POWER4BIO
REGIONS FOR BIOECONOMY

Summary report of the cross-visits

Deliverable 6.1

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Draft 3	08/03/2021	Second draft reviewed	CIRCE, NAIK
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Table 2: Document History

PROJECT PARTNERS

CIRCE: Fundación CIRCE Centro de Investigación de Recursos y Consumos Energéticos

DBFZ: DBFZ DEUTSCHES BIOMASSEFORSCHUNGSZENTRUM GEMEINNUETZIGE GMBH

WR: STICHTING WAGENINGEN RESEARCH

META: META GROUP SRL

NAIK (former: AKI): NEMZETI AGRARKUTATASI ES INNOVACIOSKOZPONT

NAK: MAGYAR AGRAR-, ELELMISZERGAZDASAGI ES VIDEKFEJLESZTESI KAMARA

EPC: EPC Project Corporation Climate. Sustainability. Communications. mbH

DRAXIS: DRAXIS ENVIRONMENTAL S.A.

BZN: Bay Zoltán Nonprofit Ltd. for Applied Research

UNFU: Ukrainian National Forestry University

CAGPDS (former CAPDER): Junta de Andalucía – Consejería de Agricultura, Ganadería, Pesca y Desarrollo Sostenible

MAE: Mazovia Energy Agency

USB: University of South Bohemia

CCB: Chemie Cluster Bayern GMBH

SPRING: Sustainable Processes and Resources for Innovation and National Growth

EWI: VLAAMS GEWEST (Government of Flanders)

SUA: Slovak University of Agriculture in Nitra

ECRN: European Chemical Regions Network (ECRN) e.V.

PUBLISHABLE SUMMARY

In pursuit for transformative development and advanced progress towards an "Organic Europe" established on a strongly biomass based economy, the POWER4BIO consortium initiated cross-country fact finding on the current situation of biomass across regions In line with the project's goals, the regions developed its operational framework for the cross-visits under the supervision of the consortium with the aim of reaching out to a wide range of stakeholders for ease smooth bioeconomy adoption and transition across Europe. To expand the societal reach on the benefits and future potentials behind a bio-based economy, the consortium adopted the highly successful methodology used by the H2020 project 'Agri-spin' to mutually monitor regional progress and knowledge exchange. This was achieved by organizing 10 cross-visits in 10 regions which brought together different multi-actor groups (policy makers, practitioners, and academics) across each of the region. **1 897 stakeholders were reached (it is equal 847 participants in total) during the different module of 10 cross-visits organized within the POWER4BIO Project.**

The cross-visits were organized with the theme of identifying and categorizing the current best practices, the relevant innovations, technologies and knowledges, and the nature of the multi-actor networks existing across the region and how they can spur the local region to capitalize on biomass and side-stream resources available. To realize the objectives, the cross-visits deliberations were organised based on 8 modules cutting across through the regional availability and use of resources, the infrastructural and industrial factors, Research and innovation, bioeconomy funding possibilities, Market/Economic aspects, transition towards bioeconomy, Public and institutional support/Governance/Policy framework, and the Social and environmental aspects. Due to the Covid-19 Pandemic disruption and limitation of cross border travelling, only 40% of the meetings were organised physically whereas the remaining 60% was organised virtually. The methodology, adapted to the challenges out of compulsion, worked well all in all. The results of the project reached a wider audience due to the exploitation of online opportunities. According to the feedbacks of participants, both personal and online cross-visits were successful, meaningful, and interesting and easy to follow. Cross-visits organized as a stand-alone event provided, however, more results than those integrated into a larger event or organized as a side event.

As intensive, multilateral cross-fertilisation and an experience exchange between the different participant regions are key success factors for the development and future implementation of their bioeconomy strategies all regions contributed with great enthusiasm to this process, even those without established bioeconomy strategies and bioeconomy-based industries. In line with the results of the deliverable on D2.2 *key performance indicators to evaluate regional bioeconomies* the status of the bioeconomies in the 10 POWER4BIO regions were assessed by means of a SWOT-analysis in order to help the work of the regions in developing their regional bioeconomy strategies. The results of the SWOT-analysis were used in the deliverable on D5.3 *the summaries of 5 new regional bioeconomy strategies* to survey the regional biomass-based economy. Furthermore, the results obtained during the cross-visits provided the basis for the preparation of the D6.2 *report with the most promising paths and areas of cooperation for regions*, which aimed to encourage the cross-border cooperation between Central and Eastern European regions.

In general, based on the outcomes of the cross-visits, all the regions reported that there is a strong resource base for bioeconomy coupled with increasing advancement in technological development which strengthens the existence of a Biobased economy. Although there is strong resource base and

future potential markets, it was discovered that the policy coherence on the implementation of the bioeconomy strategies needs to be strengthened including the coherence with the EU Green. Future prospects on Bioeconomy potential can be banked on the fast-growing trend of environmentally aware society to promote clean and sustainable development. This path calls for increased diversification and solidification of the multi-actor approach and increasing knowledge sharing on the importance of Bio-economy.

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1 INTRODUCTION

Intensive, multilateral cross-fertilisation and an experience exchange between the different participant regions are key success factors for the development and future implementation of their bioeconomy strategies. All regions contributed to this process during the ten cross-visits organizing in POWER4BIO Project, even those without established bioeconomy strategies and bioeconomy-based industries.

The main objective of the task 6. in POWER4BIO Project was to increase the capacity and knowledge of the most relevant regional bioeconomy stakeholders (from public authorities to industry and research and academia) by mentoring through presentation and exchange of experiences between regions, especially from more advanced to less advanced regions.

Considering the objectives of the project, 10 cross-visits were organized under the auspices of the POWER4BIO Project. Four out of the 10 cross-visits were organised as a face-to-face meeting, while 6 were online due to COVID-19 pandemic.

Name of partner	1. cross-visit	2. cross-visit	3. cross-visit	4. cross-visit	Online cross-visits because of the COVID-19 pandemic	5. cross-visit	6. cross-visit	7. cross-visit	8. cross-visit	9. cross-visit	10. cross-visit
CAPDER (Spain)									20-21. 10. 2020		
MAE (Poland)											20-21. 01. 2021
DBFZ (Germany)							23-24. 06.2020				
USB (Czech Republic)										30.11. - 01.12. 2020	
SUA (Slovakia)								23-24. 09. 2020			
SPRING (Italy)		2-4. 09. 2019									
CCB (Germany)			21-22.01.2020								
EWI (Belgium)				20-21.02.2020							
UNFU (Ukraine)						19.05.2020					
BZN (Hungary)	25-26. 09. 2019										

The cross-visits contributed to the achievement of the project objectives. The training programs (6.3. Task) were organized partly embedded in the cross-visits, and these events also contributed to the dissemination of the results of the project (D 3.3; 3.4; 4.2).

Using the experience gained from 10 cross-visits, a conference called Bioeconomy Innovation Week will be held in the last month of the POWER4BIO Project within the WP7.

1.1 Methodology

A series of 10 cross-visits (one in each participant region) that employ the highly successful methodology used by the H2020 project AgriSpin supported the knowledge exchange and mutual mentoring among the regions. Multi-actor groups (policy makers, practitioners and academics) composed of a representative of each region visited each of the other region in the project in person or virtually (online) to see and discuss practical examples of bioeconomy implementation.

The two-day long regional cross-visits provided an opportunity to share and discuss the experiences of the stakeholders related to the bioeconomy, and to identify the main sectors at the regional level where development or improvement could be assisted by the Power4Bio Project. The members of the Community of Interest could be involved in the planning of the cross-visits.

The main objectives of the cross-visits were to:

- Identify and categorize current best practices in a broad range of host regions.
- Identify relevant innovations, technologies and knowledge that could potentially enable their own local actors to capitalize on the biomass and side-streams resources available in their region.
- Identify the types of interested parties that should participate in the regional multi-actor network needed for sharing knowledge, information and experiences for formulating a regional bioeconomy strategy.
- Identify needs and barriers for developing the bioeconomy in the regions.

