase the competitive advantage by implication of bio-innovators in local economic activities*

The circular economy is among the key contemporary policy goals both in Europe and in Romania, therefore, sustainability and life cycle thinking should be the centre of attention also on company levels. Promoting the circular economy and becoming a recycling society bring many changes to businesses but also provide new opportunities for them. In many economic sectors, the availability and cost of raw materials, energy aspects, quality of products and the security of the raw material supply can ensure competitiveness. For instance, in forest-based industry, wood construction, energy and climate policy and reduction of greenhouse gas emissions need particular attention. Sustainability and responsibility, recycling/reuse of products and material/energy efficiency were seen as promising approaches to promote long-term competitiveness. In agriculture the valorisation of by-products ensures an additional income for farmers allowing them to become more resilient and flexible.

- *Elimination of by-products and waste production in food industry, agriculture, forest-based industries by valorisation of these materials*

Eco-innovation results in reducing emissions and wastes, and as a side-effect ensures sustainability for rural areas in Covasna County. Examples of eco-innovation are: energy community based on local renewable energy sources, energy recovery from solid waste at regional waste management centre, waste usage for materials recovery in textile, forest-based industry, agriculture, fertilizer production from wastewater, eco-products, and several types of management systems (Eryigit, 2015).

Operational Objectives

1. Develop Bio-economy Business Models

In the field of circular bioeconomy, although more consumers are interested in recognizing a high value for sustainability, many SMEs and start-ups adopt conventional and non-innovative business models with linear economy principles. Bioeconomy and circular economy go along with a value chain approach focusing on reducing the fossil raw materials dependence and CO₂ emissions, exploiting by-products (Gatto, 2021). Industrial application of the circular economy concept requires innovative and solid business models, therefore dissemination of new business models and “trust” and “common goals” based local business collaboration should be facilitated in Covasna County.

The following actions are suggested:

- Elaboration of circular bioeconomy business models for local companies
- Increase the number of companies implementing circular bioeconomy processes
- Increase the number of new jobs by the bioeconomy sector
- Increase the number of SMEs introducing innovation in the bio-economy sector
- Increase the number of new certified producers for bio-based products
- Set up business infrastructures (industrial parks, business incubators)
- Set up a grant scheme dedicated to collaborative networks (clusters, associations)
- Set up of financing support projects for business associations acting on local level
- Public Private Partnership (PPP) initiatives to lengthen regional value chains.

2. Support for education and cooperation culture for the implementation of regional bio-economy processes

The circular economy concept is seen by many as a novel pathway to sustainable development. Since this is different from the linear economy concept, elaboration of new courses and re-designed and adopted pedagogical principles are required in our education system. Nowadays the focus of the students can grab only with new methods, such as interactivity, non-dogmatism, and reciprocity as well as constructive alignment and problem-based learning. The scholars suggesting applying novel circular economy exercises and games such as: a drill game, buzzword bingo, a teardown lab, an eco-industrial park simulation, policy instruments, circular party, and circular futures (Kirchherr, 2019).

The role of business incubator centres is essential in transition from linear to circular economy. Stakeholders include firms seeking economical ways to manage waste, firms that might use waste as value-added input, government agencies, and circular economy analysts that can provide potentially beneficial information. Entrepreneurs would be recruited to develop circular economy ventures. The government would be asked to support initial financing, but the final start-ups would stand on their own as enterprises worthy of venture capital funding. The collaborative environment would promote profitable circular economy behaviour. Entrepreneurs need access to relevant

information and a supportive network, both of which the circular economy-focused incubator centres provides. In Covasna county there are 2 business incubator centres, one of them is strongly facilitating the circular economy principles in economic centre, while a third one is initiating phase, expecting to start its activity from 2024. In Covasna County future work is needed to implement circular economy-incubators to engage entrepreneurs to realize economic and environmental benefits (Millette, 2020).

The main actions proposed:

- Initiate, elaborate and implement bioeconomy investment projects in Covasna County
- Introduction of the bioeconomy topic in informal/formal education curriculum in Covasna County
- Disseminate and raise the awareness on the bioeconomy concept in Covasna County
- Organisation of good practice transfer activities
- Qualification of bioeconomy management teams at the level of the local authorities
- Train the trainers
- Organisation of bioeconomy promotion events where offer meets demand in terms of qualification services and skills
- Adapt the regulatory framework to the bioeconomy sector and to the regional specificities in Covasna County.

More details are listed in the Logical Matrix Annex 3.

