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

Evaluation of BE-Rural's stakeholder and public engagement activities

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EXECUTIVE SUMMARY

BE-Rural applied a variety of participatory tools with the aim to increase knowledge and build capacity among regional stakeholders and citizens, to collect their views on the bioeconomy and its potential for regional development and finally to co-create regional strategy and roadmap documents. The aim of this report is to reflect on the project's participatory activities and share practical lessons learned with other regions across Europe regarding the development of regional bioeconomy strategies and roadmaps as part of a bottom-up participatory process.

Participatory tools of various sizes and formats such as pop-up stores showcasing bio-based products, a teachers' summer school, educational events, capacity-building and knowledge exchange seminars, regional stakeholder working groups and regional Task Forces for Business Development were organised at regional, national and European level. Based on these activities, the following key lessons learned can be identified:

- **Public engagement**: The mix of engagement tools targeted at the general public such as educational events for teachers and students, physical and virtual pop-up stores, social media and the project website was effective to reach different target groups. The use of local networks and age-appropriate educational material were key factors for the successful implementation. The developed bioeconomy games facilitated the interaction between participants, serving as both a teaching tool and icebreakers and educational entertainment (edutainment). Promoting the pop-up-stores, side-events, etc. through local media (TV and radio) is key.
- **Capacity building and knowledge exchange**: Capacity building and knowledge exchange formats are important to facilitate mutual learning processes and lay the foundation for innovative development processes at regional level. One key factor for the success of these events was that they focused on region-specific bioeconomy opportunities, technologies, business models and policies.
- **Participatory strategy and roadmap development:** Involving stakeholders at the beginning of the strategy development process is important to create trust and allow all participants to co-develop outcomes. However, it was challenging to keep the stakeholders motivated and interested throughout the project duration and beyond. To prevent stakeholder fatigue, it is important to link the strategy or roadmap development process to existing debates and initiatives and emphasise the utilisation potential of the expected outputs and outcomes for the regional stakeholders.
- **Business model development:** The structured market assessment and business model design framework and the collaborative, iterative and incremental process were well received, considered useful to build capacity, and are applicable also in a rural context. Changing and adopting new business models remains difficult and is perceived as risky as no capital appears to be available for new business models in the context of rural regions.

Further, this report includes a reflection on BE-Rural's conceptual framework focusing on four key principles of co-creation, openness and inclusiveness, sustainability, and transparency. Here, particular attention has been paid to the challenges related to the implementation of bottom-up approaches in BE-Rural's focal regions, the identification and consideration of gender aspects in strategy documents, the involvement of marginalised groups in the project activities as well as some sustainability limitations arising from the lack of robust biomass data at regional level.

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Abbreviations

CB	Capacity Building
CEE	Central and Eastern Europe
CPD	Continuing Professional Development
CSO	Civil Society Organisation
ESF	European Social Fund
FLAG	Fisheries Local Action Group
KE	Knowledge Exchange
LAG	Local Action Group
MAF	Market Analysis Framework
NGO	Non-governmental Organisation
OIP	Open Innovation Platform
RIS3	Regional Innovation Strategies for Smart Specialization
SDG	Sustainable Development Goal
STEM	Science, Technology, Engineering, Mathematics
SWG	Stakeholder Working Group
UN	United Nations

1 Introduction

Public and stakeholder engagement has a long history in European research and policy and has been promoted through the Responsible Research and Innovation (RRI) agenda of the European Commission. Previous and ongoing Research & Innovation Programmes such as Horizon 2020 and Horizon Europe are increasingly focusing on the establishment of multi-actor partnerships and the co-creation of research and innovation outcomes, which can feed into policy agendas and provide more societal benefits.

This approach was also at the heart of BE-Rural, with activities that built upon the following key principles for participatory strategy/roadmap development in five different socio-economic, cultural and ecological contexts (cf. Abhold et al., 2019):

- **Co-creation**: BE-Rural built on the idea that providing spaces for co-creation for a broad spectrum of stakeholders and citizens will not only contribute to broader societal goals, which can be embedded in the regional strategies and roadmaps, but can also stimulate a stronger demand for sustainable, innovative products and services in the regions. In each of the five regional Open Innovation Platforms (OIPs) established by BE-Rural, the development of bio-based business models and encompassing regional strategies and roadmaps was embedded in a structured participatory process, which ensured the proper evaluation of alternative policy options and business strategies and their effects on the region. This implies that trade-offs can be made explicit and discussed among relevant stakeholders and the general public, aiming at the definition of shared objectives and the creation of mutually valued outcomes.
- **Openness and inclusiveness**: The regional strategy and roadmap development processes were open to all relevant stakeholder groups. Besides the so-called 'Triple Helix', representing government, business and academia, BE-Rural strongly encouraged the participation of civil society (organisations) in these processes, thereby facilitating multi-faceted discussions and the implementation of broadly shared objectives. The participation of women was specifically encouraged to ensure a gender-balanced representation of stakeholders and end-users in all related activities.
- **Sustainability**: The regional strategy and roadmap documents equally addressed the three pillars of sustainability (social, environmental and economic sustainability) and explicitly promoted the sustainable use of agricultural, forest and marine ecosystems. Reference was made to the UN's 2030 Agenda for Sustainable Development and its Sustainable Development Goals (SDGs) as incorporated in the European Commission's Communication on 'Next steps for a sustainable European future' (COM (2016) 739), and to the objectives of the EU's Circular Economy Action Plan.
- **Transparency**: In order to allow local stakeholders to enter the regional strategy and roadmap development activities, also at later stages of the process, all participatory activities and their outcomes were documented, and the documentation was publicly available, thereby ensuring full transparency of the project's participatory activities.

BE-Rural applied a variety of participatory tools with the aim of providing stakeholders and the public with relevant knowledge/information, consulting stakeholders and the public with regard to their views/priorities and of co-creating strategy and roadmap documents. Furthermore, all participatory activities were implemented based on the action research approach, paying particular attention to the continuous reflection and evaluation. This allowed us to draw lessons for the whole project and to provide ideas and recommendations for future research needs and policy guidance, which are outlined in this report.

The stakeholder and public engagement activities in BE-Rural were guided by the conceptual framework of BE-Rural, which provided practical guidance to the design and implementation of the participatory activities in the five regional OIPs (Abhold et al., 2019). These activities included educational events, physical and virtual pop-up stores showcasing bio-based products, a summer school for teachers, capacity-building and knowledge-exchange seminars, as well as dedicated meetings of the regional Stakeholder Working Groups (SWGs) and the Task Forces on Market Assessment and Business Model Design. Table 1 provides an overview of the assessment criteria, which were taken into account depending on the specific participatory format to be evaluated.

Table 1: Criteria used for the evaluation of participatory activities

Criteria related to social impact	Criteria related to policy impact	Criteria related to business / technological impact
Formats applied, topics discussed, mode of discussion	Participation of policymakers in project activities	Number of business ideas developed
Number of participants, representation of stakeholder groups, geographical coverage (if applicable), outreach / promotion of the event	Identification of policy gaps	Uptake of new business models
Feedback received from stakeholders taken up in strategy and roadmap documents	Outreach and dissemination of results to policymakers	Replication of existing business models / technologies
Number of individual citizens involved in the project activities	Links to existing policy documents / processes	Creation of new networks and institutions
Media coverage	Results taken up in the formulation of regional / national policies	Number of entrepreneurs involved
Social capital and networking		

To ensure that the lessons learned from the regional stakeholder and public engagement activities will inform the project's final policy recommendations, an internal evaluation process was set up at the outset. As such, internal evaluation reports were drafted by the facilitators of each respective participatory tool. The aim of these short reports was to (i) describe the themes presented and discussed, (ii) the number and type of participants, (iii) the agreed outcomes, and to (iv) provide a reflection on key lessons learned. In addition to this main source of information, feedback surveys and interviews with the participants were conducted and fed into the evaluation.

As such, the following chapter presents the objectives of the three main participatory tools applied, namely public engagement, capacity building and knowledge exchange, as well as strategy, roadmap and business model development. It also further gives an overview of the specific activities undertaken focusing on the evaluation of their effectiveness and lessons learned. The final chapter provides conclusions on the participatory development of bioeconomy strategies and roadmaps in regional and rural contexts.

2 Evaluation of BE-Rural's stakeholder and public engagement activities

2.1 Public engagement

2.1.1 Educational events

2.1.1.1 Objectives

The aim of the educational events in each of the OIP regions was to engage with teachers and students, and to disseminate the educational materials on sustainability, circular economy and bioeconomy developed by BE-Rural (João, 2020). These educational materials were translated into the local languages to facilitate their use and are therefore available in English, Bulgarian, Latvian, Macedonian, Polish and Romanian.

2.1.1.2 Activities

The five OIP regions carried out 24 educational events in the respective national language on the broad theme of 'Sustainability and the Bioeconomy', where the translated educational materials were used. The events took place between September 2020 and June 2022. The educational events involved schools, colleges, university pupils, students and/or teachers. The specific focus of these events was tailored to the interests and needs of each region, both in terms of sub-themes and in terms of target group e.g., age group, educational level, students/pupils and/or teachers. Some events were in-person events while others were online due to the COVID-19 pandemic. See João (2021) for a summary of the events carried out for each OIP region.

Table 2: Overview of educational events per OIP region

OIP region	Number of events	Type of attendees	Number of attendees
Stara Zagora, Bulgaria	3	Teachers, students (high school, university)	124
Vidzeme and Kurzeme, Latvia	4	Members of the public, people from different sectors	54
Strumica, North Macedonia	6	Teachers, students (high school)	224
Szczecin Lagoon and Vistula Lagoon, Poland	4	Teachers, students (high school, university)	96
Covasna, Romania	6	Teachers, students (high school, university)	374
Total	**23 events**		**Approx. 872 participants**

2.1.1.3 Evaluation

The initial goal was for each of the five OIP regions to carry out three educational events (15 in total). Ultimately, a total of 23 educational events were held, exceeding the initial goal. With more than 800 participants in total, the events succeeded in engaging with a large number of people. The majority of participants were high school students (638) and teachers (20). In addition, approximately 90 university students and over 35 teachers took part. Lastly, 34 primary students and 54 representatives from a range of sectors and stakeholders participated.

Key outcomes of the educational events were:

- Increased awareness of the bioeconomy and its products and processes among the general public.
- Generated public debate on the prospects of a regional bio-based industry.
- The bioeconomy game served as a source of inspiration for future young entrepreneurs.

After each educational event, an evaluation report was written. Overall, all events were successful and very well-received, although some comments were made with regards to possible improvements. Feedback of these events demonstrated the immense popularity of the BE-Rural bioeconomy games which are part of the educational materials.

These educational events increased the teachers' capacity and the students' knowledge on the subject of the bioeconomy. More importantly, the integration of bioeconomy and sustainability themes in school and university curricula (see section 2.2.3) shows the impact of the BE-Rural project. Teachers at both the university level (Trakia University in Bulgaria, master programme 'Bioeconomics and Eco-Entrepreneurship') and high school level (High school in Nowy Dwór, Poland, class called "Tourism Organization Technician") demonstrated strong interest by adopting the material into their courses.

Figure 1: Students playing with the printed games

Ultimately, participants expressed an interest for more of these events to take place – e.g. "The feedback from the students and teachers is more than satisfactory with an eagerness for these events to continue in the future." (Macedonian educational event on 15 March 2021).

2.1.1.4 Lessons learned

Regarding the impact of the educational events, several lessons can be summarised:

- It was a valuable aspect that regional OIP partners were in charge of running the educational events. It ensured that the events were tailored to the interests and needs of each region - both in terms of sub-themes and language, and in terms of target group (e.g., age group, educational level, and students/pupils and/or teachers).
- The OIP partners ensured that the educational events were both promoted and carried out successfully. Using local knowledge and networks worked well. The fact that the educational materials were translated into the five languages helped their use during the educational events.
- With regard to content, extensive presentations with information on EU strategy papers and concrete examples were extremely useful in informing and piquing the curiosity of the young generation.
- Both students and teachers responded positively to the content, noting that they enjoyed the presentation in general, because it was concise and provided basic and age-appropriate information (high school students). With regard to more age-appropriate material, it was noted that for primary school, participants the material must be adapted (e.g. too much text) for a younger audience (which could involve more information being presented in pictures or pictograms).
- The games facilitated the interaction between participants and increased their interest – for example, "Children enjoyed the challenge of finding Bioeconomy-related words in the Word Search Puzzles." (Latvian educational event on 18 September 2020), and "Interesting game ideas, I would love to try. Very good […] that materials are available in Latvian. Depending on interests - I am

interested in interactive materials." (Latvian educational event on 22 February 2021). Interestingly, the games will be integrated in the discipline "Planning for sustainable development" and in the master programme "Bioeconomics and eco-entrepreneurship" at the Trakia University, Stara Zagora.