Implementing steps of cross-visits were as follows:

- Kick-off (In-depth discussion of region-specific issues)
- Field visits
- Reflections (Discussion of pre-defined thematic issues)
- Preparation of Feedback
- Social activity (Establishing of network which continue after the project)
- Symposium (Participation of decision makers and key actors are invited)

All modules had to be included into each cross-visit programme, but partners could change the order if it was necessary, especially if the event had to be organized online. Project partners were in each case kindly reminded that before circulating the final agenda among the stakeholders, the representatives of the regions should have contacted AKI by email (power4bio@aki.gov.hu). The host regions provided solutions for overcoming the language issues that emerged during the cross-visits.

The Agenda – i.e. the content of each module – was created by the regions themselves. It was a great effort on their behalf to find, select and invite the most interested speakers. In each case it proved to be a definitely time-consuming activity to involve both the adequate speakers and the target audience.

MODULE 1: Introduction and orientation (approx. 60- 90 minutes)

In a meeting room (e.g. a hotel's conference room or a meeting room of a host company) /online

- Introduction of the regional host partner (10-15 minutes with ppt slides)
    - Why did they join the consortium?
    - How do they interpret the Power4Bio Project itself?
    - What results/impacts do they expect from the Power4Bio Project, and how do they think this Project could contribute to the development of the regional/local bioeconomy?
- Getting acquainted – very brief introduction of the participants (40-60 minutes)
    - Participants:
        - Colleagues from the Power4Bio Project partner organisations
        - Key actors from the host region (min. 15 persons) – farmers, business companies, associations, research institutes, etc.
        - Policy makers from the host region/country (min. 2-3 persons)
- Getting oriented (10-15 minutes)
    - Introduction of the host farm/business company/association, etc. (10-15 minutes with ppt slides)
        - How do they interpret the bioeconomy?
        - Are they members of the Community if Interest (CoI)? If yes, what do they expect from the Power4Bio Project?

MODULE 2: Group work for developing or improving the regional bioeconomy

Timing (5*10 minutes and 5*3 minutes to present the main conclusions of the Discussion Groups)

Five out of the eight themes listed below had to be selected and five parallel Discussion Groups had to be organized around five tables where all participants and regional CoI members were invited to share experiences and ideas. All stakeholders, policy and academic experts, project partners and other visitors had the opportunity to discuss the following topics based on the experiences of the e-conference and WP.2.1, WP 2.2 and WP2.3.:

- Availability and use of resources
- Infrastructure and industrial factors
- Research and innovation
- Funding
- Market/Economic aspects
- Transition towards bioeconomy
- Public and institutional support/Governance/Policy framework
- Social and environmental aspects

MODULE 3: Field visits (min. 2 visits within the time available with approx. 90-120 minutes for each visit) with project partners and stakeholders

- Tour to farm/enterprise/industry in person or virtually
- Description of activities (technologies, networks, etc.)
- Questions & answers session

MODULE 4: Feedback session and wrapping up the discussion on the recommendations, including the results of the field visits and group works (approx. 20-30 minutes)

- Reflections on the day/days
    - Summary of the observations and the group discussions (0,5 page/categories below)

- Identification and categorization of current best practices
- Identification of relevant innovations, technologies, knowledge and
- Identification of types of interested parties
- Identification of needs and barriers for further developing the bioeconomy

MODUL 5: Symposium (approx.. 180-200 minutes)

- The remaining/ unselected 3 themes from the Module 2 had to be integrated into the symposium programme. If the regional partners decided not to include all themes in the programme of cross-visit they gave sufficient reasons why.
- Existing public deliverables of POWER4BIO (published on the website) were introduced to the audience by the help of WP leaders (who seem these useful? what would be used for? etc.)
- Participants (min. 30-50 persons)
    - Colleagues from the Power4Bio Project partner organisations (1-2 person(s)/organisation)
    - Key actors in the host region/country (10-15 persons) – business companies, associations, research institutes, etc.
    - Policy makers in the host region/country (4-5 persons)
    - Key actors / policy makers from any Power4Bio or neighbouring regions (5-15 persons)
- Questions & answers session (e.g. https://www.menti.com/ or https://padlet.com/ could be used)

MODULE 6: Social event (60-120 minutes)

- Building networks (e.g. cultural events, gastronomy, etc.)
- Organized during the day or in the evening.

DELIVERABLES OF THE CROSS-VISITS:

- Detailed report of each cross-visit (due date: 2 weeks after each cross-visit) prepared in close collaboration with AKI.
- Photo and video reports of each cross-visit
- Describe how the CoI members have been involved (1 page) in the cross-visits.

2 CROSS-VISITS

2.1 Southern Great Plain (Event organisers: BZN)

The first POWER4BIO cross visit took place in Hungary, on 25-26 September 2019. Altogether, more than 50 experts participated, including Hungarian stakeholders and the representatives of the 10 regions of the POWER4BIO project. The main organiser of the event was the Bay Zoltán Nonprofit Ltd., representative of the Southern Great Plain region. The conference program can be found at the following link.

The visit started with a half-day "future thinking" workshop, where participants were triggered to visualise their ideal world from a bioeconomy perspective while putting into consideration research, society, political and business sectors. During the afternoon session, a field visit was organised to the Pilze-Nagy Ltd. in Kecskemét Where visitors were introduced on how the biomass can be utilized for mushroom production and in biogas plants. The first day culminated with a networking event at Lajosmizse.

The second day of the visit took place in Budapest on the framework of the National Agriculture and Food Exhibition and Fair. Three companies, active in the field of bioeconomy, were visited: Herbária Zrt, Tungsram and Grapoila/Virgin Oil Press Kft. In the afternoon, the "Vision and collaboration opportunities of bioeconomy-related organisations" symposium was organised. First, the Hungarian Bioeconomy Cluster was introduced by Ákos Koós, representative of Bay Zoltán Nonprofit Ltd. Then, Dr Dries Maes (Administration of the Flemish Region, Department of Economics, Science and Innovation) talked about the policy conflicts for the bioeconomy. The Bioeconomy Group of the Hungarian Agricultural Chamber was introduced by Dr Adrienn Nagy where she presented some good practices of the Hungarian bioeconomy. The representative of Ministry of Agriculture, Ákos Kristóf discussed about SCAR-AKIS and BIOEAST. The last presentation was given by the Ministry of Innovation and Technology representative, Dr Barbara Botos, where he expounded on the possible connections between bioeconomy and climate policy. To synthesise on the discussion outcomes, a round table panel on the importance of bioeconomy in Hungary as well as the good field practices chaired by Dr Nora Hatvani (Research fellow at Bay Zoltán Nonprofit Ltd) and the presenters concluded the event.

2.1.1 Module 1

The Module 1 "Kick off" was held in Budapest at the Aquincum Hotel, Árpád Fejedelem útja 94 where **35 attendees** from 23 consortia partners were present. The business stakeholders were majority of the attendees with 20 participants followed by the researchers and policymakers with 13 and 2 participants, respectively. Although there was no participant from the CoI, in some instances, a participant could be accounted for, in more than one category. The Kick-off started with a short introduction presented by Katalin Kalai and Ákos Koós from BZN and Dries MAES from EWI. The main goal of this session was to inform the participants on the newly established Hungarian Bioeconomy Cluster (HBC). After the introductions, Ákos Koós presented on the role of BZN in POWER4BIO Project as well as on the vision and aims of the HBC.

2.1.2 Module 2

The venue of Module 2 ”Group work for developing or improving the regional bioeconomy” was held in Budapest, the Aquincum Hotel, Árpád Fejedelem útja 94.

Number of total attendees was 35, number of consortia partners was 23, number of Community of Interest members was 0, number of business stakeholders was 20, number of researchers was 13, number of policy makers was 2. In certain cases, 1 attendee belongs to more than one category.