The roadmap features a bottom-up approach; activities will be implemented by the regional stakeholders gathered in several public-private partnership initiatives concerning business infrastructure, financing of joint projects and capacity building measures including international transfer of good practices. In that regard a stronger cooperation with the Covasna County Council and the City Hall of Sfântu Gheorghe is of highest importance. This roadmap has the purpose to guide the development of a future local bioeconomy strategy.

Against the background of the regional S3 of the Centre Region, which emphasises both the role of clusters as drivers of green, digital, and resilient economic recovery and bioeconomy as one of the smart specialisations in the region, funding of the strategy could be assured by means of the Regional Operational Programme as well as the National RDI Plan, Horizon Europe, INTERREG Europe etc. In the same line of thoughts, the timeline of the strategy is aligned with the general programming period at EU, national and regional levels (2021-2027).

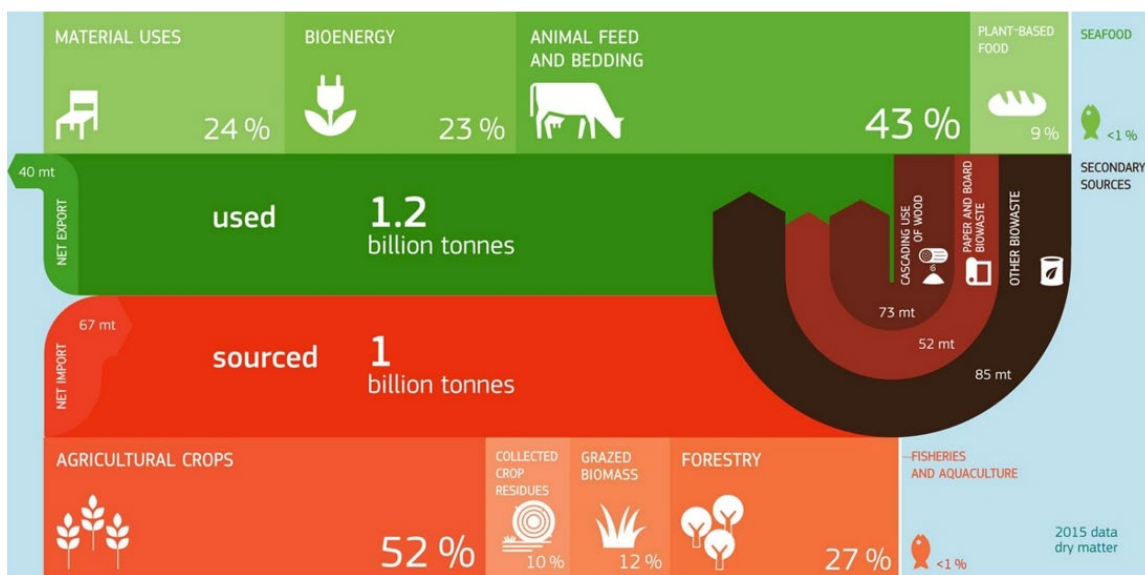
In order to become a politically assumed document, it is necessary to continue the collaboration with the local / regional administration in Covasna for the application of the recommendations that are transparent from these roadmap documents for bioeconomy strategy elaborated during the BE-rural project.

3.2 Small-scale bio-based business models development²⁰

The previous economic evolution recommends Covasna County as an effervescent "Living Lab", dominated by the enterprising spirit and cooperation. Among the analysed initiatives in the field of bioeconomy that related to ensuring the energy sustainability of communities stands out; in fact, this Covasna County initiative has been promoted, in the meantime, as a priority at national level. In this context, the BE-Rural project team conducted an in-depth exercise on a business model, the results of which we present briefly below. A good knowledge of the business models meant to strengthen the local bioeconomy represents a premise of the implementation of the proposed strategic actions.

The development of the bioeconomy depends primarily on the availability of biomass as a solely feedstock (Figure 8). It can be divided in two premises. Firstly, substantial amounts of biomass are currently underexploited, and many waste streams remain used in an inefficient way or not used at all. Thus, more materials as well as energy can be extracted from current biomass streams. Secondly, the biomass potential can be boosted by closing yield gaps, extending productive and using marginal, less fertile land, and by introducing new and improved extraction and processing technologies. The development of new innovative technologies for using and transforming living matter has opened the way to a plethora of application areas (Mathijs et al. 2015).²¹

Figure 9 Sources and uses of biomass in the EU (EU Science Hub 2019)



Source: BE-Rural Deliverable 2.5, Figure 3, p. 16

²⁰ Section based on BE-Rural, Deliverable 5.2.