- In the first educational events in Latvia, it was noted that the games were very popular and more copies would be beneficial. With this in mind, over 200 copies of the games were redesigned and printed.
- Despite the pandemic and the resulting need to run many of the events online, the feedback was overall positive.
- Although it was often suggested that it would be much better for such events to be organised on site and with physical interaction, others suggested that the online nature of the event allowed for a more interactive and complex style of presenting a new topic. It was even suggested that "the online nature of the event facilitated the interaction with the children as, when they cannot see each other (face to face), they have more courage to interact with their teachers; they are less afraid of giving a wrong answer" (Romanian educational event on 11 March 2021).
- Involving a wide range of teaching levels (primary and secondary school, college, university) in the educational events was a good decision.
- It was also positive that the educational events targeted both students and teachers. The OIP partners found it most successful to first run an event with a small number of teachers for them to get acquainted with the overall idea, objectives and concept in an intimate setting before adapting the material to their classes.
- A focus on the teachers, as was the case with the teachers' summer school, was key (see section 2.2.3). For example, in North Macedonia (educational event on 18 February 2021), it was noted that "the materials might be better presented by the teachers themselves, as the student's interest for discussion will rely on the teacher's ability to engage them as it is necessary to reduce and to adapt the material to be age appropriate." In Poland (educational event on 9 March 2021), one teacher noted that they did not feel prepared to answer many questions on the issue. Thus, it would have been better if the summer school had taken place before all the educational events and that all the teachers that were involved in educational events participated in the summer school.
- However, in order to significantly increase awareness of this topic, 1 or 2 educational events are insufficient. One key lesson is that these topics ultimately becoming an integral part of the curricula, is fundamental (see also the section 2.2.3).
- Games are relevant - not only for teaching but also for raising awareness among company employees during corporate events that use games as entertainment and ice breakers.

2.1.2 Bio-based pop-up stores

2.1.2.1 Objectives

The main objective of organising the pop-up stores in the context of BE-Rural was to provide local citizens with information on the bioeconomy to enable informed discussions. The BE-Rural bio-based pop-up sought, in particular, to advance "informative participation". Here, products are shown, their bio-based content explained in connection with the SDGs, and people with little previous knowledge in this area are reached. The approach was threefold: 1) to shed light on innovative bioeconomy products, 2) to discuss how these can contribute to selected SDGs, 3) and to inspire people to think of regional resources and innovative business models.

In addition to the goal of increasing the general knowledge of the bioeconomy, the pop-up store sought to contribute to a range of other activities in the project. Notably, to 1) raise awareness of the project and recruit participants for events and workshops, 2) disseminate project results, share insights and educational material, 3) host Stakeholder Working Groups and educational activities to enable collaborative stakeholder engagement, knowledge exchange and capacity building, 4) serve as a tool to mobilise engagement among citizens in the development of bioeconomy strategies and roadmaps. One of the key elements of the pop-up store was its need to adapt according to the overall project timeline. At the beginning of the project, the pop-up store sought to recruit stakeholders and help

channel feedback from citizens into the bio-based strategies and roadmaps, while at the end of the project, the pop-up store focused on disseminating the developed strategies and roadmaps and collecting critical stakeholder and citizen feedback for its implementation.

2.1.2.2 Activities

Between February 2020 and August 2021, three physical pop-up stores in Latvia, Poland and North Macedonia were organised. While COVID-19 posed significant challenges to all engagement activities in the project, decreasing infection rates in the summer months allowed for the implementation of limited physical events with hygienic restrictions. However, in light of the frequently changing health regulations, increasing COVID infection rates and low vaccination rates in the OIP regions in the fall of 2021, a project extension was requested to halt the planned physical implementation of the pop-up stores in Bulgaria and Romania. In March 2022, after no significant improvements in the situation, the decision was made to implement the remaining pop-up stores virtually. This was not an easy decision given the preference for an on-site implementation, in which local rural populations can be better targeted and visitors can have a more immediate tactile experience by seeing and touching the bio-based products and discussing their properties and potential with local representatives.

Table 3: Overview of Pop-Up Stores (physical and virtual)

Pop-Up Store	Date	Link to External Event	Visitors	Online Facebook Clicks and Reach	Surveys	Side Events
Cēsis, Vidzeme, Latvia	24.02. until 28.02.2020	Vidzeme Innovation Week 2020	487	-	66	2 (210 participants)
Świnoujście, Poland	01.08. until 10.08.2020	None, due to COVID-19	350	-	253	2 (24 participants) (due to COVID regulations)
Strumica, North Macedonia	30.07. until 03.08.2021	Strumica Open Festival	200	-	82	3 (50 participants)
Virtual - Stara Zagora, Bulgaria	launch date: 25.05.2022		1591 (*)	6165 clicks, 71,000 reach (**)	10	3 (100 participants)
Virtual - Covasna, Romania	launch date: 25.05.2022		410 (*)	1557 clicks, 81,000 reach (**)	8	3 (119 participants)
Total			**On site: 1037 Virtual: 2848**	**7,722 clicks, 152,000 reach**	**419**	**13 events, 503 participants**

(*) Active users from launch date until 19.07.2022; (**) Clicks and reach from launch date until 09.07.2022

Figure 2: Impressions of the Physical Pop-Up Stores

Latvia	Poland	North Macedonia
		

Overview of the virtual pop-op store

With the development of a virtual bio-based pop-up store, a bioeconomy market full of innovative products is now available to everyone on the BE-Rural website https://be-rural.eu/pop-up/. The virtual exhibition specifically highlighted the innovation regions of Stara Zagora, Bulgaria and Covasna, Romania by showcasing a number of their regional products and providing a glimpse of the great bioeconomy potential and innovative use of resources and business models presented in their regional strategic bioeconomy documents. All information was available in English, Bulgarian and Romanian. With quizzes and other interactive elements, visitors were encouraged to engage with the products, test their knowledge on the bioeconomy, and spark debates on issues of sustainability and achieving the SDGs.

Figure 3: Impressions of the Virtual Pop-Up Store

2.1.2.3 Evaluation

Social impact

The overall expected outcome of increasing bioeconomy awareness and generating public debate can be evaluated by several criteria. Regarding the number of people reached, the amount of in-person visitors ranging from 200 to 500 (totalling over 1000) can be viewed quite positively given small populations of the communities and the hurdles created by COVID-19.

The virtual pop-up store was visited by over 2,800 users in its first 2 months (from 25.05 - 19.07 2022). Over 70 percent of these were from the target countries of Romania and Bulgaria, while close to 15 percent came from the target regions of Sfantu Gheorghe and Stara Zagora. The promotion of the virtual pop-up store was significantly aided by a collaboration with local media agencies in Bulgaria and Romania. Both print and online campaigns were utilised in the target regions of Stara Zagora and Sfantu Gheorghe, including billboards, flyers, posters, press releases (see examples in figure 4). Targeted Facebook campaigns supported the promotion of the platform and reached a substantial audience in the two regions (reach of 71k in Bulgaria and 81k in Romanian).

Figure 4: Promotional Campaign of the Virtual Pop-up Store

Stara Zagora, Bulgaria; billboard	Covasna, Romania; online campaign
	

While not all physical visitors filled out a survey, a breakdown of the visitors by country revealed a change in stakeholder targeting. In the case of the first pop-up store in Latvia, outreach was achieved by inviting school groups to attend the pop-up store, resulting in a high proportion of young visitors. The pop-up store was also visited by attendees of the Vidzeme Innovation Week. In the second pop-up store in Poland, a more balanced age range and stakeholder representation was achieved. The store´s placement in the touristic harbour of Świnoujście, however, resulted in a higher percentage of foreigners as well as Polish residents outside the OIP region. In the last physical pop-up store, a balanced age range was achieved, and the majority came from the OIP region of Strumica, North Macedonia.

An indication of the impact of the pop-up stores is also revealed by the strong local media uptake. All pop-up stores succeeded in garnering significant local media attention in TV and radio. The pop-up store in North Macedonia, which was visited by the Mayor of Strumica, Janevski Kosta, received significant media attention at both the local and the national level.

Figure 5: Media Resonance in the OIP regions

Cēsis, Vidzeme, Latvia	Świnoujście, Poland	Strumica, North Macedonia
		
• Local TV, ReTV • Local radio, LSM.lv	• Local TV, TV Słowianin • Local radio, Radio Twoje	• National TV, TV MRT, • Local TV, Telma TV (Website & YouTube), SRnet, • (Radio StrumicaNet), TV Sitel (Website & YouTube), TV Vis, as well as on their social media channels.

Stara Zagora, Bulgaria	Covasna, Romania
	
• Local radio: Radio Stara Zagora, Darik Radio • Local TV: TV Stara Zagora • Articles (print and online): over 28 media publications, Telegraph Agency	• Local Radio: Sepsi Radio (with streaming on Facebook), We Radio, Slager Radio, Marosvasarhelyi Radio • Articles (print and online): We Radio, Transilvania Business, szekelyhon, marosvasarhelyiradio, hirmondo

Visitors were handed a survey at the end of their visit to the pop-up stores. Survey respondents overwhelmingly felt that their bioeconomy knowledge had improved after visiting the pop-up store (indicated by more than 75% of survey participants in all countries). Furthermore, the pop-up store helped visitors to gain a better understanding of the aim of the SDGs (indicated by more than 80% of survey respondents in Poland and North Macedonia). A key element of this successful result can be linked to the guided tours in which either the OIP partner or a local hired staff member explained the bio-based products and their connection with the SDGs to those entering the pop-up store.

For the virtual pop-up store, too, an increase of knowledge on the bioeconomy and SDGs was reported after the visit. Visitors especially stated that they had learned much about the bioeconomy potential of the Stara Zagora, Bulgaria and Covasna, Romania regions. However, should be mentioned that the survey for the online pop-up store was only filled out by 20 visitors during the first 6 weeks.

While the more novel and innovative bio-based products on display in the pop-up store left quite an impression on the visitors (e.g. in the feedback forms, the most interesting items includes clothes made from milk and wood, pineapple shoes, a smartphone from sugar and food made from insects), the pop-up store also intended to trigger discussions and thoughts on the use of local resources. Many visitors were impressed with the wide range of materials that could be used to produce consumer products, especially what could be produced using leftover or waste material. Regarding the availability of resources, visitors agreed that many of the products displayed (or very similar products) could also be produced in their respective regions. In North Macedonia, for example, innovative ideas were discussed regarding the use of residue from agricultural production, such as the utilisation of residue from eggs for yoghurt packaging, vine branches for construction materials and packaging, or the residue from tomato or cucumber pruning.

The inclusion of regional bio-based innovations helped make these connections and spur more discussions. Over the course of the project, the number of bio-based items increased from 48 to 57 as new regional products were added. While difficult to source at times, in the end, 16 regional products representing all 5 OIP regions were included in the exhibition.

2.1.2.4 Side Events

Parallel to the pop-up store, interactive events were organised to better cater to the specific characteristics and needs of each region. In the end, 13 side events took place - surpassing the target of 10. OIPs could choose from an initial "toolbox" of six potential event concepts based on local conditions as well as the timeline of the project.

Figure 6: Impressions from the side events

The tasting events "Eat/Taste the Bioeconomy" were chosen by the OIP regions with face-to-face pop-up stores. Furthermore, the "Open Space Learning" concept was adapted, and local teachers and their students were invited for guided tours through the pop-up store. "World Café" formats were chosen by two OIP regions to discuss new ideas for the strategy formulation. Barriers, appropriate solutions and key actors for implementing bioeconomy were discussed. One side event targeted high-level stakeholders including local authorities such as the mayor of the city and focused more intensively on the roadmap development process and cross-regional exchange.

Further side events focused on the business community, e.g. the presentation of a young business incubator designed for bioeconomy and start-ups initiatives in the region, the discussion on entrepreneurs' initiatives and SDGs as well as presentations of individual entrepreneurs. The side events were very well received: for some of them, extensive promotion attracted a high number of participants as well as media attention. The side events brought together a wide range of stakeholders and citizens and attracted additional visitors to the pop-up stores.

Policy impact

All OIP regions are different in that their stakeholder engagement processes have united different actors. Moreover, all regions were at different stages in their strategy development process. A pop-up store implemented at the beginning of the project (e.g. Latvia) helped attract attention to the project, energise stakeholders and potentially integrate citizens' feedback into the regional strategies. Conversely, a pop-up store implemented towards the end of the project (Bulgaria and Romania), helped disseminate the strategies and gather feedback on their implementation.

However, the aim of engaging the general public in an open and informative dialogue on the bioeconomy in order to better identify citizens' needs and concerns and integrate this feedback in the regional strategies proved more difficult than expected. Not only did the length and detail of the surveys prevent citizens from contributing, but in discussions with locals it became clear there was still need for further informative measures and discussions before concrete input could be gathered. Feedback was limited by the number of people willing to fill out the surveys (both physical and online) and by the level of knowledge.

While the side events successfully supported the project´s stakeholder-engagement processes and helped integrate more high-level stakeholder involvement, it proved more difficult to capture average citizens´ feedback to integrate into the strategy development. The pop-up stores significantly helped make the bioeconomy in the regions more tangible, vivid and closer to the local stakeholders, encouraging them to utilise the local residue and contribute to the implementation of a bioeconomy roadmap. For example, in the case of North Macedonia, the involvement of other regions (Polish representatives) and local authorities helped build partnerships and share experiences. In Bulgaria, the diverse mix of people - from students to government and business representatives - helped spark more informed discussions.

However, a need remained for the development of region-specific instruments to enable people to express their needs and concerns on themes such as bioeconomy development in their regions, sustainable consumption, climate and nature protection, etc. and to actively involve them in the strategy development process.