Title of the module was “Group work – innovation game/ future thinking” moderated by Ákos Koós (BZN). **The main objective** was to find interconnections between environmental, economic, societal, and governmental sectors in an idealistic world of bioeconomy ecosystem. Participants had to highlight the supporting tools that make the system viable and sustainable. By the end of the discussion, they had to find those indicators that are suitable for measuring the system performance. **The methodology** was based on the perfect world imagined by the participants from the bioeconomy point of view. They tried to find the role of bioeconomy in this perfect world, regarding research, society, political and business sectors.

The workshop was based on the results of T2.2. coming from POWER4BIO project, using the identified key factors. Areas were covered within this module were the following:

1) Availability and use of resources
2) Research and innovation
3) Funding
4) Market/Economic aspects
5) Public and institutional support/Governance/Policy framework
6) Social and environmental aspects

Participants received the key indicators beforehand and they were asked to consider these factors when adding something to the discussion.

During the session, **numerous issues** were highlighted in the discussion such us:

- Some participants were very passive, only followed the discussion.
- The chosen method required a holistic approach, but unfortunately it did not appear in the discussion.
- Personal competences and interests were the main motivation of the participants.

The result of this modules was that there was no consensus about the “perfect world” described by the participants. Several approaches were presented, based on the personal preferences of the participants. Many aspects were considered during the task making it difficult to group them into the 4 categories. Indicators are interlinked, usually they are not sector specific. Bioeconomy itself is very diverse, characterised by actors with different background and motivation explain as to why the “perfect world” was imagined in many ways.

2.1.3 Module 3

The third Module themed on “Field visits” was held in Kecskemét by Pilze-Nagy Ltd. and in Budapest during National Agriculture and Food Exhibition and Fair (OMÉK) where the participants could get acquainted with Herbária, Tungsram and Grapoila / Virgin Oil Press companies.

Number of total attendees was 35, number of consortia partners was 23, number of Community of Interest members was 0, number of business stakeholders was 20, number of researchers was 13, number of policy makers was 2. In certain cases, 1 attendee belongs to more than one category.

Pilze-Nagy Ltd. /*TRL 9***/,** *Kecskemét, Hungary*

The main presenters were Dr. Adrienn Nagy, and Tamás Pécsi.

The **main objective** of the visit was to showcase good practices in the field of bioeconomy. Pilze-Nagy Ltd. utilizes biomass in two different ways: **(i)** the company produces own substrate, which is used during their mushroom production. **(ii)** The company uses the biomass remaining during production in its own biogas plant. Some of the energy produced is sold as electricity, while heat energy is also used in their production. The company is more than 20 years old and their technology is proved to be effective.

Herbária, Budapest, Hungary

The main presenter was Petra Kovács.

Participants were able to see a good practice of the Hungarian bioeconomy. Herbária Co. was chosen as a target of the cross visit because it is one of the leading companies in the herbal product sector in Hungary, which was established in 1949. They produce cosmetics and teas by utilizing biomass to produce cosmetics.

Tungsram - Agritech division, Budapest, Hungary

The main presenter was Zoltán Sejpes.

The visit was planned because the company provides and innovative solutions for indoor farming. After a general introduction of the company, the Agritech division was introduced. It was explained why the offered solutions are innovative and what is their added value. The LED-technology applied in indoor farming provides very specific wave lengths to the plants. It facilitates to provide optimal conditions to plants during the growing period.

Grapoila / Virgin Oil Press, Budapest, Hungary

The main presenter was Tamás Varga.

Grapoila / Virgin Oil Press produces oils without any additives or preservatives, through cold pressing, a clean and environmentally friendly “zero waste” technology. The technologies used by Grapoila can be considered as good practice for the bioeconomy. It is because after processing all parts of the raw materials, high value-added products are produced.

2.1.4 Module 4

Venue of Module 4 “Feedback session and wrapping up the discussion on the recommendations based on the field visits and group work” was skipped due to some technical difficulties.

The regional partner planned to use menti.com application for collecting feedbacks from the participants. It provides a real-time platform: participants connect via their mobile phones and answer questions, which appear immediately on a screen. Because of the weak Wi-Fi connection this module was skipped.

2.1.5 Module 5

Venue of Module 5 “Symposium” was organised within National Agriculture and Food Exhibition and Fair (OMÉK) on the third day.

Number of total attendees was 61, number of consortia partners was 18, number of Community of Interest members was 0, number of business stakeholders was 30, number of researchers was 18, number of policy makers was 13. In certain cases, 1 attendee belongs to more than one category.

The main presenters for the meeting were Ákos Koós (BZN), Dr Adrienn Nagy (Chamber of Agriculture/ Pilze-Nagy Ltd.), Ákos Kristóf (Ministry of Agriculture), Dr Barbara Botos (Ministry of Innovation and Technology), Dr Dries Maes (Administration of the Flemish Region, Department of Economics, Science and Innovation) and Dr Nóra Hatvani (BZN).

The **objective** of the symposium was to give the possibility for the most important policy actors in the Hungarian bioeconomy to present their vision and work. Additionally, it was also important to initiate a discussion and common thinking in a roundtable discussion among the panellists.

After the opening speeches, the Hungarian Bioeconomy Cluster was introduced by Ákos Koós followed by, Dr Dries Maes who talked about the policy conflicts in the field of bioeconomy. The Bioeconomy Working Group in the Hungarian Chamber of Agriculture was introduced by Dr Adrienn Nagy where she presented some good practices of the Hungarian bioeconomy. The representative of Ministry of Agriculture, Ákos Kristóf gave an insight in the work of SCAR-AKIS and BIOEAST Initiative. The last presentation was given by the representative of Ministry of Innovation and Technology, Dr Barbara Botos, who showed the possible connection between the bioeconomy and climate policy. After the presentations, a round-table discussion was organised with the panellists. The participants talked about the situation of the bioeconomy in Hungary and its potential.

The **main message** was that Hungary has huge potential in the field of bioeconomy but is still not fully exploited. Several decisions have been taken in Hungary to exploit the biomass-based resources. But these measures are rarely linked, affecting only certain areas. The speakers reiterated that supporting primary use of biomass such as biogas and burning biomass should not be a priority for Hungary. They proposed that the interest of Hungary should be production of high value-added products after biomass processing.
This module provides a good visibility for the Hungarian Bioeconomy Cluster (HBC) therefore several actors (mainly businesses) showed interest to join the cluster. HBC, working as a common platform of stakeholders, facilitates to the communication and collaboration among different stakeholders to boost the Hungarian bioeconomy.

2.1.6 Module 6

Module 6 was the “Social event” including visit of a typical authentic Hungarian restaurant which provides different services for the tourist in the field of bioeconomy.

Number of total attendees was 35, number of consortia partners was 23, number of Community of Interest members was 0, number of business stakeholders was 30, number of researchers was 13, number of policy makers was 2. In certain cases, 1 attendee belongs to more than one category.

The organization went on perfectly and the calm environment contributed to the deepening of the relations between the stakeholders.

2.1.7 Feedbacks (post event survey)

All participants received direct invitation from the regional partners. They highlighted the networking possibilities as the main reason for attending the event. Three respondents answered that they came because of the POWER4BIO project and it results. The event was successful with 35% of the participants rating it as excellent and 57% referring it as very good. Although it was successful, the participants highlighted the lack of enough time to discuss the project results and the summary after the cross-visits as the only bottlenecks of the event.

In terms of event organisation, the participants were highly satisfied with 55% of them describing it as very organised and extremely organised by 45% them. 90% of the participants acknowledged that all the materials necessary for the event were provided in adequate time. Additional information participant shared was the following:" the *organisation was very hospitable and thoughtful; very nice social event – you really thought of something special; the group work could have been better organised and moderated. There are different tools and methods how you can involve all the participants; It gave a very useful introduction in the bioeconomy in Hungary.*"

2.1.8 Main findings of SWOT

This module was integrated after the second cross-visit to explore the needs and provide information to the training module in WP 6.3.