²¹ BE-Rural, Deliverable 2.5, p. 15

In the first stage it is necessary to make the local actors aware of the potential in the field of bioeconomy, so that in the following stages, various actions could be developed to capitalize on this potential, with the ultimate goal of improving the quality of life.

The BE-Rural Open Innovation Platforms (OIPs) are forums where incumbents of regional bio-based supply chains come together. OIP members are biomass producers/owners/distributors, developers of bio-based products and services, developers/distributors of enabling equipment and technologies, potential and/or existing paying customers and end-users, and relevant public authorities. By involving all these stakeholders, the OIP structures become highly effective sources of market intelligence as well as “resonance boxes” for bio-based product developers to gather direct feed-back from potential end-users and paying customers.²²

For an overview of the regional biomass potential, Table 5 provides additional details on biomass streams available and presents an overview of enabling factors (i.e., the financial, infrastructure and other outstanding conditions). The financial category identifies the conditions for attaining financing for bioeconomy businesses in the region, including the availability of public or private funds and any obstacles to financing. The infrastructure category is primarily focused on the availability of transportation net-works for biomass in the region. A more general “other” column is included to address any out-standing issues, such as technical expertise available, stakeholder collaboration, and employment issues. Finally, brief descriptions of the relevant technologies and highlights of their business models are presented. This covers the key activities of the business and the key resources they require, the value proposition they offer, and the cost structure and revenue streams.²³

Starting from the biomass potential (presented in the first part of the document) and the socio-economic conditions (also described in the first part of the document) and summarized in Table 5, the BE-Rural project team identified and analysed using a specific methodology, a representative business model, which allows achieving energy sustainability for communities, respectively the model initiated by Biomass NRG Consulting SRL. The methodology prepared for this task and the process followed for its implementation was designed to promote open innovation and generate instances of collaboration on concrete business ideas relevant and adaptable to the context of the Covasna region. The core element of this is the Task Force on Market Assessment and Business Model Design. This is a group of individuals from the OIP that are invited to take part in the exploratory assessment of the business idea by contributing their specialized knowledge of the region, their professional experience, access to specific data, information, and contacts, etc. Underpinned by this collective knowledge, the bioeconomy entrepreneur who came forward with the bio-based business ideas got the opportunity to incorporate expert insights into his market analysis and business model design activities. The assessment was executed following an agile approach in which the Task Force met at regular intervals to examine different elements of the business strategy and to develop them iteratively and incrementally.²⁴

²² BE-Rural Deliverable 5.1, p. 4

²³ BE-Rural Deliverable 5.1, p.25

²⁴ BE-Rural Deliverable 5.2, p. 8

Table 5 Overview of the regional biomass potential in Covasna County

<p>Biomass streams</p>	<p>The biomass potential in the Covasna region comes primarily from the forestry sector – including wood manufacturing and furniture production. Agriculture is a secondary industry, though also offers significant biomass potential. Further studies are required to determine the region’s capacities for both of these biomass streams. Most woody biomass is currently used for fuel, though other applications are desirable.</p>		
<p>Enabling conditions</p>	<p>Financial</p>	<p>Infrastructure</p>	<p>Other</p>
	<p>There is a strong private banking sector in the region, offering easy access to financial resources. Public subsidies may become more available due to the increasing attention in national policymaking.</p>	<p>Transportation infrastructure is already in place in the region. Construction of industrial parks is attractive to investors, while also stimulating cooperation and collaboration in the field.</p>	<p>R&D is already fairly prominent in the area through clusters, universities, and companies. Initiatives and programs to support start-ups also exist.</p>
<p>Challenges</p>	<p>Despite the robust financial systems, investment is still lacking. Collaboration and coordination between stakeholders will need to be carefully managed, particularly with the transport sector, but also SMEs, clusters, and R&D institutions. Further government support is also required for the development of new local businesses. Additionally, the development of a strategy for R+D+I in the region would be beneficial. Finally, it seems the region is lacking the skilled workforce needed for the development of a biomass supply chain, and so trainings and courses may be necessary.</p>		
<p>Suitable technologies</p>	<p>Businesses in both the forestry and agriculture sector could be relevant here. Pelletizing and briquetting may be applicable here, and the business models from Spawnfoam and Spinnova may be especially interesting to stakeholders.</p> <ul style="list-style-type: none"> • Spawnfoam is a company that turns organic and agroforestry residues into a renewable bio composite for manufacturing plant pots, construction boards, and ornamental vases. The company is focused on extending the life cycle of untapped agroforestry residues in surrounding areas. Other key activities include the sale of the product, as well as communication and relationship building with key partners. Resources required by Spawnfoam include skilled labour, appropriate research infrastructure, financing, and of course the biomass resources required to make the product. The sustainable and biodegradable bio composite Spawnfoam produces can be used for a range of applications to replace fossil-based alternatives, with multiple target customer segments. Tree and plant nurseries can use plant pots as pots as well as organic fertilization afterwards. In the construction industry, the bio composite can be used as acoustic or thermal isolation, for example. Finally, the retail sector, including DIY and online shops, can sell these products to environmentally conscious consumers and households. The cost structure includes: wages for skilled labour for development and marketing, the biomass cost, as well as logistics and rent. Revenues come from selling the bio composite products; awards and prizes support Spawnfoam through promoting the products and generating further revenue. • Spinnova is a company that turns wood fibres into yarn without the use of harmful chemicals. The technology uses micro fibrillated cellulose from wood residues to produce the fibres. The product is a fluffy wool-like material, suitable to spin into yarn or for producing other textiles. Additionally, the product is fire retardant, antimicrobial, warm, and biodegradable, which can open a range of potential uses beyond simply the textile industry. 		