2.1.2.5 Lessons learned

Regarding the social impact and policy impact of the pop-up stores, several practical insights can be summarised below:

- Overall, the pop-up stores proved successful as a format to increase public awareness on the bioeconomy and its connection to the SDGs. More than **3000 people** were introduced to the pop-up store through physical and virtual events.
- **Linking the pop-up store to larger events** was important in attracting visitors. However, with enough local promotion, even the side events of the virtual pop-up store were able to attract between 30 and 40 participants.
- Promotion is key, especially to reach local media (TV and radio). Only by working closely with the OIP facilitators was the project successful in achieving such a **high local media resonance**. Given the ability of the pop-up stores to attract a large amount of attention to the project, it proved helpful to organise the pop-up stores towards the beginning of the project.
- The bioeconomy as a concept must be introduced with a significant amount of **background information**. The pop-up stores incorporated the lessons learned from the BioSTEP project (2015-2018) by not only using trained guides in the OIP regions to present the material and answer questions, but also by increasing the amount of explanatory material. In addition to the descriptive brochures on the bio-based products, detailed posters with background information on the bioeconomy and its connection to the SDGs were provided. Furthermore, short videos on specific topics of the bioeconomy were provided with the use of QR codes. However, finding additional engaging online resources in the local languages proved difficult.
- Using more engaging elements such as food tastings was successful in attracting attention. They were, however, difficult to implement and safely administer during the pandemic.
- While the pop-up store was successful in sparking curiosity at the beginning of the project, its **adaptive role** was also crucial. Towards the end of the project, more project outputs were available to engage with citizens (e.g. handbooks, printed educational games), which allowed for a better dissemination of project outputs. The pop-up stores can play different roles from stakeholder recruitment to collecting roadmap/strategy feedback.
- As suggested in the BioSTEP project, more attention should be paid to the bio-products and their sustainability. The pop-up stores made **clear connections to the SDGs** with posters and with more general information on their sustainability. Determining the level of sustainability and production methods was significantly more difficult for the local products.
- Not only did the pop-up store showcase the innovative side of the bioeconomy, but a concerted effort was also made to include **local bio-based products** (16 in total) in order to emphasise the diversity and to inspire the use of local resources and business models.
- The online pop-up store was key in reaching a **broader audience** and providing a permanent and more **sustainable showcase of bio-based products**. It was, however, limited in its capacity to reach a **rural audience** with limited internet access to spur haptic conversations and debates and inspire people through a more impactful sensory experience.
- Regarding the pop-up stores' effectiveness as a tool in the development of regional bioeconomy strategies, citizens´ understanding and **debate on local bio-resources** and products increased and there was a helpful **engagement with local authorities and entrepreneurs**, which not only created key partnerships, but also enhanced their understanding of the importance of involving the public in bioeconomy discussions.

However, a few challenges also presented themselves and thus future exhibitions should pay attention to the following aspects:

- While a stronger focus on the sustainability of the bioeconomy is crucial, more in-depth conversations and dialogue with citizens on these issues, their impressions, concerns, fears or wishes, is necessary. This is due, in part, to both the overall complexity of the bioeconomy and a still limited knowledge of its potential, as well as the need for better ways to capture citizen feedback. While surveys provide a certain level of formal feedback, future exhibitions could use other techniques such as 1) having staff attending the pop-up store note the observations of visitors in daily diary entries, 2) an impression wall where visitors can share more open-ended impressions

visually, 3) educational quizzes with prizes to enhance participation, 4) social media interviews with citizens, 5) future scenario methodologies in which the bioeconomy is discussed in relationship to how rural citizens envision a sustainable future.

- The side events also could be improved to bring together stakeholders and the general public. A more concerted effort to **bring them together** could help the stakeholders integrate citizens' needs and knowledge into their strategies and roadmaps.

2.1.3 Website, social media, and newsletter

2.1.3.1 Objectives

A website, social media accounts, and a bi-annual newsletter were used to leverage public engagement and offer easy access to the project activities and results. The website was published in month four of the project and four social media accounts were created thereafter on the following platforms: Facebook, Twitter, LinkedIn, and Instagram. BE-Rural's Twitter account was created based on the existing Twitter account of the predecessor project, BioSTEP. This allowed BE-Rural to take advantage of the Twitter following and the reputation already established during the BioSTEP project. Regarding the project newsletter, a first edition was published in month 13 and a new edition is published every six months with regular project updates. Subscribers were acquired via the previous newsletters, via the project website and social media accounts, and by participating in a BE-Rural event. Besides project updates, the newsletter also featured information on the five OIP regions, interviews with project partners and advisory board members, as well as relevant events organised in the scope of the project or attended by project partners.

One of the main objectives of the website was to provide a comprehensive description of the overall approach and concept of the project, providing details on the consortium, advisory board, and peer group, among others. The website also served to give a multimedia overview with background information on the bioeconomy. In addition to this, the website also contained a section dedicated to the OIP regions including key facts and a map of each region. Two sections, 'News' and 'Events', were also created with the aim of listing news from the project, past project newsletters, as well as project-related and external events. The external events were either relevant in the context of the project or involved some participation from the BE-Rural consortium. Subsequently, as the first project results were made available, a new section called 'Resources' was added to the website with the objective of centralising all the project deliverables on one page, along with the educational and communication materials developed during BE-Rural, among others.

Additionally, social media accounts were used to further spread project results, news, and events. The main target audience on social media was the European bioeconomy community, but also the general public, and, more specifically, the citizens of the OIP regions. Although it was not described in the project's Description of Action, an Instagram account was created for the purpose of delivering impactful pictures from the OIP regions that could raise attention to the regional bioeconomy, but also to regional tourism. In general, the social media accounts and newsletters served as amplifiers of the project website as they relayed and informed on most of the project results and activities posted on the website.

2.1.3.2 Activities

Website

Between the creation date of the website in July 2019 and the evaluation date of 22 July 2022, 18 news items and 95 reports were uploaded to the website informing visitors - either in English or in the OIP languages – about the events taking place in the scope of the BE-Rural project. To illustrate these events, 155 photos were added to the website. The website also listed a total of 42 public events relevant to the project. Most of them were external and a few of them were attended by consortium partners. Additionally, 7 online communication materials in English and in the OIP languages (e.g. project brochures, flyers, roll-ups) were uploaded and 5 educational games and 8 slide decks (PPTs) on the bioeconomy for teachers were made available in English and in all the OIP languages. Dedicated web pages also provided information on the OIP regions, featuring the permanent regional bioeconomy stakeholder panels. Finally, 15 project deliverable reports were also made available on

the website, in addition to the regional bioeconomy strategies and roadmaps (available in English and/or in the OIP languages), the handbook on regional and local bio-based economies (available in English, German, and all the OIP languages), a policy brief, and the online bio-based pop-up store.

Social media

Table 4: Overview of social media activities

	Twitter	LinkedIn	Facebook	Instagram
Number of posts	129	129	136	70
Number of interactions (likes, comments or shares)	1,207	546	745	154
Number of impressions (= number of times a tweet/post was viewed)	136,046	9,074	120,281	NA
Number of followers	2,465	249	128	64

The figures above reflect the period between the creation date of the social media accounts in July 2019 and the evaluation date of 22 July 2022.

Newsletter

A first edition of the project newsletter was published in month 13 of the project and a new edition was published every six months with regular project updates. Subscribers were acquired via the previous newsletters, via the project website or social media accounts, or by participating in a BE-Rural event. In addition to project updates, the newsletter also features information on the five OIP regions, interviews with project partners and advisory board members, as well as relevant events organised in the scope of the project or attended by project partners.

Table 5: BE-Rural Newsletter – outreach

	Newsletter #1 – April 2020	Newsletter #2 – Oct. 2020	Newsletter #3 – March 2021	Newsletter #4 – Oct. 2022	Newsletter #5 – April 2022
Number of recipients	143	213	213	278	302
Number of openers	53	52	58	121	130
Opening rate	37.1%	24.4%	27.2%	43.4%	43%
Number of clickers	26	31	31	38	32

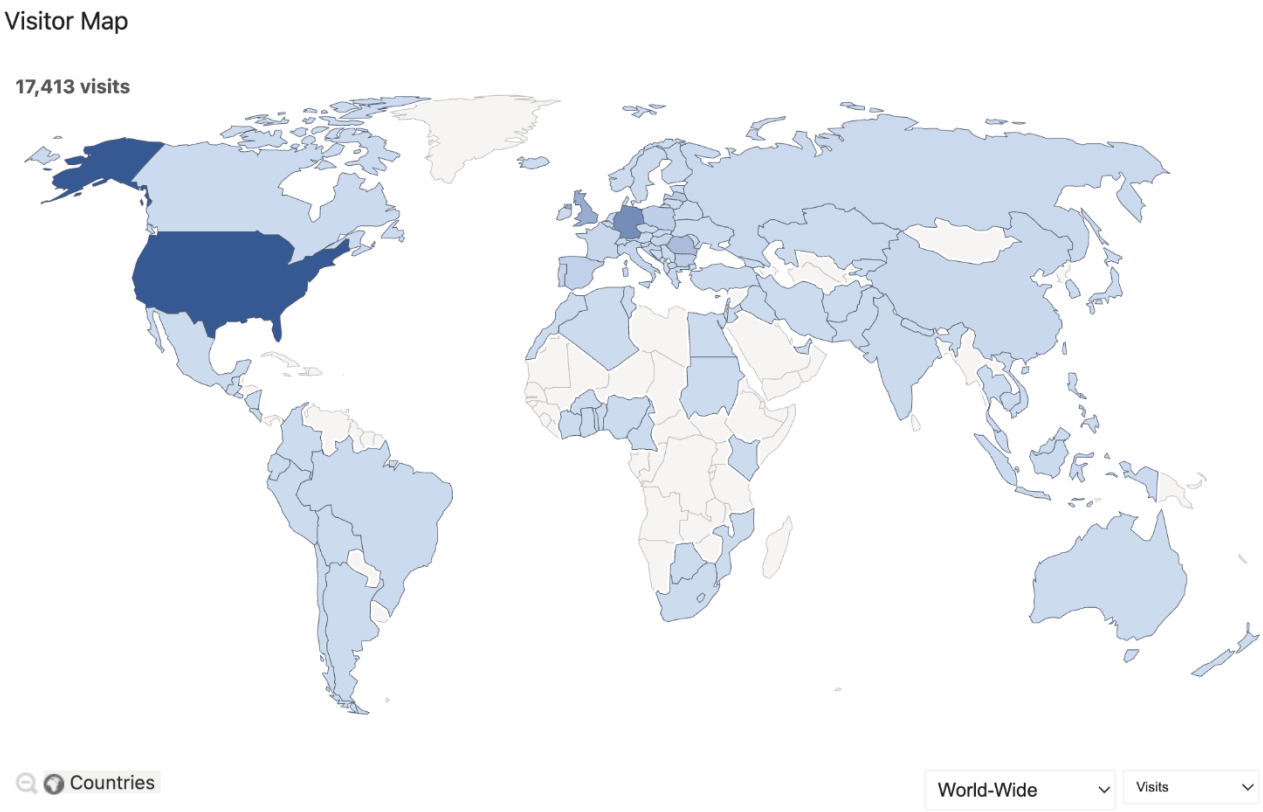
The figures above reflect the period between the release of the first newsletter in April 2020 and the evaluation date of 22 July 2022. The project's final newsletter is thus not covered in this evaluation.

2.1.3.3 Evaluation

Website

Between the creation of the website in July 2019 and the evaluation date of 22 July 2022, there have been 17,413 visits (these visits exclude the visits made from the office of BIOCOM AG and the visits made directly on the online bio-based pop-up store).

Figure 7: Visitors to the BE-Rural website



Geographically, it is noticeable that, on a global scale, a high concentration of the visits was from the United States, with more than 5,500 visits registered in the country, and from Europe, with more than 11,700 visits registered in the continent.

In comparison to other countries, the countries of the OIP regions recorded a significantly higher number of visits, especially in the case of Romania (1,272 visits). North Macedonia reached 341, Bulgaria 503, Poland 504 and Latvia 666 visits. It can also be observed that some of the countries represented by the target regions of the peer EU project, POWER4BIO, recorded a relatively high number of visits as well (e.g. Italy, Spain, Hungary). As expected, very high numbers of visits were registered in the countries of other non-OIP project partners, e.g. Germany (3,429) and the United Kingdom (1,929).

When analysing how many website visitors consulted the 95 event reports made available on the website, it is important to note that only five event reports were downloaded by more than 15 visitors. These are the reports on:

- the educational event "Bioeconomy comes to Jelgava", organised on 18 September 2020 (downloaded by 34 visitors);
- the first BE-Rural inter-regional webinar, organised online on 18 March 2020 (downloaded by 29 visitors);
- the second BE-Rural inter-regional webinar, organised online on 16 June 2020 (downloaded by 17 visitors);
- the bio-based pop-up store organised in Cēsis, Latvia between 24 and 28 February 2020 (downloaded by 15 visitors);
- the seminar organised in Sfantu (downloaded by 15 visitors).

It can be summarised that the event reports received very little attention from the website users – even those that were made available in both the local language and in English. Having all project-related

events documented on the website certainly served the purpose of transparency. It did, however, not contribute to creating further engagement with members of the public visiting the website. Furthermore, different aspects can be questioned to understand why these event reports were consulted so few times. Among these is the way in which they are presented and made accessible on the website (in the form of long lists).