2.2 11 Italian regions (Event organiser: Cluster Spring)

The 2nd POWER4BIO cross-visit took place in Naples, Italy, from the 2nd to the 4th of October 2019. In the afternoon of October 2nd, a dedicated POWER4BIO event presented the status of bioeconomy in different Italian regions, with also the participation of regional representatives. Then, Italian bioeconomy strategy, available technologies in the bioeconomy and bioplastics fields were presented by industrial and academic representatives. The conference program can be found at the following link.

On October 3rd and the morning of October 4th, participants attended to IFIB2019, the International Forum on Industrial Biotechnology and Bioeconomy, co-organized by SPRING, with around 250 participants form 30 different countries represented a leading event on bioeconomy in Europe.

IFIB hosted innovative companies such as LanzaTech, Fater, Novamont, Terravesta, Pirelli and Sulzer, research centers such as National Research Council of Italy, VTT of Finland, Wageningen University and Fiat Automotive Research Center. And then: TEAGASC (Ireland), Frost & Sullivan (UK), European Forest Institute, OECD, Bioeconomy Cluster of Slovakia, Cluster Food+i (Spain), Irish Bioeconomy Foundation and many other world bioeconomy stakeholders, giving to the participants the opportunity to know about different aspects, trends and technologies on bioeconomy in Europe.

On the afternoon of October 4th, a visit to the Novamont R&D center of Piana di Monte Verna was organized. Novamont is the Italian lead company for biodegradable and compostable bioplastic production and for the exploitation of biorefineries integrated to the territories to transform different biomasses in value-added compounds and materials. The PR&D center of Piana di Monte Verna is focused on the development of industrial biotechnologies, such as the transformation of raw materials of renewable origin into molecules of industrial interest thanks to specific metabolic pathways naturally present in microorganisms or suitably engineered.

2.2.1 Module 1

The goals of this module were to support the development of Regional Bieconomy. A total of **28 attendees** from 14 consortia partners were present. , number of Community of Interest members was 0, number of business stakeholders was 9, number of researchers was 1, number of policy makers was 4 In certain cases, 1 attendee belongs to more than one category.

The objective of this module was to give an overview on the methodology for fostering the dialogue with and among regions on bioeconomy in Italy and to introduce the round table of regions. The introduction was hosted by Dr. Raffaele Liberali and Sara Cantone, coordinator of the SPRING working table of Regions on bioeconomy.

2.2.2 Module 2

The title of Module 2 was "Group work for developing or improving the regional bioeconomy especially boosting the regional bioeconomies in POWER4BIO regions".

Number of total **attendees was 28**, number of consortia partners was 14, number of Community of Interest members was 0, number of business stakeholders was 9, number of researchers was 1, number of policy makers was 4 In certain cases, 1 attendee belongs to more than one category.

The **objective** of this module was to give an overview on Italian regions' bioeconomy status , the national bioeconomy strategy and some inputs on bioeconomy-related activities across the country. It was organised in a round-table discussion including Question and Answer session where representatives of the regions were invited.

The **results** of this module were the following:

- From organizational point of view: "less is more", the afternoon should had worked better concentrating only in the round table. The agenda organization was based on the time-availability of regional representatives and of the speakers.
- Looking at the shared information during the round table discussion, at the regional level was quite clear that the main problem is lack of proper internal organization and dedicated expert personnel (difficulty to work in an integrated way among the different directorates). Similarly, difficulty in data collection since they (when present) are scattered among different sources making it harder to involve the stakeholders from primary sectors and the lack of expertise/maturity in part of the industrial sectors (especially SMEs).
- The presentations gave an overview of the national approach to bioeconomy and give an introduction on the main field of bioeconomy development in Italy, that is represented by bioplastics.
- The regions are waiting for the publication of the results of POWER4BIO Project, which can be used to develop the regional strategies.

2.2.3 Module 3

The Module 3 – so called Field visits - was organised in two different places. The participants visited the Novamont R&D center in Piana di Monte Verna, and in Biosphere and Ayron.

Number of total **attendees was 13**, number of consortia partners was 10, number of Community of Interest members was 0, number of business stakeholders was 3, number of researchers was 0, number of policy makers was 0.

Novamont R&D center – Piana di Monte Verna

The host of the field visit was Maria Dani (Responsible of the center) and Eleonora Diaferia – Representative of Novamont.

The **objective** of this first field visit was to give knowledge on the biodegradable and compostable bioplastics production, give information about the biorefinery model of Novamont (self-sustainable biorefinery integrated to the territories)

The **results** of this module were the following:

- Possibility to re-evaluate abandoned farm land to cultivate local, low-demanding vegetables (i.e. cardoon) in order to create biorefineries for the production of bioplastics and added-value compounds for the nutraceutic, cosmetic and chemical industry
- This visit increased the awareness on the possibility that bioeconomy represents not only for industries, but also for territories and farmers.

Biosphere and Ayron

The host of the field visit was Marco Pistocchi.

The objective of this field visit was to give inputs about existing industrial technologies on anaerobic digestion and enzymes fermentation and application in processes.

The **results** of this module were the following:

- Anaerobic digestion can be the "heart" of new biorefineries, where locally available biomass, by-products and waste streams are used for the integrated production of bio-based chemicals, biomaterial, biofuels and renewable energy, in a sustainable way.
- Microbial fermentation is a powerful tool for the bio-based industry, for large scale environmentally friendly production of microroganisms, enzymes, metabolites with a wide range of applications.
- Biocatalysis is a cleaner, safer, and environmentally sound alternative to traditional chemical synthesis.
- The cross-visit gave an insight to the existing technologies running in Italy. It facilitates to the creation of possible collaborations between different realities.

2.2.4 Module 4

The Module 4 was the Feedback session and wrapping up the discussion on the recommendations based on the field visits and group work, which was hosted by Cantona Sara.

Number of total **attendees was 13**, number of consortia partners was 10, number of Community of Interest members was 0, number of business stakeholders was 3, number of researchers was 0, number of policy makers was 0.

The objective of this task was to collect feedback from the participants on the field visits. The main result of the task was to give more awareness on the possibilities and challenges of bio-products.

2.2.5 Module 5

Module 5 was the "Symposium" which was organised within the IFIB – International forum on Industrial Biotechnology and bioeconomy – Conference. The moderators of the different sessions were

Mario Bonaccorso (SPRING); Lucia Gardossi (University of Trieste and SPRING); Gianluca Carenzo (Hub Innovation Trentino and SPRING); David Chiaramonti (University of Florence and SRING); Pasquale Falcone (Unitelma La Sapienza); Fabio Fava (University of Bologna and SPRING); Chris Patermann (former European Commission).

Number of total **attendees was 238**, number of consortia partners was 14, number of Community of Interest members was 0, number of business stakeholders was 95, number of researchers was 105, number of policy makers was 24.

The objective of the module was to give an insight on the different aspects of bioeconomy and give the opportunity for networking.

The symposium has been organized in the following structure Key notes, Bio-based industries, The bio-based economy and the creation of value chains (round table), Energy and environment, Training and education in the circular economy (round table), Agrofood, The role of cities and regions in the circular bioeconomy. IFIB hosted innovative companies such as LanzaTech, Fater, Novamont, Terravesta, Pirelli and Sulzer, research centers such as National Research Council of Italy, VTT of Finland, Wageningen University and Fiat Automotive Research Center. And then: TEAGASC (Ireland), Frost & Sullivan (UK), European Forest Institute, OECD, Bioeconomy Cluster of Slovakia, Cluster Food+i (Spain), Irish Bioeconomy Foundation and many other world bioeconomy stakeholders, giving to the participants the opportunity to know about different aspects, trends and technologies on bioeconomy in Europe. The speakers were from Italy, UK, USA, Brazil, Australia, Greece, Finland, Belgium, Canada, France, Slovakia, Ireland, Netherlands, Switzerland, Germany, Spain, Iceland.