Source: BE-Rural Deliverable 5.1, p. 28 Covasna

The detailed, confidential assessments of the individual business idea are available in a separate document, for which access is restricted to the BE-Rural Task Forces on Market Assessment and Business Model Design, the wider BE-Rural Consortium, and the Commission Services.²⁵

The Task Force from OIP Covasna assessed the consultancy service based on the concept of Sustainable Energy Communities. Sustainable Energy Communities are groups of stakeholders, private and public entities on local or micro-regional level who are engaged to develop and contribute to a biomass value chain with the goal of ensuring the local energy supply from local renewable and sustainable resources.

In the context of the bioeconomy roadmap that IPE develops for Covasna region this service was considered a relevant initiative to explore as the concept behind it involves engaging multiple stakeholders from communes in Covasna around bioenergy, the main field of interest for bioeconomy entrepreneurs of the region. The working group saw potential in this to gain a much deeper insight into the local dynamics and priorities, and to use the lessons of the assessment as a building block for their own work on the regional roadmap development.

Concretely, this will inform the design of the measures to be incorporated in the regional roadmap for bioeconomy strategy. It will also help lay guidelines on involving local actors in the establishment of bio-based value chains for renewable energies in rural areas. The group was also interested in finding and developing instances of cooperation between entrepreneurs in the field of bioresources for renewable energies; in building capacities to provide technical support in exploring business opportunities in the circular economy and energy sector; and in training and informing members of regional clusters on identifying and accessing support and funding programs. In preparation for the market assessment and business model design exercises, IPE updated the information on the current biomass supply and potential as well as on the needs and wants of regional stakeholders.

Information was collected about the amount of biomass potentially available as an alternative feedstock and about the formats in which biomass is or could be supplied. It was confirmed that while a small number of biomass plants are concentrated in the area where the biomass resource is located, there still are unused biomass feedstocks available. In addition, there is a biomass and waste logistics centre working with biomass feedstocks in the region, but more than 50 km far away from potential biorefineries or bio-based industries.

This led the working group to seek businesses and entrepreneurs involved in finding ways to incorporate the available biomass into new- or updated value chains consulting with Biomass NRG Consulting SRL.²⁶

²⁵ BE-Rural, Deliverable 5.2, p. 4

²⁶ BE-Rural, Deliverable 5.2, p. 9

Bio-based service and value proposition²⁷

The analysed business idea is a consultancy service specialising in the design and establishment of “Sustainable Energy Communities” in rural areas. This idea involves a variety of value propositions which are differentiated on the basis of the market segments targeted. The most important ones considered in the assessment are:

- Developing the concept of sustainable energy (rural) communities by setting up a participatory approach involving local stakeholders and (re)designing the value chain for the production and local use of renewable energies in rural areas
- Providing technical support (e.g., from idea creation to technical design and planning, including business plans and development actions) for companies in exploring business opportunities in the circular bioeconomy and energy sector
- Providing training and information to cluster members (e.g., private companies, R&D institutions, and authorities) on the identification and access to support and funding. These can be for example from national, international and EU funding programmes such as AFM (Funds for Environment in Romania), POIM (Large Infrastructure Operational Program), PNDR (National Plan for Local Developments in Romania), Innovation Norway, Horizon 2020/Europe, Interreg Danube Transnational Programme, Urban Innovation Action, among others)
- Developing cooperation between local key stakeholders in the fields of bioresources and renewable energies. These include for instance collaborative projects among local public authorities, enterprises, and NGOs for the establishment of local bio-based supply chain, biomass-based energy supply, local renewable-energy based district heating system, etc.