Social media

Looking at the number of followers and impressions, it can be assessed that Twitter has been a more successful medium of communication and outreach. Since the BE-Rural Twitter account overtook the account of the predecessor project BioSTEP in July 2019, there have been 972 new followers (as of 22 July 2022), whereas on each of the other three social media platforms - LinkedIn, Facebook, and Instagram - only between 60 and 250 followers were acquired. There are different factors that can help explain this difference. The first is the strong basis of approx. 1,500 followers on which the BE-Rural project built its presence on Twitter. This significant follower base established in the BioSTEP project helped by providing significant exposure from the very beginning to the project results and activities that were communicated on this social media platform. Another factor to consider is the dominant use of Twitter as a means of communication by the European bioeconomy community. In recent years, Twitter has replaced many channels as the core digital way to engage with members of the public, share information, and create a community at a very quick pace. It was hoped that Instagram would be a relevant and powerful place to share, e.g., photographs captured during the project activities as they took place in the OIP regions. Unfortunately, due to the COVID-19 pandemic, many of these took place online. This situation made the use of Instagram, a platform focusing mostly on live photos and videos, particularly difficult. In addition, there is a limited social media presence of the business community and the general public from the OIP regions. Twitter, LinkedIn, and Instagram are used very little in the OIP regions, and even the OIP facilitators themselves are rarely present on these social media platforms. This generally low level of engagement on social media can also explain why there has been much less engagement than expected on platforms such as Instagram and LinkedIn.

Newsletter

The project newsletter was, in general, received and read by a steadily increasing number of followers. Throughout the project, an increase in followers was regularly noticed after project events or activities during which the newsletter was promoted, or the subscription form or link was given to participants.

2.1.3.4 Lessons learned

- Raising awareness about the BE-Rural project in the EU bioeconomy community via Twitter proved to be positive and impactful considering the number of impressions, interactions, and new followers. Although the local communities from the OIP regions don't seem to be very active on Twitter, it was a useful tool to raise awareness about the project activities and results.
- Joint communication campaigns with other bioeconomy EU projects should be further encouraged for optimal reach. For example, the dissemination of the Joint Guidance Document for Stakeholders (BE-Rural, POWER4BIO, 2020) on the social media accounts of BE-Rural and POWER4BIO resulted in increased exposure not only of the document itself, but also of the respective social media accounts.
- Given that not all members of the general public speak or understand English, translating the website, or at least a section of it, into the OIP languages would have contributed to increased traffic in the OIP regions and countries.
- Making project events part of larger public events has a higher potential to help trigger more engagement with and curiosity from members of the general public. It can be supposed when examining the website analytics on the event reports that, in general, physical project events organised in the context of larger events frequented by the general public received wider interest.
- Although it is essential to make all project-related event proceedings available in a certain way to externals for the sake of sharing knowledge, promoting co-creation, demonstrating openness, showing inclusiveness, and respecting the principles of transparency, more engaging formats should be considered to ensure a minimal level of public engagement as a result of these events. For example, quotes, or even op-eds, written about the event by an event participant could better illustrate the significance of the events as felt by the event contributors themselves than formal

event reports. Centralising and summarising the main takeaways from several events with a common denominator into 'news' articles (that could include links to all the event reports for more details) would also help reduce the high number of event reports as currently presented on the project website, simplify the information conveyed, and further contextualise how and why these events took place. This would provide external visitors with the background necessary to understand what could be interesting for them in the event reports.

- Future communication activities should focus on educating the OIP facilitators on how they can become social media ambassadors in order to be more engaging on social media vis-à-vis members of the general public from their regions. The creation of more social media messages in the local languages would certainly have contributed to a closer proximity on these online channels to members of the general public from the OIP regions.
- As the local communities seem to have a stronger presence on Facebook than on any other social media platform, having a point of access through Facebook (and even LinkedIn) groups followed by members of the general public from the OIP regions would have allowed more direct and easy connections with the general public.

2.2 Capacity building and knowledge exchange

2.2.1 Seminars

2.2.1.1 Objectives

The objectives of the capacity-building (CB) and knowledge-exchange (KE) seminars carried in the frame of BE-Rural were to increase the capacities of regional and local authorities and stakeholders from business, civil society, and academia to design and implement bio-based roadmaps and strategies.

2.2.1.2 Activities

Each OIP has organised between six and seven seminars - 33 seminars in total. The CB and KE activities undertaken by the five OIP regions have been successful in reaching out to a total of 432 participants – between 29 and 114 participants in each region.

Table 6: Overview of seminars' key focus

OIP Region	Key focus
Stara Zagora, Bulgaria	Bioeconomy: the sustainable economy of the future
	Bioeconomy and the European Green Deal - challenges, alternatives and opportunities for the Bulgarian economy
	Bioeconomy, the European Green Deal and the National Recovery and Resilience Facility
	Bioeconomy and the National Recovery and Resilience Facility and its financial opportunities
Covasna, Romania	Policy-mix related to the Regional Smart Specialization Strategies for the period 2021-2027 and the project portfolio
	Business models in the bioeconomy, structures and participatory approaches needed for the elaboration and effective implementation of the strategy
	Framework conditions for creating/expanding/completing organic value chains within the Regional Smart Specialization Strategy
	The link between the National Plan for Rural Development, National/Regional Bioeconomy Strategies, Green Deal and SDGs
	Raising capacity on the UN's SDGs: a perspective of an H2020 project BE-Rural
	Bioeconomy - Green Deal - Sustainable development objectives
	Application of the Business Model Canvas
	Circular Bioeconomy Potential

Szczecin and Vistula Lagoons, Poland	The role of local authorities in the process of creation of regional development based on local bio-resources
	The advantages of circular economy
	The UN Sustainable Development Goals (SDGs) and the Circular Bioeconomy of the fisheries sector
	Pro-ecologic strategies in business development
	Fisheries products as key element of culinary tourism
Strumica, North Macedonia	Technology options and analysis of the potential of bioeconomy of the region
	Overview of relevant educational materials on bioeconomy, circular economy and sustainability
	Best practices from other regions relevant for Strumica region
	The Bioeconomy in the context of the Sustainable development goals (SDGs), European Green Deal and the Economic and Investment plan for the Western Balkans
	The Bioeconomy in the context of the European Green Deal: synergies and trade-offs
	Overview of innovative business models relevant to the Strumica region i.e. mycelium-based materials for packaging and insulation
	Synergies of bioeconomy in the context of the SDG and the European Green Deal aligned with a business model relevant to the Strumica region
Vidzeme and Kurzeme, Latvia	Potential to develop bio-based sustainable business in rural areas
	Sustainable use of Latvian forest resources by planting and growing trees in different land uses - a contribution to Latvia's bioeconomy
	Bioeconomy in rural areas - use of wood and forestry side-products for innovative production processes.

The seminars were, in most cases, prepared solely by the OIP facilitators. In some cases, however, such as in Strumica, the facilitator actively involved the Stakeholder Working Group (SWG) in determining the topics. In Covasna, the regional partner also organised joint workshops with other bioeconomy projects and sought active collaboration with cluster organisations and the Regional Development Agency. The seminars involved **keynote speakers where external expertise was needed**, while moderation was provided by the regional partners.

In terms of the format, the seminars were **mostly half-day events**, typically split into two to three sessions – intro session to present BE-Rural and its purposes, and thematic sessions devoted to one or two specific aspects related to the bioeconomy. The thematic sessions involved a plenary discussion, with both open questions from the public and a discussion on questions pre-identified by the organisers. Break-out groups to allow smaller group discussions were not used. In the case of Strumica and the Vidzeme and Kurzeme regions, the seminars were predominantly organised online due to strict COVID-19 prevention rules, which prohibited face-to-face meetings. In the other OIPs, online events were combined with a physical or hybrid format, depending on local COVID-19 restrictions. OIPs have gradually started using **interactive tools** including Zoom polls, (virtual) sticky notes and the game-based learning platform Kahoot. This depended on careful consideration of the participants´ ability to use such tools. In some cases, the seminars were organised back-to-back with other BE-Rural activities such as SWG meetings or educational events in order to increase participation.

Figure 8: Impressions from capacity-building seminars in Stara Zagora and Covasna

The seminars addressed **a wide diversity of themes**, which were often selected to raise awareness and build capacities **around available BE-Rural deliverables** (e.g. on technology options or business models) and to **link to topics driven by EU legislation and funds** (e.g. EU Green Deal, SDGs) or national/regional policy developments (e.g. Romania's National strategy for sustainable development 2030; Bulgaria's National Recovery and Resilience Plan). The specific aims of the seminars and their respective outcomes differ to some extent as they were tailored to each region. In the cases where the bioeconomy has been a relatively new topic and awareness and knowledge were limited, the seminars had the broader purposes of addressing this gap and empowering these stakeholders to participate more actively in the future activities of BE-Rural (especially in view of the strategy development). In other cases where engagement on the topic of the bioeconomy has already been present, the seminars aimed to develop ideas and priorities to be integrated into the future strategy documents and to provide concrete input to ongoing regional strategic discussions, e.g. related to smart specialisation strategies. Seminars also intended to stir stakeholders to think outside their current practices and imagine how their businesses could be more sustainable by presenting successful examples from elsewhere.

To reach out to participants, some OIPs used **existing stakeholder databases** to promote the seminars. Participants were also invited via phone calls or personalised emails. The reason to use the latter approaches is twofold: first, in some cases, digital communication channels were not available – e.g. in small rural areas, and second, this has increased the chances for some stakeholders to participate as they appreciated the personalised approach and attention. SWGs promoted the events in their networks.

The number of participants varied widely, ranging from smaller groups (e.g. involving just 5 external participants) to larger ones (e.g. with 48 participants). Despite typically targeting a specific type of stakeholder (policy practitioners, business, academia, and civil society), stakeholders from the other fields were not excluded if they were interested in participating.

Table 7: Overview of participant types in capacity-building seminars

OIP	Science/ academia	Business/ industry	Policy/ adminis-tration	Civil society	Not identified	Total
Stara Zagora	36	39	24	9	1	86
Covasna	25	45	30	13	1	114
Szczecin and Vistula Lagoons	10	48	42	3	0	104
Strumica	4	4	12	8	1	29
Vidzeme and Kurzeme	24	28	21	4	0	77
Total	**99**	**164**	**129**	**37**	**3**	**432**

2.2.1.3 Evaluation

The capacity-building and knowledge-exchange seminars have worked *hand in hand* with the other BE-Rural engagement tools to add value to the process of building bottom-up regional bioeconomy strategies and, more broadly, to increase the capacity of stakeholders to participate in the bioeconomy on the ground. As depicted in Table 7, the outreach to different stakeholder groups has varied across OIPs. The strong involvement of business communities stands out among all OIPs, as well as the overall low engagement among civil society representatives. It is also interesting to observe the differences in participation across regions – highest presence of business and policy practitioners in the case of Szczecin and Vistula Lagoons and Covasna, of academia and business representatives in the case of Stara Zagora and Vidzeme and Kurzeme regions, and of policy community and civil society in the case of Strumica. This indicates that across regions, different stakeholder groups drive – or would be the key drivers – of the regional bioeconomy.

Overall, the capacity-building and knowledge-exchange seminars have

- **raised awareness** among stakeholders about the bioeconomy potential in each region and provided them with new knowledge;
- contributed to the **design of bottom-up regional bioeconomy strategies and roadmaps**;
- allowed **building better social connections and networks** between stakeholders in the OIP regions; and
- helped to identify concrete **policy gaps or potential synergies** with other policies or programmes.

Policy impact

Increased knowledge, awareness and connection to local needs and interests

As mentioned previously, the objectives, and, consequently, the results of the seminars have varied depending on regional contexts. The key factors were: the difference in prior knowledge and awareness related to the bioeconomy, the presence or lack of decision-making powers at the regional level, and stakeholders' prior experiences with participatory processes and the development of regional strategies. Given these different contexts, the seminars created policy-related value in diverse ways.

The seminars were tailored to the degree of the stakeholders' concrete bioeconomy knowledge. They were adapted to their context, presented in an accessible language and covered specific topics such as bioeconomy technology options or market potentials. In many cases, such knowledge was lacking and was therefore welcomed by local communities, including local and regional public administrations. In fact, the seminars even clarified some basic misunderstandings, for instance of the term bioeconomy, and its confusion with other terms such as 'ecological' or 'organic' (e.g. organic farming) and how to use it in strategic documents in a meaningful way.

The seminars have been helpful in shedding light on local conditions as a starting point in developing a regional bioeconomy strategy. For instance, in the case of the Polish Szczecin and Vistula lagoons, the first seminars were particularly useful to gain a better understanding of the economic placement of the local communities and what kind of bioeconomy is imaginable given the local conditions. Based on these initial discussions in the two lagoons, it was recognised that the bioeconomy can be especially valuable for communities who live further away from the coastal area and who benefit less from mainstream tourism activities. Related to that, the seminars have also been helpful for many of the OIPs in identifying the most engaged stakeholder groups as well as the individuals among them who could be directly involved in the strategy development process later, and who are likely to be committed to implementing the bioeconomy strategies, especially on the policy side.

The seminars then allowed collecting valuable feedback and mapping stakeholders' interests as a basis for a bottom-up bioeconomy strategy. This process, however, has not been as smooth and easy. The capacity of participants to use the presented knowledge as a basis for discussion and development of concrete ideas and common visions that can feed into the strategy documents was varied. This has been easier in the cases where the bioeconomy has already been present in strategic documents, be it in the form of a national bioeconomy strategy or a regional smart specialisation strategy, and where stakeholders had prior experiences with participatory processes/working together. On the other hand, in the contexts where the bioeconomy was newly introduced, the promotion of active discussions has been more challenging and the process of promoting active participation has been more gradual. Overall, however, most of the OIPs have been reluctant to use more interactive co-creation approaches in the seminars, due to lack of experience and the risk of discouraging future participation of stakeholders. Active participation has been further hindered by the online format due to COVID-19, which, in some cases, was reported to have created passive attitudes among participants. The production of a guidance on knowledge-exchange & capacity-building activities as well as a briefing paper with best practices has been helpful to some extent. However, experiences with the seminars have shown that some OIPs needed additional hands-on support or capacities to stimulate or moderate discussions with stakeholders. It can nevertheless be observed that individual stakeholders who have repeatedly participated in different CB and KE seminars and other BE-Rural activities, have gradually gained the capacity to contribute with concrete ideas. For instance, in Strumica, the business ideas discussed during the seminars (such as mycelium-based materials) were later discussed to feed into the strategy and roadmap documents.