The results of the symposium were that it gave quite big overview on bioeconomy possibilities and technologies in EU and abroad. Different approaches were presented on bioeconomy in different countries, with a major focus on agri-food in some regions (for instance CEE) and a more “industrial-driven” approach in others, that could maybe be useful to “merge” that should interact more.

2.2.6 Module 6

Module 6 was the “Social event” in a typical “pizzeria” of Naples. It helps to foster the networking and dialogue among the participants.

Number of total **attendees was 13**, number of consortia partners was 13.

There were no problems besides budgetary questions. It created a nice opportunity to present more about the host region and to network informally.

2.2.7 Feedbacks (post event survey)

Most of the participants received direct invitation from the POWER4BIO Project. The main reasons for attending this event were to attend presentations and lectures (9+4), to have access to networking (9). The overall rating of the event was excellent (4), very good (11) and good (3). Participants disliked the followings: Catering during IFIB (3), acoustic of IFIB (1), the fact that there were several things at the same time (satellite events on IFIB) (1), last day should be first day (1), more interactive parts needed (2). The event was very organized according to 22 participants and extremely according to 4 people. Prior to the event, all the information that participants needed was provided according to 8 participants.

2.2.8 Main findings of SWOT

This module was integrated after the second cross-visit in order to explore the needs and provide information to the training module in WP 6.3.

2.3 Bavaria (Event organiser: CCB)

The third POWER4BIO cross-visit took place in Bavaria on the 21st and 22nd of January 2020. It was held in Munich and Straubing. On the first day, regional policy makers presented their activities, and a workshop was organized where different aspects of the Bavarian bioeconomy were presented and discussed. For the morning of the second day, a transfer to Straubing was provided, where a bioeconomy forum was held at the Centre of Excellence for Renewable Resources. Regional stakeholders and bio-based start-ups presented their contribution to the Bavarian bioeconomy. In the afternoon, the participants had the opportunity to visit the Centre of Excellence for Renewable Resources as well as the demonstration plant of Clariant Sunliquid®. The conference program can be found at the following link.

2.3.1 Module 1

The venue of Module 1 "Kick off" was Munich, Bavarian Ministry of Economy Affairs, Regional Development and Energy, Prinzregentenstraße 28.

Number of total **attendees was 40**, number of consortia partners was 25, number of Community of Interest members was 3, number of business stakeholders was 13, number of researchers was 17, number of policy makers was 9 and number of others (i.e. cluster) was 7. In certain cases, 1 attendee belongs to more than one category.

The Kick-off was composed of introduction of the Bioeconomy in Bavaria, process and fields of action for developing the Bavarian Bioeconomy strategy; presentation POWER4BIO project and Chemie-Cluster Bayern; aims of the project and the role of bioeconomy within the cluster and "getting acquainted" minutes - short introduction of the participants. Presenters were Dr. Tatjana Nabokin, Bavarian Ministry of Economy Affairs, Regional Development and Energy Laura Kühn, Chemie-Cluster Bayern GmbH. The objective was to give insights about the current processes and involved stakeholders in Bavaria, to provide information about the host, the project and the purpose of the event; to get to know the participants in introductory rounds.

2.3.2 Module 2

The venue of Module 2" Group work for developing or improving the regional bioeconomy" was Munich, Bavarian Ministry of Economy Affairs, Regional Development and Energy, Prinzregentenstraße 28.

Number of total **attendees was 38**, number of consortia partners was 25, number of Community of Interest members was 3, number of business stakeholders was 23, number of researchers was 17, number of policy makers was 7 and number of others (i.e. cluster) was 7. In certain cases 1 attendee belongs to more than one category.

Title of the module was “Interregional knowledge transfer for a successful Bavarian Bioeconomy strategy.” Two parallel work sessions were carried out, one on “Involving society: how to ensure that bioeconomy is well-received by society?” and another one on “Transparency for consumers: what do consumers need for informed decisions?” Moderators were Magdalena Buch, Chemie-Cluster Bayern GmbH Laura Kühn, Chemie-Cluster Bayern GmbH. The objectives were to elaborate methodologies on how to convince society of bioeconomy and specifically incentivise consumption of biobased products; to allow interregional knowledge transfer; and to promote collaboration among participating regions. Nominal Group technique - structured methodology for collecting ideas, summarising and evaluating themes and for the specifying of measures – was used. Problems faced during the group work were mainly the following. In general, there were risks and hurdles in working with interdisciplinary and international groups, for example because of language barriers, constraints, different working and discussion cultures. In particular, the number of participants exceeded the ideal number of people for the method. As a result, the schedule had to be strictly kept and upcoming discussions were avoided. The time to thoroughly develop measures was a little too short. Furthermore, some participants did not seem overly motivated for the workshop. As major takeaways it can be stated that it was a good decision to concentrate on two aspects in detail rather than working on many topics superficially. Despite a bit too many participants, the methodology fitted the objective and the number of people very well. There were concrete results to be presented and everybody was involved in the workshop. The ministry gave the feedback that the results were useful for their ongoing strategy process and there would be a follow-up in the Bavarian bioeconomy strategy team. Recommendations of the CCB team were to have a very specific question/objective someone wants to address and let’s have maximum 15 people per break-out group.

2.3.3 Module 3

The venues of Module 3“Field visits” were Straubing, KoNaRo – Centre of Excellence for Renewable Resources, Schulgasse 18 Straubing and Clariant Produkte Deutschland GmbH, Budapester Str. 2,

Number of total **attendees was 47**, number of consortia partners was 21, number of Community of Interest members was 3, number of business stakeholders was 23, number of researchers was 19, number of policy makers was 5 and number of others (i.e. cluster) was 7. In certain cases, 1 attendee belongs to more than one category.

Field visit to KoNaRo was led by Prof. Dr. Bastian Blombach, TUM Campus Straubing and Nico Arbeck, C.A.R.M.E.N e.V. Dr. Michael Kirchinger, TFZ. Their objective was to give an insight on the different aspects of bioeconomy (research, product development, communication and commercialization) and give the opportunity for networking. The field visit was composed of a lab tour “biotechnology in the bioeconomy”, visit of the exhibition “renewable resources - from plants to utilization” and project presentation: “sprayable material from renewable resources for agricultural applications”. Problems faced during the field visit were that the time at KoNaRo was a bit too short – groups were in a rush and there was not much time for further discussing what was observed. Major takeaways are as follows: KoNaRo is a very interesting melting pot of several aspects of the bioeconomy; research on biodegradability and crop breeding is associated with long time studies and field tests and with engaging the primary sector and there are numerous biobased products in the market. The organizers expected to give input on existing infrastructure, research and developments and possibilities to address bioeconomy for the general public as a role model for other regions. As recommendations, the following

can be cited “1.5h for a field visit is good. The choice of the locations strongly depends on how remote they are and how much additional travel time is needed. You will probably have to make compromises by combining nearby places.”

Field visit to Clariant Produkte Deutschland GmbH was led by Dr. Markus Rarbach. Its objective was to give knowledge on the enzymatic production of bioethanol from straw and the overview of the international market for bioethanol, furthermore, to provide information about the biorefinery concept and the commercialisation of the process. After a presentation of the process and questions & answers, the visit to the demonstration plant took place. At the end of the visit there was room for some other Q&A. The only problem faced was that the high noise level inside the demo plant made it very hard for the participants to hear the explanations of the process steps and the facilities. As major takeaway the following can be summarized:

- Sunliqiud is an entirely new field of business for Clariant, as Clariant is not a plant operator and has never run a biotechnology plant before. The one in Romania will remain an exception. That is why Clariant started licensing the Sunliquid process know-how for future industrial scale plants; and in order to obtain the raw material, completely new types of business relationships with farmers had to be established, which was a completely new way of doing business.