Results of the market assessment and business model design process²⁸

The market overview

Biomass NRG operates at the moment in Covasna County and neighbouring regions and its business model is adapted in first line to the particular conditions that are found there.

Romania does not have a bioeconomy strategy nor a specific regional bio-based industry strategy. However, many national policies are focused on bioeconomy-related issues and are underpinned by EU level policies, which is channelling public spending in these bioeconomy-related sectors (e.g., via subsidy programmes). For instance, Romania’s Law no. 220/2008 on the Promotion of Renewable Energy Sources, the national transposition of the EU Renewable Energy Directive, supports renewable energy sources (e.g., biogas) through a mandatory quota system based on green certificates. Under this mechanism, a defined percentage (quota) of the entire gross electricity consumption has to come from energy sources that qualify for these green certificates, which are eligible for public subsidies (Investromania 2016). Therefore, projects that

²⁷ BE-Rural, Deliverable 5.2, p. 12

²⁸ BE-Rural, Deliverable 5.2, p. 13-14

apply for public subsidies are more likely to receive them if they include, at least partially, bioeconomy-related topics such as bioenergy production and utilisation of local bioresources.

At regional level, the Regional Smart Specialization Strategy (RIS3) of the Central Region and the 2010 Master Plan for Biomass, as well as other policies in preparation, have links to the bioeconomy in general and bioenergy specifically. In this context, public funding of related activities is in the coming years.

According to a previous assessment of the macro environment of BE-Rural OIPs (see Anzaldúa et al. 2019) bioenergy is currently the most promising bioeconomy sector for the future in Covasna County, particularly from waste generated by the wood processing industry and private households.

Moreover, Covasna County features a unique bottom-up initiative to promote bioenergy called “1 village 1 MW”. This is aimed at implementing small-scale bioenergy projects, initially to supply local public buildings but with prospects of expanding to supply private businesses and households. The project has been launched by the Green Energy Innovative Biomass Cluster in 2012 as a means to reduce local energy spending and decrease dependence on imported fossil fuels, while addressing environmental issues related to their combustion. In this context, various municipalities have already submitted project proposals and implemented bioenergy investments in their area, making this sector-led initiative one of the most successful development approaches in the region.

Biomass NRG has been involved in development on Energy Efficiency Action Programme in Ghelinta Municipality, as well as on the development of local bioenergy strategies and other project developments for rural development programs. These activities offered the unique opportunity for advising further municipalities, households, and companies in developing sustainable energy communities focused on the utilization of local biomass, particularly waste. During the development processes the company gained not only up-to-date details on specific technologies but also social skills on how to establish and develop working groups, team building skills, delivered engagement events with key influencers, and developed trust-based strategical action plans with local decision makers. Therefore, among the market segments potentially suitable for the type of services that Biomass NRG offers are local and regional authorities and institutions, private households, as well as companies in the agricultural, energy, forestry, and related industrial sectors.

The identified market segments have been further analysed and prioritized to sort out which of these can be considered *target groups* following five criteria:

- Their needs and willingness to act upon them
- The capacity of the offered service to satisfy these needs
- The access to/ease of communication with the market segment
- The existence of competitors addressing the identified needs
- Substantiality and potential profitability of the market segment

Due to the extremely broad nature of the service provided, many of the identified market segments were considered in the assessment as potential target groups. However, when considering future perspectives in terms of market growth rate, penetration, and profitability, certain groups appeared comparatively more attractive. For instance, in terms of needs and willingness to act upon them, local authorities are encouraged by the regional authorities to manage the waste which results from cutting off branches. Moreover, investing in the utilization of these residues for energy production also offers the potential to cover the cleaning of riverbeds, roadsides, and green spaces. To this respect, it is foreseeable that the authorities could make an investment to replace their current heating systems with one based on this biomass in the form of wood chips. On the other hand, for households there is also a need to find alternative uses for domestic wood residues, as Romanian law prohibits the burning of waste in the open field. Nevertheless, while using this waste could also be economically beneficial for this market segment, in the short term it is still not likely that it will be willing to spend money on advice or technologies to valorise this waste. Therefore, the decision was made to pursue a phased strategy focusing efforts on the most immediately relevant segment (i.e., local authorities) during the first three years and then re-evaluating and following on the rest (e.g., regional authorities, private households, farmers, and companies from forest-based industries). Through this, it was possible to narrow down priorities for the development of the business model canvas. Nonetheless, as the different target groups' needs and required services differ significantly, in turn demanding differentiated strategies, a business model canvas was developed for each of the top priority segments. These are presented below.