It is therefore noticeable that seminars aimed at creating concrete results – such as selecting and discussing business ideas/models or producing concrete policy suggestions to feed into ongoing regional strategy development (e.g. RIS3) processes. This can be seen as a way to create local success stories/examples in regions where the bioeconomy is at an initial stage. These can later incentivise larger groups of stakeholders to join the bioeconomy and are therefore considered a positive practice. What should be also noted are the often small groups in which some discussions took place. This did not necessarily allow for conflicting perspectives and competing opportunities to use biomass resources to surface and be discussed. Therefore, in a context of a growing uptake of the bioeconomy in these regions in the future and of increasing stakeholder capacity to participate in co-creation practices, it is necessary to revisit discussions with a more integrated approach.

Links to existing policy documents/processes

Beyond contributing to the development of BE-Rural bioeconomy strategies and roadmaps, **the seminars allowed for connecting with other ongoing strategy development processes**. For example, in the context of Kurzeme/Vidzeme, they provided opportunities to discuss how to incorporate the bioeconomy in regional and local development strategies, while in Covasna, seminars also aimed to discuss concrete ideas and bioeconomy-related actions identified in BE-Rural that can be taken up in the Regional Smart Specialisation Strategy. **These are positive synergies and they helped to overall increase the visibility of the BE-Rural project and its impact.** Still, impacting policies remains challenging in more centralised systems of government, where decision-making takes place at the national level and regional administrations have limited space for policymaking and capacity to develop visions and undertake policy initiatives. In this case, attracting participation from national government institutions has been challenging as well.

Seminar discussions, however, clearly indicate that **changes in business attitudes and models – from traditional to more sustainable – are related to public funding incentives and the simplification** of regulatory requirements. It is therefore understandable that in all regions, the presence of public authorities, especially at a higher administrative level, gave the events a 'higher rank'.

Policy gaps and potential synergies

The KE and CB seminars also provided opportuninies to gather professionals from different disciplines, who would otherwise **work in silos**. In some cases, like in Kurzeme/Vidzeme, this has been especially facilitated by the online format, which made access to the meetings easier. What stakeholders observe is that the seminars helped to bring the two policy fields closer, and consequently strengthened the use of terminology like 'agro-forestry' in strategic documents. In the case of Covasna in Romania, the seminars have provided a platform to discuss **gaps in legal frameworks** that pose challenges for the bioeconomy. For instance, in a seminar involving regional and local authorities, Romanian stakeholders discussed gaps in the legal framework related to the use of biomass.

The capacity-building element of the seminars has increased the policy practitioners´ understanding of what the bioeconomy is, what its local economic and social potentials are and how it links to the circular economy. When it comes to **increasing the knowledge about the circular element of the bioeconomy**, it has been considered especially valuable in the Polish case, where the circular economy was included in the European Maritime and Fisheries Fund (EMFF) OP. There is now a better understanding of how this could support circular bioeconomy objectives. In the cases of the Covasna and Strumica OIPs, there has been a strong potential to link the seminars and the capacities built through them with the **smart specialisation strategy** processes at regional and national levels.

Nevertheless, some regions, such as Stara Zagora, have recognised that there is widespread misunderstanding and confusion regarding the bio-based economy (e.g. some only relate it to organic production), and this includes its relationship (and distinction) with the circular economy. In this regard, consistent and long-term efforts are needed to **include the bioeconomy in the education system**, where policy support and funding is desirable. One of the positive results of the more intense cooperation of the Stara Zagora OIP with the regional Trakia University within the BE-Rural project (beyond the KE&CB seminars) is that the University has proposed to offer a master´s programme that will educate future bioeconomy experts.

Social impact

Improving social connections and networks

The seminars helped to **build trust and constituted first steps in learning how to cooperate** (e.g. in the Polish lagoons). They also helped **facilitate business relations**, thereby identifying new business opportunities (e.g. Stara Zagora). Where stakeholders did not already know each other well, the seminars were useful in creating better connections. In this way, the engagement activities created are important preconditions for building bottom-up strategies involving various stakeholders.

Improving connections was particularly relevant in the case of the Polish OIP, where the targeted area is split into two territories. Here, the seminars brought together stakeholders from the two regions and gave them an opportunity to identify similarities among them. This has later led to the decision to prepare one joint bioeconomy strategy for the two regions.

The seminars were mostly organised while COVID-19 restrictions were in place. This meant that regional partners needed to **find a balance between on-site and virtual events**. Some regions clearly preferred on-site meetings, as was the case in the Polish lagoons and in Stara Zagora in Bulgaria, where it could be observed that participants were much more active in physical settings. The informal parts of physical meetings, such as coffee or lunch breaks, were considered to create added value.

While the seminars were originally planned to target each stakeholder group separately – policy, business, civil society – in practice, due to the interest by other groups, **the events were open to a mix of stakeholders**. This allowed some participants to attend several seminars, thereby meeting with each other on a more regular basis and building connections and knowledge.

The seminars also helped **build connections with other related projects** - for instance those funded by Interreg and Horizon 2020 (Covasna, Kurzeme/Vidzeme). The experience of the seminars is likely to have an impact beyond the OIP regions. The OIP facilitators in Strumica, for instance, are planning to replicate a similar format of seminars in other regions in North Macedonia, involving stakeholders from Strumica in events with these other municipalities.

2.2.1.4 Lessons learned

The KE&CB workshops provided **suitable platforms for knowledge sharing and open discussion** on how to stimulate the regional bioeconomy through policies and technologies. The key to the success of the seminars was the focus on bioeconomy opportunities, technologies, business models and policies that are **specific to the region and country**. The workshops addressed different sustainability aspects such as the SDGs, circular economy, waste management, etc., depending on the local contexts and interests. It **proved to be useful to build the content of seminars on project deliverables**, such as the BE-Rural reports on small-scale technology options or market potentials, providing knowledge that was previously unavailable in the regions as well as concrete ideas and inspiring successful examples.

It can be noticed that, in some regions, partners organised the seminars in a way that the seminars build on each other. This has been possible because of predominantly repetitive participation of the same stakeholders. This approach therefore led to an accumulation of more substantial knowledge, while resulting in a limited number of unique participants (e.g. in Strumica). In other regions, the aim was rather to raise awareness among as many stakeholders as possible. This has led to a wider outreach and, potentially, to less of an opportunity to build more solid knowledge. Clearly, both approaches have their advantages and disadvantages, and should be selected depending on what works in the regional context.

More practical lessons from the implementation of the workshops and seminars include:

- **Allow the possibility to tailor the events to local circumstances**. There is no one-size-fits-all approach, but instead regional actors should be able to use different approaches to organise the workshops depending on existing capacities and interests.
- **Outreach to different stakeholder groups should be inclusive**. The application of a quadruple helix approach ensured the involvement of a wide range of diverse stakeholders, including a good gender balance.

- **More substantial efforts are needed to involve NGOs** and other civil society organisations, associations, cooperatives, unions, etc., who possess valuable knowledge and can be an access point to a larger group of stakeholders.
- **Mix different types of stakeholder groups**. While it can be useful to target some events at specific groups, mixing stakeholder types – following the quadruple helix approach – appeared to have been more useful. It allowed stakeholders to join discussions on diverse topics and acquire more knowledge.
- **Make sure the scope of the seminars is clear**. Organising similar formats in parallel, with overlapping groups of participants might create confusion and overburden stakeholders. For instance, the relation of the CB seminars to SWG events was not always clear for stakeholders. This is particularly relevant in regions with a limited number of stakeholders in the field.
- **Make use of existing networks and connections**. Good outreach requires tapping into existing actor networks, for instance through other projects, cluster organisations and local action groups.
- **Foresee hands-on support that increases the capacity of regional coordinators to deliver interactive CB & KE seminars.** Written guidance has not been sufficient to build the capacity of regional actors to organise and manage interactive seminars including co-creation approaches. More targeted advisory and hands-on help should be foreseen to increase the capacity of regional coordinators.
- **Organise physical seminars and compliment them with on-line formats**. In some regions, partners faced issues with event fatigue amongst stakeholders, especially due to the virtual nature of events (due to COVID-19). This indicates that, while online formats can be useful to reach out to participants that may not have participated otherwise, these formats need to be combined with physical ones.

In general, the workshops appear to have laid a good groundwork for the further involvement of local stakeholders in the bioeconomy. However, the sustainability or durability of these effects is dependent on continuous engagement and coordination efforts by regional partners.

2.2.2 Cross-regional exchange

2.2.2.1 Objectives

The objective of the cross-regional exchange was to facilitate the efficient and effective knowledge transfer on, inter alia, innovative bio-based business models and the design of bioeconomy strategies and roadmaps.

2.2.2.2 Activities

All BE-Rural partners contributed to facilitating knowledge exchange across European regions, through the following activities:

a) three webinars (interregional events);

b) two face-to-face workshops;

c) a mid-term conference;

d) facilitation of a peer group platform;

e) the establishment of a "Network of Knowledge" (NoK, ongoing);

f) a final conference.

Table 8: Aims and contents of the cross-regional activities

Date	Format	Aim/content	Partici-pants
18.03.2020	Webinar	Provide a better understanding of the current situation and plans for further bioeconomy development in each OIP region. Allow all OIP facilitators and their stakeholders to network together and exchange experiences and best practices.	41
16.06.2020	Webinar	Provide a better understanding of the current situation and plans for the future development of the bioeconomy in each OIP region by sharing best practices in the partner regions' bioeconomies.	36
08.09.2020	Mid-term Conference	The objective of the online event was to explore the extent to which the implementation of a bioeconomy concept can leverage the reactivation of regional economies across Europe.	80
28.09.2020	Face-to-face workshop	Facilitate the exchange of knowledge across European regions, beyond the project boundaries, in order to facilitate efficient and effective knowledge transfer and to support the development process of bioeconomy strategies and roadmaps in the OIP regions.	32
16.02.2021	Webinar	Exchange of information on good practices from each region in terms of strategy development processes.	34
01.03.2022	Virtual face-to-face workshop	Share thoughts on some of the project achievements up to now, to exchange experience in the field of the bioeconomy, and to get feedback from the stakeholders and/or other participants about the topics discussed, especially on the role of the Stakeholder Panels – the so-called bioeconomy "ambassadors" in OIPs and on how to increase the impact of the project outputs and streamline them at regional and national level in Bulgaria, Latvia, North Macedonia, Poland and Romania.	54
11.-14.07.2022	Final Conference	The objective of the event was to look back at the activities and outputs of the BE-Rural project, and to discuss how the experiences and lessons learned can inform future initiatives and ongoing policy developments.	40

In total, more than 300 stakeholders were involved in the cross-regional networking and knowledge transfer activities. To ensure that these activities are continued after the project life and lessons learned are taken up by other regions, a Network of Knowledge has been established. The aim of the NoK is to contribute to identifying and disseminating good practices across European regions, and to provide a forum for the exchange of experiences with designing and implementing regional bioeconomy strategies in rural areas. It was formally launched on 30 May 2022 as part of the Romanian Group on Facebook, entitled "Sustainable Development Network Romania", in the framework of a EU Green Week 2022 partner event.

In addition to BE-Rural's partners, other European regions and initiatives (e.g., Biolab Ponent, Osona Biocircular, Inter-Bio Consortium, IND-AGRO-POL cluster) and of other similar EU projects (GoDanubio, BIOEASTsUP) recognised the potential of the NoK for exchanging good practices in the field of bioeconomy and expressed interest in participating in the NoK.

2.2.2.3 Evaluation

The face-to-face workshops contributed to:

- the collection and summary of ideas, exchange of knowledge and information between companies and scientific units from the strategic regions for the project;
- the creation of a network of knowledge and good practices, both between the OIP regions and with participants in other European projects, such as Horizon 2020, Interreg Danube, etc.; and
- an increased emphasis on the role of the cluster approach in the development of innovation in the regions and the creation of new jobs.

Representatives from all BE-Rural regions took part in the workshops. The workshops ensured international visibility (participants not only from EU but also from Mexico Sensata Technologies) and unveiled a framework to participate in activities developed by other European projects in the field of bioeconomy.

On the positive side, the inter-regional seminars

- brought together representatives from different countries, different areas of economy and science;
- showed local stakeholders that their work in the field of bioeconomy can serve as a lesson or inspiration for stakeholders in other countries;
- opened a door to business partnerships and joint activities;
- facilitated the exchange of information about existing policies in individual countries and financial mechanisms in support of the development of the bioeconomy. Feedback from participants indicates that they found the access to new ideas and information and, more broadly, the contacts to people with similar interests across borders, a positive development.