- In the course of lowering GHG emissions and identifying alternative transport solutions, Clariant believes that bioethanol will play a decisive role as biofuel. Especially in the logistics sector, it is a better alternative than e-mobility. Successful tests have already been carried out with fleets of well-known truck manufacturers. Ethanol can be added up to 20% to diesel.

- The chemical-free mechanical and thermal pre-treatment enables an optimal hydrolysis. Purification steps are unnecessary. This creates a safer and more environmentally friendly process.

- Through the process, integrated enzyme production costs can be reduced to a minimum. Enzymes are produced exactly when and where needed, there are no costs for logistics or formulation and no dependence on external suppliers.

- Feedstock and process specific enzymes achieves a more efficient hydrolysis with maximum yields and makes the process flexible for different boundary conditions. Excellent by-product quality. Low sulphur high dry-matter lignin. Vinasse as biogas substrate or organic fertilizer.

- Companies in Slovakia, China and Poland were the first that signed licensing deals for Sunliquid plants in their regions. Estimated impact was to show a first-hand example of how residual agricultural feedstock can be utilized; how new business procedures are developed; how long it takes to develop stable, economic biobased processes; how much money and willingness must be associated with such a project. This could be a role model for other regions with much occurring dry biomass.

2.3.4 Module 4

Venue of Module 4 “Feedback session and wrapping up the discussion on the recommendations based on the field visits and group work” was Munich, Bavarian Ministry of Economy Affairs, Regional Development and Energy, Prinzregentenstraße 28.

Number of total **attendees was 38**, number of consortia partners was 25, number of Community of Interest members was 3, number of business stakeholders was 13, number of researchers was 17,

number of policy makers was 7 and number of others (i.e. cluster) was 7. In certain cases, 1 attendee belongs to more than one category.

Ansgar Rudolph, Chemie-Cluster Bayern GmbH and Laura Kühn, Chemie-Cluster Bayern GmbH were the presenters/ rapporteurs. The objectives of this module were to provide food for thought on how the workshop outcomes could be used for one's own work in the region and on which topics a closer interregional cooperation would be worthy; to collect feedback from regional policy makers on the workshop outcomes and from the participants on the field visit; and to encourage follow-ups. The major takeaway was that the bioeconomy is – in all regions across the EU – still an emerging field and requires a lot of communication, information exchange, R&D work and incentive systems for the economy. All in all, the ministry appreciated the provided program on the Bavarian bioeconomy the results of the workshop, the participants praised the informative and multifaceted program, the engagement, interest and contribution of the international guests and participants could get a very good impression of the state and activities of the bioeconomy in Bavaria. The estimated impact was to create awareness about achievements and good practices in the bioeconomy and at the same about the overarching challenges and open questions in implementing the bioeconomy. The partners principal recommendation was to take enough time and a possibly interactive methodology to get participants to contribute to the reflection and provide feedback.

2.3.5 Module 5

Venue of Module 5 "Symposium" under the title "Bavarian Bioeconomy Forum" was Straubing, KoNaRo – Centre of Excellence for Renewable Resources, Schulgasse 18.

Number of total **attendees was 50**, number of consortia partners was 22, number of Community of Interest members was 3, number of business stakeholders was 25, number of researchers was 19, number of policy makers was 5 and number of others (i.e. cluster) was 7. In certain cases, 1 attendee belongs to more than one category.

Presenters were Sabine Gmeinwieser, KoNaRo; Andrea Hain, Office of the Bavarian Bioeconomy Council; Ann-Kathrin Kaufmann, BioCampus Straubing GmbH; Jörg Dörrstein, biofibre GmbH Dr. Friedrich Streffer, LXP Group GmbH. The objective of the symposium was to give an insight on the different aspects and activities in the field of bioeconomy in Bavaria and give the opportunity for networking. Topics of the symposium were Straubing – region of renewable feedstock - Research activities and competences on bioeconomy in and around Straubing; The Bavarian Bioeconomy Council - Tasks, results and perspective of the Council; Needs of industrial actors in the bioeconomy - Experiences from regional site development; Biofibre– developing natural fibre-reinforced bioplastics, requirements to the bioeconomy from a start-up-perspective; LXP Group – disruption the 2G Biomass Value Chain. The major problem faced was that the lunch break was very short – there was too little time for the participants to properly network, which was particularly unfortunate as there were different participants than during the first day, especially more company representatives. Major takeaways were as follows: Straubing developed into the region of renewable raw materials both out of political will and by strong local support; Straubing is a good example of how the bioeconomy can strengthen rural areas and even make the research centres; bioeconomy companies and institutions still work in an emerging field and need funding, political support, networks and knowledge exchange.

2.3.6 Module 6

Module 6 was the "Social event" including a "Guided tour through the Beer and Octoberfest Museum" and a "Bavarian dinner".

Number of total **attendees was 23**, number of consortia partners was 20, number of Community of Interest members was 3, number of business stakeholders was 7, number of researchers was 13, number of policy makers was 3 and number of others (i.e. cluster) was 2. In certain cases, 1 attendee belongs to more than one category.

There were no problems besides budgetary questions. It created a nice opportunity to present more about the host region and to network informally.

2.3.7 Feedbacks (post event survey)

Most participants (25 people) received direct invitation. The main reasons for attending this event were to attend the technical visits (19 persons) and to have access to networking (24). The overall rating of the event was excellent (14) and very good (11). Participants disliked the followings: minor technical issues, less in-depth information, too general workshops, long time between workshops, short time for networking. The event was very organized according to 16 participants and extremely according to 11 people. Prior to the event, all the information that participants needed was provided according to 21 participants. Additional information participant shared was the following: "Thanks to CCB (5). Please share participant lists and presentations (2). Event was very well organized with plenty of networking opportunities. I like that it was very focussed on bioeconomy in Bavaria. Very good event, with a good mix of activities. This event was compact, and very well organized, the participants could benefit a lot from it".

2.3.8 Main findings of SWOT

2.3.8.1 Availability and use of resources

Bio-based economy continues to play an important role in shaping the biomass to energy, biomass to liquid, high-tech utilization of potato starch and bio-based coatings across Bavarian region. The strong potential base of bio-based raw material across the region makes it an outstanding feature. Continued strengthening of R&D on bio-based materials coupled with capacity development through clusters capacity support for innovation and business development are key strengths of the region. Although the region is endowed with strong raw materials base, its major weakness lies on the current technologies applied which are less competitive in the long run.

To increase their competitiveness, exploration of the possibilities of increasing agri-food value chains efficiency and internationalization of the hub for bioeconomy. Increasing the efficiency and the scope of the hub operation reduces the challenges associated with lack of proper legal frameworks which have resulted to parallel operations of stakeholders in the market making it less competitive. Poor public awareness on bio-based economy benefits by the public could lead to lower penetration rates and which could further be worsened by future climatic changes.

2.3.8.2 Infrastructure and industrial factors

Strengths are strong potential partners in bio-based industries and gross trade, e. g. food and wood industry, BayWa), excellent networks and support infrastructure for business development (e. g. Bio-Campus Straubing, Carmen e. V., Bavarian cluster initiatives), high number of innovative start-up companies in the bioeconomy sector and high level of internationalization. It is a weakness that the development of the bioeconomy sector does not receive the same attention by the state government as for instance the ICT, automotive or aerospace sectors.

Opportunity: Game-changing innovations can be initiated in the bioeconomy sector from Bavaria, e. g. decomposition of lignin into high-value materials for the chemical industry, there are strong industrial partners to bring industrial-scale processes to the market, e. g. biomass-to-liquid. As threat counts that the public opinion may react critically on new industrial developments in their neighbourhood, even if the environmental situation improves.