Business model canvas

In the case of Biomass NRG Consulting, the business model canvas was used to visually represent the company's current and future business model by summarizing its most essential components discussed throughout the MAF+ exercises. The business model canvas captured the key elements of the business plan whilst highlighting the links between components. Since the company had not developed yet such a map about its customer segments, the relationships between the stakeholders and business components, the MAF+ exercises were perceived as a training which supported and encouraged the company for further development. By completing the business model canvas, the Biomass NRG team managed to clarify gaps in the core business approach and get additional clarity to the process of business development.

Table 6 Business model canvas for target group local authorities, Biomass NRG, Romania

7) Key Partners	6) Key Activities	2) Value Propositions	4) Customer Relationships	1) Customer Segments
<ul style="list-style-type: none"> Local authorities Green Energy Cluster Media Ministry of Environment, Waters and Forests (MEWF) Local Action Group (LAG) Regional Development Agencies (RDA) Ministry of Agriculture and Rural Development (MARD) 	<ul style="list-style-type: none"> Regular meetings. Promote spring cleaning as a community action. Attract sponsors for events. Organizing online or physical events with local authorities, MEWF, MARD and RDA to debate. 	<ul style="list-style-type: none"> We have an integrated and innovative approach to sustainable and renewable energy sources. We offer you the easiest alternative to collect the branches, in order to not burn or deposit them illegally. With us, you have the best reason to clean the roadside, because it adds value to your heating solutions. You can resolve an environmental problem in your commune, and also obtain a cheap resource of thermal energy for heating the city hall and schools. You can be a national example of sustainable development and have the ministry recognition for that.* 	<ul style="list-style-type: none"> Direct sale of consulting services Meeting once a month, on monthly council meeting to establish the next steps to be followed. Keeping close relationship with the mayor by inviting him or the councillors to events on the sustainable development of rural communities. 	Local Authorities
5) Key Resources:		3) Channels		
<ul style="list-style-type: none"> Building Human resources Social media Grants from LAG, MEWF, MARD and RDA. 		<ul style="list-style-type: none"> Social media pages of our company and our customers. Articles in the local newspaper. Advertising on online meetings. Sending emails with our offers. Established meetings 1:1, in person. 		
8) Cost Structure			9) Revenue Streams	
<p>Fixed :</p> <ul style="list-style-type: none"> Salary for employees Bills on energy Advertising <p>Variable:</p> <ul style="list-style-type: none"> Training courses Transport 			<ul style="list-style-type: none"> Commission from projects Being involved in local events where we have presentation of our activity 	

Source: BE-Rural D Deliverable 5.2. Table 1, p. 15

Table 7 Business model canvas for target group private households, Biomass NRG, Romania

7) Key Partners	6) Key Activities	2) Value Propositions	4) Customer Relationships	1) Customer Segments
<ul style="list-style-type: none"> Local authorities Green Energy Cluster Media Ministry of Environment, Waters and Forests (MEWF) Local Action Group (LAG) Regional Development Agencies (RDA) Ministry of Agriculture and Rural Development (MARD) Active citizens. 	<ul style="list-style-type: none"> Regular meetings. Promote spring cleaning as a community action. Attract sponsors for events. Organizing online or physical events with local active citizens. 	<ul style="list-style-type: none"> We offer you the easiest alternative to collect the branches, in order to not burn or deposit them illegally. You can resolve an environmental problem in your commune, and also obtain a cheap resource of thermal energy for heating your house. You can have a product like wood chips obtained in your household and used as soil fertilizer, decoration and against weeds invading the lawn. In the spring season, there is no need for you to burn the branches, you can either chop them or give them to a collector (local authorities or a firm). 	<ul style="list-style-type: none"> Direct sale of consulting services Keeping close relationship with the inhabitants. 	Private households
5) Key Resources:				
<ul style="list-style-type: none"> Building Human resources Social media Formal partnerships with local NGOs. 				
8) Cost Structure			9) Revenue Streams	
<p>Fixed :</p> <ul style="list-style-type: none"> Salary for employees Bills on energy Advertising <p>Variable:</p> <ul style="list-style-type: none"> Training courses Transport 			<ul style="list-style-type: none"> Commission from projects Being involved in local events where we have presentation of our activity 	