However, there were also challenges:

- the participation of representatives of public authorities from the regions was comparatively weak, which meant that these actors could not contribute to the exchange of ideas and policies for regional development as much as would have been desired.
- the formation of concrete inter-regional business partnerships requires a long-term platform for the development of joint ideas and an actual commitment of funds. These seminars provided only a temporary opportunity to meet and therefore lacked the resources to support long-term relations. Nevertheless, they are indicative of the potential and appetite to develop cross-regional projects and investments.
- regional stakeholders have been able to select and present a regional (best) practice according to broadly set themes. In some cases, this led to the selection of diverse practices, and not necessarily the presence of corresponding experts across regions who could appreciate learning about them or able to reflect on them. As a result, the interaction among participants has been limited.
- the second workshop that was intended to be face-to-face was conducted entirely in an online environment due to COVID-19, which did not allow for more direct and informal contacts between the participants.

2.2.2.4 Lessons learned

- Inter-regional exchanges need to be conceptualised in a way that allows participants to relate their own experiences to the experience of others. This means that topics need to be narrowed down and relevant experts in each region identified and attracted to participate in the exchange.
- Knowledge exchange and best practices are most important tools to facilitate mutual learning processes triggering innovative development processes at the regional level.
- Compared to online meetings, face-to-face meetings are more effective in strengthening intra- and inter-regional cooperation between stakeholders. Also, the novelty of the webinar concept, as outlined in the work plan, was lost in the context of COVID-19. There were also language barriers during the webinars, which prevented stakeholders from engaging in meaningful discussion.
- Regional stakeholders particularly value sharing practical experiences and telling "stories" in more informal settings.

- Participatory approaches increase the level of trust among regional stakeholders, encouraging them to speak out and actively participate in the strategic development process from a bottom-up perspective.
- Inter-regional debates allowed synergic effects and new developments beyond the original scope in each region, widening the understanding of the bioeconomy concept.

2.2.3 Teachers' summer school

2.2.3.1 Objectives

BE-Rural organised a summer school for teachers interested in developing curricula on the bioeconomy. This was in order to facilitate further learning and wider multiplier effects (i.e. reaching a wider audience than those attending individual events).

2.2.3.2 Activities

The summer school was held in English and took place online over three consecutive Tuesdays, on 25 May, 1 June and 8 June 2021. The summer school was promoted via the BE-Rural website which informed interested people that all the attendees would receive a CPD (Continuing Professional Development) certificate. The summer school was jointly run by Elsa João (University of Strathclyde in Glasgow, Scotland) and Rachel Moir (Skills Programme Manager, IBioIC), and featured the participation of two other members of the BE-Rural team and three guest speakers. The University of Strathclyde has a long history of teaching sustainability (since 1992) and has been involved in teaching circular economy and bioeconomy since 2016. The IBioIC connects industry, academia and government with the aim of accelerating new biotechnology processes. Their activities involve innovative initiatives for the development of skills in the bio-based sector.

The topic of each respective day was:

- Day 1: Introduction to the bioeconomy and overview of the bioeconomy educational resources developed by BE-Rural (run by Dr Elsa João, University of Strathclyde).
- Day 2: Bioeconomy of different sectors (e.g. fisheries, agriculture) and how best to integrate bioeconomy teaching in schools in Bulgaria, Latvia, North Macedonia, Poland and Romania (run by Dr. Elsa João, University of Strathclyde).
- Day 3: Developing the industrial biotechnologists of the future: the innovative work of IBioIC with Scottish schools (run by Rachel Moir, Skills Programme Manager, IBioIC).

Although the expectation was that all people would attend all three days, it was also possible for attendees to attend just one or two of the days. The summer school was primarily targeted at teachers in the five OIP regions (Vidzeme and Kurzeme in Latvia; Szczecin and Vistula Lagoons in Poland; Covasna in Romania; Stara Zagora in Bulgaria; and Strumica in North Macedonia), although other attendees were welcome. Due to the COVID-19 pandemic, the summer school was held online using the platform Zoom. Interestingly, the online format increased the opportunity for people to attend. Although the initial plan was for the summer school to only consist of 15-20 teachers, 294 people registered to attend in the end.

Following the summer school, CPD certificates were sent to the people who requested them (151 certificates were emailed). Also, innovatively, the games created as part of the educational materials (João, 2020), were printed and sent to attendees who requested them. In total, 1 Bulgarian, 20 English and 40 Romanian games were sent to participants of the summer school.

Figure 9: Students playing with printed educational material

2.2.3.3 Evaluation

The summer school featured the active participation of more than 100 attendees from 12 countries, including the five main target countries - but also people from Croatia and Slovenia, for example. The summer school had a wide range of educators attending (pre-school, primary school, high school and universities) and all enjoyed and benefitted from it.

At the end of day 3 of the summer school, participants filled out an online survey. The results demonstrate that 97% of the participants who answered the survey were either "very satisfied" or "extremely satisfied" with the summer school overall. The reason for this appreciation was both due to the new material and the way in which it was presented. Attendees mentioned that they liked the speakers, the interactivity, the discussions between participants and enjoyed the experience overall. One person said "the atmosphere was extraordinary!", which is especially impressive given that the summer school was conducted online. Box 1 includes some quotes showing the range of people who benefitted from the summer school.

Box 1: Quotes showing the range of people who benefitted from the summer school

"I was extremely satisfied with the interesting presentations and people who attended this summer school and with the educational tools and information that I learned throughout this course. All of this will help me in the future to improve the quality of my teaching in the school that I work at." (Secondary chemistry teacher, North Macedonia)

"Although I am teaching English as a foreign language, I have found many interesting pieces of information and a lot of ideas to be later applied in my classes or in extracurricular activities." (Secondary English teacher, Romania)

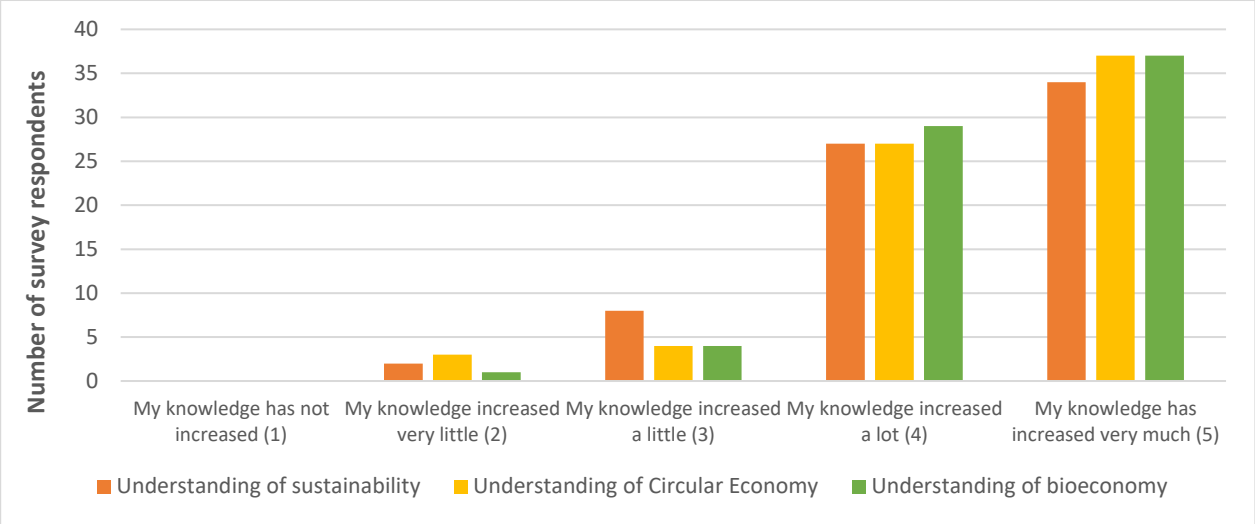
"Extremely satisfied because the course provided me with new ideas and new experiences. It was very useful to me." (Primary school teacher, Romania)

"The provided information was interesting and I liked the presenters' approach." (University Lecturer on Regional Policy and Environmental Economics, Bulgaria)

"Because all the discussions were great, everything that I heard was very interesting, some things were actually very new to me, others were things that I am interested in. I have a big interest in STEM activities, in ecological activities, in bioeconomy, but I feel I can't do very much because I teach in the kindergarten, but I always try, I even developed an optional activity in my class with STEM activities. So, that's why I liked this course very much and the information and ideas from it." (Pre-school teacher, Romania)

Participants were also asked how taking part in the summer school helped them gain a better understanding of what bioeconomy, sustainability and circular economy are. Figure 10 shows that the summer school strongly contributed to the increase of knowledge of the participants in all these areas, with most participants stating either that "my knowledge has increased a lot" or "my knowledge has increased very much". This shows that the summer school increased the capacity of teachers in these areas.

Figure 10: Teachers' summer school – survey responses (1)



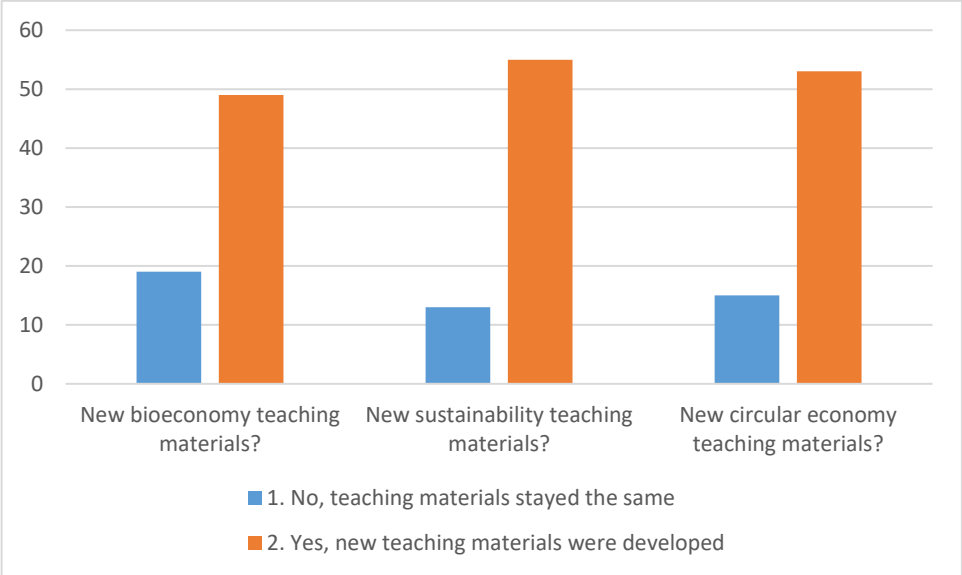
Answer to the question "On a scale from 1 to 5 (where 1 is "my knowledge has not increased" and 5 is "my knowledge has increased very much") has taking part on this summer school helped you to gain a better understanding of what bioeconomy, sustainability and circular economy are?" [n = 71]

The main aim of the summer school was to enthuse participants about the bioeconomy, so participants would be more likely to try integrating bioeconomy teaching in the curriculum. It was therefore good to see that most answered "Yes" when asked if they planned to integrate bioeconomy teaching in their school. Some of the high school teachers said that, in addition to integrating bioeconomy teaching in classes and in extracurricular activities, they would also "present the concept in our teachers' meetings and highlight the benefits", which was a welcome result as it would further spread the message to other teachers and school management.

To find evidence that bioeconomy and sustainability themes were actually integrated in schools' and universities' curricula, a second survey was sent to all summer school attendees in April 2022 asking how the BE-Rural Summer School influenced their teaching. There were 80 responses to this survey.

The 70 teachers were asked: "Did attending the summer school influence development of new teaching materials on bioeconomy, sustainability or circular economy in your school?". The answer to this question is mainly yes, as can be seen in figure 11.

Figure 11: Teachers' summer school – survey responses (2)



Answer to the question of how the summer school influenced development of new teaching materials on bioeconomy, sustainability or circular economy [n=68].

For example, a university lecturer used the printed educational games and stated: "The general impression is that the information is user-friendly, very efficiently comprehended and combines material that, in our case, was known by the students – our group consisted of people from specialties economics, agricultural engineering, veterinary medicine – therefore close to their thematic areas … I could include the games in the discipline 'Planning for sustainable development' and in the master programme 'Bioeconomics and eco-entrepreneurship'".

To summarise the outreach, Table 9 includes a rough estimation of how many pupils/students could have been reached. Most of the impact seems to be with regard to secondary pupils/students, but it is interesting to see that primary school teachers and even preschool teachers have also integrated new materials in their classes (based on the April 2022 survey).

Table 9: Number of teachers who integrated bioeconomy, sustainability and circular economy in teaching materials

	Number added bioeconomy materials	Number added sustainability materials	Number added circular materials	*Estimate number of students (*)*
Preschool teachers	2	2	2	*40*
Primary school teachers	10	12	10	*200*
Secondary school teachers	34	38	38	*680*
University Lecturers	3	3	3	*60*
Total	**49**	**55**	**53**	***980***

(*) As a rough and conservative estimate, if there are 20 pupils/students per class, this is how many pupils/students would benefit from these new materials (using the values for the bioeconomy column).

The teachers were also asked how regularly they taught bioeconomy, sustainability or circular economy before and after taking part on the summer school in June 2021.The results to this question show that, in all cases, the amount of teaching of bioeconomy, sustainability or circular economy has increased after taking part in the summer school.