2.3.8.3 Research and innovation

Strength: There is an excellent research infrastructure on bio-based economy (e. g. TUM campus Straubing, Competence Center for Renewable Resources (KoNaRo), Rosenheim University of applied sciences and a BioCampus Straubing: Incubator with specialization on bioeconomy. Furthermore, there is an excellent ecosystem for technology transfer, including cluster initiatives, incubators and institutions that support acquisition of public funding. Currently, it is a weakness that a strategic roadmap that helps to prioritize the most promising solutions and to allocate funding efficiently is still missing.

Opportunities are cross-fertilization between different innovative sectors, e. g. new materials and bioeconomy; ICT and bioeconomy; mobility and bioeconomy, hub for international cooperation in bioeconomy-related research. It is a threat that restrictive regulatory practice by Bavarian authorities may inhibit new industrial developments.

2.3.8.4 Funding

Strength: There is a strong support system in Bavaria for acquisition of funding: BayFor, clusters, Bio-Campus, regional transfer hubs, good network of international partners that helps getting access to EU funding in joint projects, good support for start-up companies with funding and consultation and a state scheme for funding of cross-cluster projects. As weaknesses, it can be mentioned that currently, a strategic roadmap that helps to prioritize the most promising solutions and to allocate funding efficiently is still missing, there is a lack of venture capital – there is little attention for the bio-based economy in the venture capital scene.

An opportunity could be that based on the State bioeconomy strategy more funding is provided. Besides, the EU “New Green Deal” strategy may provide additional funding opportunities in the future. It is, however, a threat that the State of Bavaria did not include bioeconomy into its recent high-tech research funding initiative.

2.3.8.5 Market/Economic aspects

Strength: Bavaria is a strong market on its own and very well connected to international markets in Europe and overseas and may profit from international cooperation along major corridors of transport, e. g. by connecting Lower Bavaria with South-East European countries as sources of bio-based raw

materials along the Danube river. Furthermore, high purchasing power and public awareness for environmental aspects result in good demand situation for products from sustainable production. It is a weakness that the discounter-based retail system results in low price level for primary agricultural products and often low rentability of farming.

As opportunity could be listed that the bio-based economy may open new opportunities for income in the agricultural and forestry sectors. By cross-sectoral cooperation, bio-based products may be easily integrated into products e. g. from the automotive or aerospace sector, which serve strong and large markets. Market introduction of bio-based products may not succeed if prices are not competitive. (Threat).

2.3.8.6 Transition towards bioeconomy

Strength: There is already a large industrial base for bioeconomy in Bavaria, with strong agri-food and forestry/wood industry sectors and several large producers of paper and cellulose. Industrial-scale new technologies in bio-based economy are readily available, e. g. SUNLIQUID®. Cooperation along the whole industrial value chain from R&D over production to market integration is well organized. Weakness: Non-bio-based products are still very strong in the market. There is a tendency with large companies in the industrial sector rather to defend existing market positions than to explore future market opportunities.

At the same time there are a few opportunities, too, such as: Bavaria may become a European hotspot for transition towards bioeconomy. Licensing of products developed in Bavaria may support other European regions in their transition process. A community of practice (active stakeholders) can be developed that enables the collaboration and development of biomass flows (see ENABLE project). NAWAREUM: Central venue for information and experience for topics of renewable energies and sustainable raw materials in Bavaria. It is a threat, however, that global tendency to protect national markets may be counterproductive to transition towards bioeconomy and the transition may slowed down if not supported by adequate regulatory/tax policies.

2.3.8.7 Public and institutional support/Governance/Policy framework

It is a strength that the availability of public funding is better than in most other German regions and there is strong public support for policies and products that can contribute to reach a CO2-neutral economy. Among weaknesses we can list that the institutional support framework is split up in quite a number of institutions, which makes it more difficult to coordinate action and bioeconomy is at the interface between the responsibilities of several state ministries, which requires an increased effort of coordination and slows down policy development.

Opportunity: State-level bioeconomy strategy may become a strong tool, helping to coordinate policies and to allocate public funding effectively. As a threat it needs to be highlighted that the state-level bioeconomy strategy may stay reduced to a general vision without setting priorities and/or defining an action plan to implement transition towards bio-based economy.

2.3.8.8 Social and environmental aspects

Strength: Bio-based economy helps to reduce the consumption of space and natural resources, can contribute to decarbonization, may provide new opportunities for value creation in rural and/or underdeveloped areas and bio-based value chains may be created on a regional level. Weakness: Public acceptance of bio-based products needs to be strengthened by information campaigns, labels etc.

Opportunity: Bio-based economy may contribute to overcome regional disparities in Bavaria as well as in other regions and it may be a key element in the transition towards CO2-neutral economy. Threats: Some bio-based industrial processes lines may be associated with environmental risks. Example: Contamination of surface water in the case of accidents or inadequate maintenance of biomass energy plants.

2.4 Flanders (Event organiser: EWI)

On the 20th and 21st of February 2020, the POWER4BIO members visited Flanders. The cross-visit started on Thursday 20/02 with a full day workshop on a particularly important topic for the development of the European Bioeconomy: "How to include primary production in bio-based value chains?". The conference program can be found at the following link.

This workshop had a dense programme and was attended by over 100 persons, including POWER4BIO members, members of the Community of Interest, industry representatives, policy makers and researchers. Several European networks were represented, such as the SCAR-FOOD and SCAR-BSW, the European Chemical Regions Network and the topic group on the bioeconomy from the European Network on Rural Development, as well as representatives from different Directorates from the European Commission.

On behalf of the organizing partner, 1 colleague was involved in the organization itself, and 2 additional colleagues supported the reception. First discussions started in May 2019, especially reaching out to other European projects and networks. It was a particular request to make this cross-visit a little different from the other cross-visits as it took place in Brussels. It was the intention to invite a lot of policy makers from Brussels to join the discussion. Potential risk factors according to the organizers were to get interesting speakers and to have simultaneous other meetings as there is a very high density of workshops, conferences, discussion days etc. in Brussels, so the public is oversaturated, furthermore the limited budget. Some risks were unavoidable. The initial efforts went into crafting a collaboration with the H2020 project Microbiome Support and with the international Bioeconomy Stakeholder Forum. This led to a long negotiation involving multiple parties and DG RTD. But in the end the collaboration was refused, and several months were lost in the preparation of the workshop. In the second stage the organizer connected with a lot of European networks to schedule meetings back-to-back (ENRD, SCAR-FOOD, SCAR-BSW and ECRN) so the international visitors could join their meeting and this workshop at the same time. A good venue was found that accepted to accommodate this event for free. The allocated budget was not enough. The catering costs quickly rose above the entire budget, not counting the preparation, transports costs or other related costs. As it is simply a very large undertaking for a project such as Power4Bio to organise all these cross-visits within a short time frame, it was recommended not to underestimate this effort neither in terms of budget nor in working hours.

2.4.1 Module 1

The venue of Module 1 “Kick off” was Royal Flemish Academy of Science and the Arts, Rue Ducale 1, 1000 Brussels.

Number of total **attendees was 84**, number of consortia partners was 23, number of Community of Interest members was 0, number of business stakeholders was 22, number of researchers was 25, number of policy makers was 23.

Participants were welcomed on behalf of the Administration and Vice-Minister President of the Flemish Government and the moderator was Dries Maes.

2.4.2 Module 2

The venue of Module 2 “Innovations to join agriculture and biobased solutions” was Royal Flemish Academy of Science and the Arts, Rue Ducale 1, 1000 Brussels.

Number of total **attendees was 84**, number of consortia partners was 23, number of Community of Interest members was 0, number of business stakeholders was 22, number of researchers was 25, number of policy makers was 23.