Source: BE-Rural Deliverable 5.2. Table 2, p. 16

4 MONITORING AND EVALUATION. GOVERNANCE

Most international organizations, such as the World Bank, UNICEF, UNFPA, etc. through their methodology they unify the monitoring, evaluation, and feedback phases under the title of monitoring and evaluation. This is justified by the fact that the action plan of any development strategy, programs and projects includes a chapter on how it will be monitored and evaluated. In the case of the Bioeconomy Roadmap in Covasna County, the evaluation and monitoring methodology, the procedures and the mechanisms that will be used must be established.

Achieving a sustainable circular bioeconomy requires a substantial effort both of public authorities and of industry. The circular economy is one of the development priorities of the Centre region where Covasna County is located, being also a topic carefully analysed in the preparation process of the programming period 2021-2027. Under these circumstances, the roadmap for the bioeconomy strategy of the Covasna County acquires an increased significance. Therefore, during the last SWG meetings held in September 2021 dedicated to the elaboration of the document, the creation of a permanent regional bioeconomy panel of stakeholders from Covasna County was discussed. This nucleus of people concerned with promoting the bioeconomy will present the results of the BE-Rural project at future regional events, looking for synergies with similar local initiatives as well as it will launch pilot actions for bioeconomy development (e.g., waste management, soil carbon storage etc.) in rural areas non-involved in the BE-Rural project.

Monitoring activities

Monitoring is a continuous activity that follows the process of implementation, the activity focusing on the process and not on the results of the action. The implementation requires the participation of all actors (public institutions, organizations, communities, social groups, individuals, and stakeholders) who often have different motivations, converging or divergent interests and their own priorities. But they need to be involved in implementing the roadmap and their activities need to be constantly monitored for coordination. In this regard, it is necessary to designate at the county level an E&M (evaluation and monitoring) group that will prepare regular monitoring reports (every 6 months). The reports will be on the one hand a good support for the regional management entity, and on the other hand it will have the role of awareness and internalization of the objectives pursued at the level of individual and collective actors. Thus, the E&M group will organize every six months meetings, debates, information sessions of the social actors, and after these meetings the monitoring reports will be prepared. The task can be performed by the regional bioeconomy panel of stakeholders set up during the planning period.

Each year, it would be advisable to approve an action plan for the current year, the action plan being made based on the priorities, objectives and development measures included in the Bioeconomy Roadmap of Covasna County.

The annual action plan could be debated twice in the public debates organized by the E&M group, so that each actor involved would be aware of the degree of implementation of the development strategy, and certain corrections can be made if things do not go as previously planned.

Evaluation

Evaluation is a regular activity of analysing the relevance of the roadmap, its efficiency and impact on the objectives, measures set. The evaluation activity may lead to changes in the roadmap because it focuses on overall efficiency.

The evaluation activity will be the task of the E&M team, which through collaboration with the members of the regional management entity will conduct on four occasions roadmap evaluation sessions, as follows:

- Baseline evaluation, at the beginning of the implementation of the strategy, second quarter of 2022, in which the actors involved will become familiar with the priorities and strategic objectives. The first evaluation session requires the appointment of the E&M group from the local and regional stakeholders.
- Interim evaluation, at the end of the second semester of 2023.
- Interim evaluation, at the end of the second semester of 2025.
- Final evaluation - the last semester of 2027.
- Impact assessment - second semester of 2028.

If during the mid-term evaluation activity serious deviations from the situation are found, the initial direction set by the roadmap for strategy development requires the re-planning of strategic objectives and development measures (through the involvement of specialists), in order for the future vision and priorities to be met.

Each evaluation stage will require the preparation of an evaluation report and its presentation in forums organized with local actors (entrepreneurs, public institutions, NGOs, farmers, individuals, R&D entities, etc.).

Governance

Covasna represents the cradle of the clustering process in Romania. As previously detailed, several clusters (Pro Wood, Green Energy, Transylvania Textile & Fashion, AgriFood Covasna etc.) are part of the business incubator of Sf. Gheorghe, which represents the main innovation actor in the region. They will be the main beneficiaries of the bioeconomy roadmap while the Association of SMEs in the county of Covasna will assure its monitoring and governance. As active local actor involved during the whole participative process of roadmap drafting, the Association of SMEs in Covasna has the ability to further monitor the implementation of the Roadmap for a Bioeconomy Strategy in Covasna County.