2.2.3.4 Lessons learned

The summer school was a huge success with a high participation and a substantial uptake of the ideas and material provided. Some lessons learned are:

- It can be summarised that the summer school was an effective way to reach teachers in the five OIP regions. It increased the teaching of bioeconomy, sustainability and circular economy topics in different types of schools and universities.
- The teachers are multipliers on the local ground within communities with a high outreach to different age, social groups, etc. They seemed to be a very good target group to increase knowledge within a wider audience.
- The use of new teaching materials in bioeconomy, sustainability and circular economy has a multiplier effect in terms of the number of pupils/students that it reaches. The careful and attractive preparation and delivery of new educational material for different age groups is a very suitable format to support awareness raising and was worth its relatively resource-intensive development.
- The online format for the teacher summer school was a suitable format to reach a large number of participants from across Europe. The interactivity of the event seemed to be one of the key factors in its success. Through the small group discussions and exchanges during the event, the participants could also engage with the topic in the online format and were motivated to incorporate the new knowledge in their teaching and use the educational material.

- Very importantly, the summer school provided a platform for teachers to discuss how best to integrate the teaching of bioeconomy in their schools. Data resulting from these discussions includes 108 ideas which are listed in João (2021), and many are recommendations for schools.

2.3 Participatory strategy development

2.3.1 Stakeholder Working Group meetings

2.3.1.1 Objectives

BE-Rural's predecessor project BioSTEP showed that there is a need to build in a broad participation in the development of bioeconomy strategies from an early stage (Gerdes & Kiresiewa, 2018). Based on this finding, the aim of the regional Stakeholder Working Groups (SWGs) was to bring stakeholders with diverse backgrounds and affiliations together and support them in the co-creation of the regional bioeconomy strategies and roadmaps throughout the entire policy cycle, namely from the agenda-setting to the monitoring phase of the policy process. By doing this, we were expecting to develop more user-driven strategies reflecting the needs of the local community, to address and create demand for more sustainable, small-scale business models and innovative solutions and to empower regional stakeholders in the implementation of the strategies beyond the project duration.

2.3.1.2 Activities

Designed as a bottom-up approach, the SWGs were facilitated by BE-Rural's regional partners and built upon the following steps: 1) a comprehensive stakeholder mapping exercise, resulting in five regional stakeholder databases; 2) identification and ranking of the stakeholders (155 in total) according to their perceived interest in and influence on the further development of the regional bioeconomy; 3) establishment of the SWGs; 4) facilitation of the SWG activities.

The composition and function of the SWGs varied among the OIPs. While some of the OIP facilitators decided to work with a smaller core team of five to six stakeholders, others have established comprehensive SWGs consisting of 20+ members. In line with BE-Rural's principle of openness and inclusiveness, the SWGs have been established as an open formation, meaning that new stakeholders were able to join the SWG at any time. In Covasna, for example, the SWG started with 7 members and reached 38 members towards the end of the first half of the project.

Table 10 below gives an overview of the number of meetings and SWGs composition for each OIP region.

Table 10: Overview of SWG meetings and stakeholder affiliations

OIP	Number of meetings	Science and academia	Business and industry	Policy and adminis-tration	Civil society
Stara Zagora, Bulgaria	11	10	18	6	9
Covasna, Romania	9	6	14	12	6
Szczecin and Vistula Lagoons, Poland	10	4	16	44	5
Strumica, North Macedonia	4	5	1	20	14

OIP	Number of meetings	Science and academia	Business and industry	Policy and adminis-tration	Civil society
Vidzeme and Kurzeme, Latvia	9	47	42	22	1

The strategy development was based on an extensive analysis of the policy frameworks and the biomass potentials of the regions. In parallel to the analytical work, the stakeholder process was embedded in dedicated capacity-building and knowledge-exchange activities aiming at increasing the capacities of regional/local authorities and stakeholders to design and implement bio-based roadmaps and strategies (Kiresiewa & Gerdes, 2021).

2.3.1.3 Evaluation

Formats applied, topics discussed, mode of discussion

A crucial factor for the success of the SWGs was the motivation of their members. As such, creating ownership among the stakeholders and framing the bioeconomy within the specific regional context turned out to be an important first step. It was, however, challenging to maintain a high level of motivation throughout the project duration. The pandemic and the resulting economic shutdown had - and still has – a significant impact on entrepreneurs and small and medium businesses. Unemployment increased in many of BE-Rural's regions and national and regional governments needed to reallocate public funding to crisis priorities (OECD, 2020). This consequently affected the interest in project-related meetings and activities.

The necessary shift from physical to online meetings also had a significant impact on the SWG's activities. Reaching out to more technology-averse stakeholders turned out to be challenging in the Polish Lagoons despite the efforts to train the stakeholders in the use of digital tools and provide guidance. As such, the collaboration with the members of the SWGs was facilitated through bilateral phone calls leading to less exchange between the stakeholders and opportunities to develop shared visions and priorities. In the Kurzeme and Vidzeme regions, stakeholder responsiveness to events was considerably higher in face-to-face meetings compared to online meetings - especially in the last phase of the project. At the same time, the training BE-Rural provided for the use and implementation of online tools was perceived by stakeholders from Strumica as highly beneficial for their future work (project proposals preparations, realisation of different projects, international communication, and cooperation, even for daily communication and exchanges), in the bioeconomy domain and beyond, short presentations and joint discussions showed positive results during the entire BE-Rural project SWG activities in Strumica. Appreciating each member's time is a valuable asset to remember, so more frequent and shorter meetings are more likely to be effective in order to avoid stakeholder fatigue.

In addition, the stakeholders could not fully benefit from physical cross-regional knowledge exchange and networking, which was particularly important for generating innovative ideas and developing the bioeconomy strategies. The lack of interaction and an informal social atmosphere during the virtual meetings, which are especially relevant for stakeholders with diverse cultural backgrounds, were perceived as an obstacle by some stakeholders. Other stakeholders, however, reported that they were very satisfied with the opportunity to join meetings online without travelling to other places and that these new formats were more productive compared to physical events. It was further mentioned that the mix of physical and online meetings worked very well as it gave different types of people the room to interact in a more comfortable way. Therefore, this increased the diversity of people actively joining the process. Also, it was explicitly mentioned that online meetings made it easier to stay in touch and created opportunities to work together across larger distances, e.g. in the case of Poland and Latvia where two regions in one country were part of the project.

The participation in the SWGs was perceived by the regional stakeholders as very beneficial in terms of generation of knowledge as it helped to systematically connect and use the existing fragmented knowledge in the field of the bioeconomy. Having this more holistic view of the bioeconomy supported the development of the bioeconomy strategies in different ways. For example, the regional strategies cover different sectors and take into account not only the social and economic impacts, but also the ecological effects associated with the outlined actions. Furthermore, the strategies and roadmaps

include a wide spectrum of measures related to business sector development, R&I capacities and activities, use of funding streams, synergies with other policy fields, education and information and international collaboration.

The continuous involvement in the SWG meetings and the capacity-building and knowledge-exchange formats throughout all phases of the strategy development increased stakeholders' understanding of the bioeconomy as a whole and the utilisation of regionally available and underused biomass. This knowledge has been integrated into some of the strategies, outlining measures for the utilisation of underused biomass within the regions, contributing to the establishment of new and innovative value chains or transitions of existing towards more sustainable value chains. The stakeholders also reported that having a similar level of knowledge and sharing common challenges created a common ground during the meetings and contributed to open and transparent discussions.

The importance of meeting on a regular basis was also perceived as very beneficial by the members of the SWG. The different formats used in BE-Rural, e.g. education events, trainings, etc. paved the way for the strategy development. It was important to first convince local actors, e.g. local authorities and businesses, about the benefits for the region. This was done by, for example, exchanges with other regions and real-world examples of successful business ideas. In some of the regions at the beginning of the project, sceptical and less involved local authorities could be convinced to be more active by showing them good practice examples from other regions.

Policy impact

The involvement of policymakers in the SWG activities turned out to be challenging in most of the regions, although at least one representative of the local/regional government was represented in all regions. One of the reasons for this was the lack of personnel resources in the regional authorities, lack of motivation and the fact that, especially in countries with centralised governance systems, regional authorities do not have sufficient power to place topics on the political agenda and to mobilise the required funds. In the case of Strumica, however, only representatives of public authorities participated in the core SWG group. This was perceived as very beneficial by the OIP facilitator as the members of the SWG were familiar with the existing policy framework and potential windows of opportunities to promote bioeconomy development at regional level.

In Covasna, the existing clusters were the main driver for the development of the bioeconomy strategy. Although not specialised as bioeconomy clusters, they are framed around the bioeconomy focusing on the use of natural resources (wood, agri-food resources, etc.) and covering sectors relevant for the bioeconomy such as forestry, agriculture, food & feed production, chemistry and textiles. The shared objectives with BE-Rural, namely to foster local development, which includes job creation, strengthening of competitiveness and environmental protection, enhanced their motivation and connection to the project. Engaging with the clusters and tapping into their networks turned out to be very effective and is also reflected in the high number of stakeholders mobilised in Covasna.

In Stara Zagora, representatives of business organisations in the region, the Agency for Regional Economic Development and the Trakia University actively participated in the SWG. Cooperating in the working group gave them the opportunity to establish closer contacts, exchange ideas to create better conditions for the development of the regional bioeconomy, establish contacts to get to know the potential of the region for the development of the bioeconomy, as well as to spread the already existing good practices in this area. The representatives of Trakia University were particularly active in disseminating information and provoking the interest of young people from the region.

The policy impact generated through the development of a bioeconomy strategy or roadmap differ across regions. In Strumica, for example, real efforts are being made to integrate the strategies developed in the context of BE-Rural in the local development strategy for the communities and to mobilise regional funding for the implementation of the strategies. In Poland and Latvia, the documents deliver concrete input to ongoing policy processes, namely the development of strategies in the context of the new Operational Programme under the European Social Fund (ESF) in the case of the Polish lagoons, and the formulation of strategic development plans in the case of Kurzeme and Vidzeme. In Covasna and Stara Zagora, the roadmap and strategy documents will serve as a key reference for regional stakeholders in their ambition to strengthen the role of the regional bio-based sector as part of related policy developments (Kiresiewa & Gerdes, 2021).

2.3.1.4 Lessons learned

- The stakeholder mapping initiated at the beginning of the project was a useful tool to facilitate the process of setting up the SWGs, to identify gaps within the current stakeholder network and to mobilise stakeholders (e.g., send invitations for events, collect feedback etc.).
- The feedback survey as a tool to get feedback from participants after events turned out to be ineffective and provided very limited feedback regarding the format of the events and mode of discussion. Open-ended questions aimed at getting more qualitative data from the stakeholders remained unanswered in most cases. Furthermore, online events have limitations in providing spaces for informal exchange with participants, which could also yield useful feedback regarding the events.
- Involving stakeholders at the beginning of the project is important to create trust and allow them to co-develop outcomes. As such, the co-creation and participatory approaches in BE-Rural were employed at the beginning of the project. It was, however, challenging to keep the stakeholders motivated and interested throughout the project duration and beyond. To prevent stakeholder fatigue, the OIP facilitators stressed the benefits of the bioeconomy strategies and roadmaps for regional development giving concrete examples of technology options and business models applicable for the specific regional context. An additional aspect which may have led to engagement fatigue is that the members of the SWG were approached through different participatory elements of the project, asked to take part in the CB and KE seminars and asked to fill out questionnaires and provide inputs in the pop-up stores. The number of activities might have reached their time limitations. A good mix of events, coupling activities with larger events, implementing events alongside parallel projects/processes and an early planning for the timeline of different engagement activities (e.g. in an engagement strategy per stakeholder (group) could be helpful during future projects.
- Building on and strengthening existing networks (e.g. clusters) turned out to be an important step towards the establishment of the SWGs in some of the regions. For example, the LAGs can be a good channel to involve less influential stakeholders.
- In some regions where national and regional policies are based on public consultation and stakeholders are familiar with bottom-up approaches, it is easier to mobilise stakeholders.
- In some regions, representatives of public authorities have not taken an active part in the SWGs and in the project activities in general. To some extent, this was related to the pandemic and the changed regime of work. Our experiences showed that public authorities are usually more actively involved in conferences and exhibitions where they can be seen and interact with a wider range of people, as well as when already prepared strategic documents are being discussed, but it is challenging to involve them in co-creation processes.
- In other regions, the SWG only included representatives of public authorities. This was perceived by the OIP facilitator as very beneficial for several reasons. Firstly, representatives of public authorities are familiar with the existing policy framework and aware of most past and upcoming legal issues regarding the bioeconomy. Many of them are also members of different NGOs or run their own business and thus bring the perspectives of the business and CSO sector into the process. Lastly, many of these stakeholders have an extensive network, which they can easily mobilise.
- A mix of physical and online meetings was seen as beneficial and was indicated as a possibility to take up in future projects and activities.
- Framing of the strategy development process and linking it to existing debates at regional level (opportunities for coal regions in transition such as Stara Zagora).
- The inclusion in SWGs of representatives of various organisations of civil society, business, scientific circles and public authorities provides an opportunity to refine the topics that are of significant interest to the region, provide key information on new strategic documents and thus mobilise more stakeholders in project activities.

2.3.2 Business development activites

2.3.2.1 Objectives

The aim of this task was to update and expand a previous analysis of market conditions in the five BE-Rural regions and use this to design small-scale business models for regionally-relevant bio-based innovations. The task was conceived and executed as a capacity-building exercise in which the facilitators of BE-Rural's OIPs worked together with bioeconomy entrepreneurs and other regional stakeholders to conceive suitable, locally-adapted business models and explore their market potential. The purpose of this approach was to confront project partners and selected innovators with a) business development concepts and tools they were largely unfamiliar with before, and b) a focused, collaborative and iterative method to analyse market conditions and develop a business model. By doing so, the task aimed to contribute to building capacity in the regions that would last beyond the project's lifetime. The wide analysis of market needs and conditions in BE-Rural's regions included reviews of biomass streams, suitable technologies and enabling factors. It was meant to provide an impulse and guidance for the business model design process.

2.3.2.2 Activities

The business development tasks in BE-Rural comprised the following steps:

- Updating and exploiting the information produced during the first year of the project (on macro-environmental conditions, technology options and biomass potentials);
- Preparing a briefing paper on market assessment and business model design to instruct the OIP facilitators and the members of the SWGs who would participate in such activities;
- Conducting a two-day training for OIP facilitators and supporting partners on the BRIGAID Market Analysis Framework (maf.brigaid.eu) and the assessment procedure;
- Setting up a team in each of the OIPs to engage in the business development activities (referred to from here on as Task Force on Market Assessment and Business Model Design, or simply Task Force);
- Conducting a market analysis and identifying promising business opportunities;
- Elaborating a Business Model Canvas for each of the business ideas that emerged;
- Reflecting on the lessons learned from running the assessments and reviewing their results to generate inputs for the regional bioeconomy strategy and road map documents that followed.

As a result of the activities listed above, small-scale business models for the following bio-based ideas have been devised: 1) Sustainable Energy Communities from Covasna, Romania 2) Mycelium-based Packaging and Insulation Material from Strumica, North Macedonia, 3) Wood Wool from Vidzeme, Latvia, 4) A slow tourism concept underpinned by low-value fish species in the Szczecin Lagoon and the Vistula Lagoon, Poland, 5) Cold-pressed Grape Seed Oil from Stara Zagora, Bulgaria.

Table 11: Overview of the Task Forces

OIP	Stakeholders involved in the Task Force (OIP facilitators + external stakeholders)
Stara Zagora, Bulgaria	3
Covasna, Romania	5
Polish Lagoons, Poland	6
Strumica, North Macedonia	3
Vidzeme and Kurzeme, Latvia	3

2.3.2.3 Evaluation

The business development task supported business owners in all OIP regions. All OIPs identified entrepreneurs with interesting ideas for bio-based products and services for which better informed business models were elaborated and market potential was evaluated. The work within the Task Forces engaged bioeconomy entrepreneurs in direct collaboration with other stakeholders and experts from their region and endowed them with new or enhanced abilities to work more strategically in the future perspectives of their bioeconomy business idea. The processes were successful in supporting the business owners in getting a better overview of the potential of their business idea – even if Task Forces were not as diversely constituted as originally planned.

Many OIP regions found it challenging to identify and select business ideas for their regions at the beginning of the task. These might have been influenced by the lack of knowledge about the used BRIGAID tool and its potential. The process could also have been started earlier in the project by compiling a long list of business ideas and the entrepreneurs behind them. This could have helped to overcome the inertia faced at the start of the task in this regard.

Regarding the methodological framework used (the MAF+), the group judged it to be suitable for the type of innovations being explored, as it is well-structured and can be used by stakeholders and innovators without a background in business. The two-day online training on the methodology and the process given to all OIP facilitators before the start of the assessments was deemed simple, helpful and very well structured. This is confirmed by the fact that one of the OIP facilitators decided to work independently (primarily to avoid language barrier issues) and managed to provide a very good first draft of the assessment.

Regarding the implementation of local/regional adapted bio-based business models in BE-Rural's regions, the main barriers mentioned by the OIP facilitators are:

- Higher product prices, lack of information about bio-based products
- Little or no experience in financing bio-based business models. Insufficient and not easily available funding opportunities for new business. Banks are not willing to provide financial support for new and 'risky' business (which is what bio-based business is usually considered).
- Lack of good practice examples of successful bio-based businesses in the region.
- Lack of sufficient financial support for the development of production capacity, for investments in equipment.
- Little or no collaboration of key stakeholders. Lack of initiatives among individual producers for joint actions that lead to increased competitiveness on the international market.
- Rural exodus, difficulties in hiring trained and experienced staff.
- Not enough awareness of bioeconomy concepts and value chains, synergies, etc.
- Fear of failure.
- Language barrier in case of foreign cooperation.
- Lack of connections or stakeholder network to promote and support the business model.
- Lacking or difficult-to-access statistical information on a regional basis
- Unless there is a funding scheme available and accessible, the overall political and economic circumstances represent a drawback for new business models development when entrepreneurs are preoccupied with keeping their business alive

2.3.2.4 Lessons learned

- Changing/adopting new business models is very difficult and perceived as risky; no capital appears to be available for new business models in the context of rural regions.
- Increasing the chances of market uptake of bio-based products and services is easier when these are developed to address real needs and market demand and not only to provide a bio-based alternative to existing fossil-based products. Adopting user-centric product development will take bioeconomy entrepreneurs to the next level and could reduce the perceived risk of investment in their endeavours. In turn, all this requires a better understanding of the target regions, their macro-

environmental conditions, the business opportunities emerging from them, and the specific target groups to be addressed.

- Entrepreneurial activity is underway in BE-Rural's regions, often as disconnected, independent, small-scale initiatives in regions more dependent on tourism and leisure economies, and better connected and more dynamic where educational centres, industry clusters and SME associations exist. Moving forward, it will be important for innovation support service programmes to distinguish between these different types of entrepreneurs, the scale of their businesses, and their specific needs and tailor their offer, incentives and conditions accordingly.
- Both the structured market assessment and business model design framework, and the collaborative, iterative and incremental process were well received, considered useful to build capacity, and are also applicable in a rural context.
- The ambition of engaging a broader range of regional stakeholders in a co-creative business model design process was not met. This may have been partly due to specific circumstances that emerged during the project's lifetime (e.g. the pandemic), but it may also have been an unrealistic aim given the lack of clear incentives (monetary or other) to commit the necessary time and effort.

3 Conclusions

BE-Rural aimed at enabling public sector organisations to establish supportive framework conditions for the development of bio-based sectors in their regions. To this end, the project's conceptual framework defined four key principles for relevant activities to build on: co-creation, openness and inclusiveness, sustainability, and transparency. On this basis, BE-Rural designed and implemented stakeholder engagement processes in five focal regions across Europe, which should facilitate the participatory development of regional bioeconomy strategies or roadmaps. While the respective activities were guided by a common conceptual framework, BE-Rural's local partners, acting as facilitators of these processes, were able to adapt the conceptual framework to local conditions and requirements.

A specific feature of BE-Rural was that it could not build on existing bioeconomy networks or partnerships within the regions, as the regional bio-based sectors were not yet developed and bio-based activities and potentials were generally not considered to be a priority among local actors. Thus, BE-Rural's activities started with a comprehensive stakeholder mapping, which identified relevant stakeholders and ranked them according to their perceived interest in and influence on the regional bioeconomy. The stakeholder mapping was not limited to the usual suspects – the so-called triple helix, consisting of actors from business, science and policy – but also aimed at identifying civil society organisations and other relevant actors which might be affected by bio-based developments in the region.

This approach – basically starting from scratch, with stakeholders having limited or no knowledge about the bioeconomy, its potentials and challenges – required BE-Rural to develop and implement activities that provided stakeholders and the general public with information and knowledge about the bioeconomy, thereby enabling them to contribute to informed discussions about future bio-based development pathways. To this end, BE-Rural organised physical and virtual bio-based pop-up stores showcasing bio-based products as well as a series of educational events in schools and universities. Seminars were organised that provided opportunities for knowledge exchange and capacity building among regional stakeholders. These were complemented by a teachers' summer school, a research and innovation capacity-building workshop, and several cross-regional stakeholder exchanges. Combined, these activities provided the foundation for the participatory development of regional strategy and roadmap documents, as well as for the elaboration of small-scale bio-based business models in collaboration with local entrepreneurs.

The strategy and roadmap documents that were developed for Covasna (Romania), Stara Zagora (Bulgaria), Strumica (North Macedonia), Vidzeme and Kurzeme (Latvia) and the Szczecin and Vistula Lagoons (Poland) represent key outputs of the project, which can serve as a basis for the further development of the regional bio-based sectors. In some of the regions, the strategies and roadmaps will inform and feed into concrete policy processes, such as the development of rural development

plans in the case of Vidzeme and Kurzeme, the update of the FLAGs' local development strategies in the case of the Polish lagoons, and the identification of opportunities for coal regions in transition in the case of Stara Zagora.

While all five OIPs managed to develop region-specific bioeconomy strategies and roadmaps, their approaches to realise this objective differed. This relates to the implementation of the project's conceptual framework and of BE-Rural's four key principles of participatory strategy and roadmap development. The focal regions covered by the project do not only feature different socio-economic and ecological conditions – they also showcased different participatory cultures, which impacted the organisation and implementation of the regional stakeholder processes. This can, in part, be related to the lack of participatory traditions as a result of the Communist Era, and to the fact that certain stakeholder groups (e.g. primary producers in the case of Bulgaria) are still sceptical towards 'cooperative approaches', e.g. as part of a bottom-up strategy or roadmap development process. In most of the OIPs, however, the opportunity to collaborate jointly on the development of a common vision for the biobased sectors has been embraced by the stakeholders, showing that participatory cultures develop over time. It needs to be pointed out, however, that across all OIPs, the facilitators played a key role in the practical organisation of the processes, the provision of knowledge and expertise, and the formulation of the strategy and roadmap documents. Thus, one must note that a bottom-up process as it has been designed in BE-Rural requires individuals or organisations that take on a leadership role, mobilising stakeholders and providing concrete guidance regarding potential development pathways.

In addition to the participatory culture in a region or country, the structure of a country's governmental system is a decisive factor which determines the potentials of a bottom-up approach to the development of the regional bio-based sector. This has also impacted the work in BE-Rural. While multi-level-governance concepts prevail in most European countries, there are countries, particularly in Central and Eastern Europe (CEE), where decisions are centralised, i.e. made by the national government, leaving limited room for regions to shape their own development pathways. In the case of the Stara Zagora OIP, for instance, this limited the interest of regional authorities to actively engage in the strategy development process. Overall, however, experiences in BE-Rural showed that regional actors in CEE countries have gained importance when it comes to the elaboration of regional and rural development strategies, particularly in relation to the development of the bio-based sector.

BE-Rural recognised the importance of integrating gender aspects into rural development plans and specifically addressed the involvement of women in the project activities in its conceptual framework. Although not part of the initial work plan, the project ambition was to identify women's specific needs and interests and integrate them into the bioeconomy strategies and roadmaps. However, this turned out to be challenging for various reasons. First, collecting a sufficient amount feedback from the general public to determine the interests of specific societal groups was very difficult (see section 2.3). Second, in some of the OIPs, positions in the business sector and/or in public authorities are traditionally occupied by men, which makes the involvement of women in the project activities (e.g. as members of SWGs, participants in seminars dedicated to policymakers or business representatives) difficult. Despite these limitations, ensuring a balanced gender representation in the project activities was not a major issue as other domains - such as academia and civil society - turned out to be dominated by women.

Furthermore, the individual stakeholder processes in BE-Rural relied mainly on the involvement of existing networks, including clusters and local action groups. Going beyond these existing networks proved to be difficult, as it usually involves additional efforts and limited visible effects, as well as the general risk of taking too much attention away from the main focus of the project. With regard to marginalised groups, involving them in the project activities was challenging as these groups usually do not actively participate in the political decision-making process and are often socially isolated. There was also a common lack of understanding among the project team about who the marginalised groups in BE-Rural's focal regions are. In sum, the confined resources that were available to BE-Rural to implement its work plan did not allow for a more profound analysis and consideration of the above-mentioned issues. To effectively involve women and vulnerable groups in the project activities and identify and integrate their voices, there is a need for Communication and Support Actions (CSA projects), which are dedicated to identifying tools for engaging appropriately diverse perspectives of different societal groups and ensuring their adequate representation.

Regarding the sustainability aspect, the explicit aim of BE-Rural was to contribute to Priority 3 of the EU Bioeconomy Strategy: 'Understand the ecological boundaries of the bioeconomy'. More specifically, the objective was to discuss potential socio-economic and environmental trade-offs with the regional stakeholders, and to convey the message that the development of rural bioeconomies should not put the functioning of the local ecological systems at risk. Consequently, the environmental sustainability dimension was taken up in selected knowledge-exchange and capacity-building seminars, as well as in the educational events and the teachers' summer school. In general, one can hold that stakeholders were aware of the negative environmental impacts which increased biomass production and intensified agricultural practices might bring along. However, clear statements on whether a certain bio-based product or process should not be considered – due to the potentially negative environmental impacts it might have – were not reported. In the frame of the strategy and roadmap development processes, broader discussions on the sustainability of the bioeconomy did not take place. This can most likely be attributed to the fact that the lack of statistical data at the regional level prevents stakeholders from conducting reliable assessments of – and have informed discussions on – the state of the ecological systems, as well as the potential environmental impacts of increased bio-based activities.

Several challenges concerning the availability of robust data at the regional level have crystallised during the project implementation. Among the most urgent challenges facing the regional stakeholders in Stara Zagora is, for example, the lack of information about the existing collection practices and technical possibilities for collecting field residues, about the necessary residual mass to meet the criteria for sustainability (e.g. prevention of soil erosion), and about how much of the residual biomass is used for farm animal feed. In response to these challenges, BE-Rural has developed and piloted a *sustainability screening for regional bioeconomy strategies* as part of an exploratory task (Anzaldua et al., 2022), which will be taken up in future initiatives (e.g. the upcoming Horizon Europe project SCALE-UP).

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