Figure 10 Business Incubator ecosystem in Sfântu Gheorghe, Covasna County



Source: Lajos Vajda, seminar presentation

In the Covasna case, the regional stakeholders are well aware of the urgency of developing a bioeconomy roadmap; and this necessity became even more obvious once the pandemic hit and all businesses were affected by the temporary but complete shutdown of the Romanian economy (not only in the Covasna region).

The lack of bioeconomy-oriented institutions and networks hinders the bioeconomy development in Covasna even though it is a region with a strong bioeconomic profile given its natural resources and heritage. Thus, the *Roadmap for a Bioeconomy Strategy in Covasna County* outlines the actions from cross-sectoral areas that are then taken forward by cluster organizations and representatives of the relevant institutions.

LOOKING TO THE FUTURE

The national bioeconomy development strategies have been elaborated in several countries around the world. At the same time, there are several differences regarding the level of achievements for bioeconomy developments in economic sectors while among the society we can experience even less knowledge and disseminated information. In Covasna County the bioeconomy developments should be adopted according to the local specific needs and their corresponding desire to advance the transformation from a fossil-based economy towards an economy based on renewable resources (Braun and Lang, 2018). According to the above-detailed aspects, in the next decades the maturation of bioeconomy sector will succeed in the green energy, agrofood, food and forest-based industries. In line with the expectations, several new bio-based products, such as biochemicals based on organic materials, new products based on recycled organic materials and engineered products will appear on the market. Innovative technologies, such as engineering or further digitalization of the agriculture and forest-based industry sector, increasing importance of short supply chains and local SMEs with bio-based products will pave the way to enhancing further bioeconomy developments.

Significant optimism has been identified during the BE-Rural SWG meetings in Covasna County mostly with respect to future innovation, bio-based industrial developments and regarding to availability of local biomass feedstock for bioeconomy growth. A majority of participants stressed the need to develop novel (bio-based) products and making more resources available for R&D activities in bioeconomy.

The bioeconomy outlooks in Covasna County are also linked to SDGs. The following were identified as the most essential in the context of future bioeconomy developments on regional level:

SDG4 – Quality Education – Ensure inclusive and equitable quality education and promote the bioeconomy principles in education system in Covasna County for the next generation. Adequate funding and access to capital should be ensured for educational and R&D institutes, technology transfer hubs.

SDG7 – Affordable and Clean Energy – Ensure access to affordable, dependable, sustainable, and mostly biomass-based energy supply in Covasna County. Initiate and multiply small-and medium sized local renewable-energy based supply systems.

SDG9 – Industry, Innovation, and Infrastructure – Build resilient infrastructure, promote sustainable and bio-based industry in Covasna County. Many experts stressed the need to reduce waste production and recycling or upcycling and valorise it.

SDG11 – Sustainable Cities and Communities – Transform the towns and rural municipalities from fossil-based to renewable resource-based settlements, such as with mobility, digitized public administration, supporting bioeconomy developments in Covasna County.

SDG12 – Responsible Consumption and Production – Ensure sustainable consumption and production patterns by creating and development of local short supply agrofood chains, development of consciousness consumption behaviours in Covasna County.

SDG13 – Climate Action – Realize massive actions to mitigate the climate impacts in economy, mobility, residential sector, and public sector of Covasna County.

SDG15 – Life on Land – Protect, restore, and promote the sustainable forest management and ensure the required parameters for sustainable forest-based industry in Covasna County by cascading approach.

The roadmap document elaborated within the BE-Rural project will be a reference document both for other projects initiated at local level and for consolidating the knowledge base and understanding of the specific fields of the bioeconomy as well as promoting good practices regarding the functioning of the bioeconomy within safe ecological limits.

The active involvement of clusters in the Covasna County in the sustainable circular bioeconomy will stimulate growth in the rural area and will contribute to job creation, especially to stop the migration of young people. The Roadmap will be a practical guide for local people in their attempt to capitalize on the vast potential in the bioeconomy of Covasna County.

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ANNEX

1. Bio innovators Presentation Cards
2. Logical Matrix
3. BE-Rural Meetings with Stakeholders, 2019-2021
4. BE-Rural World Café Snapshots, Sfântu Gheorghe, 23 September 2021