The objective of the module was to provide a range of presentations on different innovation activities that are currently ongoing in Flanders, and that are intended to join the primary sector and the biobased industry in the long run. The chair of the workshop was Sofie Dobbelaere, Flanders” Biobased Valley and the following presentations were held: Enzymatic conversion of renewable biomass into green high value products by Karolien Vanbroekhoven & Winnie Dejonghe, Flemish Institute for Technological Research VITO (Vlaamse Instelling voor Technologisch Onderzoek); Flanders” FOOD as innovation partner for the agrifood industry in Flanders and Europe by Maarten Uyttebroek, Flanders” FOOD; Biomass production on marginal soils in Europe by Nele Witters, Hasselt University (Nele WItters was unfortunately ill, but provided a presentation afterwards to the participants.); The role of the agribusiness complex in the Bio-economy: challenges and opportunities, ILVO’ perspective by Bart Van Droogenbroeck, Research Institute for Agriculture, Fisheries and Food (ILVO) and BBI JU: Enhancing the participation of the farming sector in bio-based value chains by Ana Cuadrado Galván, Bio-Based Industries Joint Undertaking (BBI JU). Interaction was limited at first, but unexpectedly large at some subjects that were not foreseen. As major take-aways the following can be summed up: “There is a large diversity of innovation activities that are ongoing. In terms of technological research, there is certainly a large potential for bioeconomy development. For the application of all these research activities, a different type of action is needed. Many collaborative research projects with farmers are being executed, but this does not lead automatically to practical applications. At the European level of the Biobased Industries consortium, a limited number of projects already involves primary producers. This work has led to a large number of relevant recommendations to increase this collaboration in the future. But these recommendations still have to be implemented.” From organizational point of view it is recommended not to build a too strict schedule.

2.4.3 Module 3

The venues of Module 3 “Field visits” were Arcelor Mittal Ghent, John F. Kennedylaan 51, 9042 Gent and BioBase Europe Pilot Plant, Rodenhuizekaai 1, 9042 Desteldonk.

Number of total **attendees was 24**, number of consortia partners was 19, number of Community of Interest members was 0, number of business stakeholders was 5, number of researchers was 11, number of policy makers was 7.

Arcelor Mittal is one of the major steel producers in the world. The plant at Ghent is the only steel production site in Belgium and puts Belgium as the 6th largest steel producer in Europe. The company presented its strategic paradox, where on the one hand an increasingly large amount of steel will be necessary in the future to build a sustainable world for renewable energy production and new means of transport. On the other hand, the steel production itself should be conscious about its own climate impact, that should be decreasing. The company pursues a unique strategy that combines different technologies. They are heavily investing in a biotech solution that can capture CO-gases from the steel production and transform these into chemical base products. At the same time, they are investing in the use of wood waste as an alternative to coal. The POWER4BIO and SCAR-FOOD representatives were allowed to visit the new construction site of the Steelanol project that has to put these technologies into practice. The presenters were Carl De Mare (ArcelorMittal. Vice President Technology Steelmaking & ECO Solutions) and Wim Van der Stricht (ArcelorMittal CTO - Technology Strategy - CO2 and Circular Economy). In this case, the following recommendation was formulated: “The industrial development of biobased technologies is not yet a reality and will still take a lot of time and effort to take off. However, this type of technology should not only be developed as a collaboration between industry and organic material providers (primary producers or organic waste stream collectors.) It is equally possible to set up high-impact processes in a circular economy setting in collaboration with the chemical industry”.

The second visit was to the neighbouring Biobase Europe Pilot Plant. This is the main pilot facility for the bio-based economy in Flanders, and one of the largest of its kind in Europe. North Sea port, the harbour that hosts both Arcelor Mittal and the Biobase Europe Pilot Plant, also provided a presentation to show how the developments were all connected in a strategy to turn the harbour into an integrated bioeconomy cluster. Presenter was Hendrik Waegeman (Head of Business Operations, Bio Base Europe Pilot Plant). In this case, the following recommendation was formulated: “From a policy perspective, pilot plants are tricky. There ought to be support for local SMEs to make use of pilot plants abroad, but this is a very difficult message to transmit to the policy makers. The opposite is often easier: “let’s make a pilot plant in our region as well.” But this solution is counterproductive for the development of the bioeconomy both in the region (it takes more money and time than setting up partnerships with pilots abroad) and for Europe as a whole (because all pilot plants will start to compete, and all will lose).”

2.4.4 Module 4

Venue of Module 4 “Feedback session and wrapping up the discussion on the recommendations based on the field visits and group work” was Royal Flemish Academy of Science and the Arts, Rue Ducale 1, 1000 Brussels.

Number of total **attendees was 24**, number of consortia partners was 19, number of Community of Interest members was 0, number of business stakeholders was 5, number of researchers was 11, number of policy makers was 7.

Panellist were Mr Galin Gentchev (DG Agri); Mr Dirk Carrez (Biobased Industry Consortium, BIC); Mr Tomasz Calikowski (DG RTD) and Ms. Maila Puolamaa (DG Grow), the chair was Dries Maes, Department of Economy, Science and Innovation.

A lot of subjects were addressed. In general, within the European Commission, a lot of efforts are done to align policies between different Directorates. This is a new evolution and will need further work (which is planned). However, the regional policy makers will have to follow and act in consequence. The alignment of policies remains a very difficult and long task and requires an in-depth knowledge of all policies across the different topics. There is an important role here for regional policy makers, to translate these combined policies to a coherent regional policy framework. Major lesson learned are as follows: "The EU Green Deal is firstly a growth agenda. This means that the actions are designed to achieve sustainable economic growth in Europe. This is an important precondition to understand the different policy elements of the green deal. The bioeconomy strategy is embedded in the Green Deal, but in a dispersed and hidden way. Unlike the Circular Economy Action Plan, there is no direct mention of the EU Bioeconomy Strategy. Still several elements return in the Green Deal actions. The commission (DG Agri) organises several workshops to collect information for policy makers, on how to design new value chains, starting from primary production."

The following recommendation was formulated by the organizer of the event: "There was a preparatory activity to collect questions for the panel, but this did not yield the expected result. Many project partners could not determine the questions that were most appropriate for them. This is a very important signal, as it shows that the EU policy making activities are still perceived as very far away from the daily activities of regional policy makers. The reactions from the panel showed that the regions have an important role to play in the policy making debate, but there is a lack of in-depth knowledge and connection with the latest EU developments. New initiatives will be necessary to provide a bridge to cover this gap."

2.4.5 Module 5

Venue of Module 5 "Symposium" under the title "Case-studies: practical initiatives to include primary production in the bioeconomy" was Royal Flemish Academy of Science and the Arts, Rue Ducale 1, 1000 Brussels.

Number of total **attendees was 84**, number of consortia partners was 23, number of Community of Interest members was 0, number of business stakeholders was 22, number of researchers was 25, number of policy makers was 23.

Three practical case studies of innovative collaborations between farmers and new bio-based value chains were presented. The Belgian Farmers' Union presented the results of a projects that combined farmers with product designers. These collaborations in the "Food Heroes" project directly led to new food products and services based on food waste streams.

ProNatura presented a particularly important development of bio-based innovation in a social economy company. ProNatura is a social organisation that assists and trains persons who cannot be directly employed in the regular labour market. This assistance should allow them to gain skills and confidence and to join the regular labour market in the long run. ProNatura has a strong activity in management of public green spaces and natural reserves. They invest in the development of bio-based materials, fungi-based materials and furniture. This shows that the discussion of the bioeconomy should also look beyond traditional economic sectors, especially in urban areas.

Problems faced during the symposium were pressing time constraints. One presenter could not attend due to illness, and this allowed the program to continue according to schedule, otherwise there would have been major delays.

Lessons learned during the symposium were: “Practical solutions that are not technology-driven are very important. A large part of the bioeconomy development is still dependent on the creation of new collaborations (for instance, the collaboration between freelance product designers and farmers who want to create a new food product). There should be a lot of attention going to supporting instruments for these new types of collaboration. Policy instruments are often not equipped to deal with all types of collaborations, as the Common Agricultural Policy makes that R&D instruments are split between primary sector and the rest. This makes collaborative exercises difficult.”

Recommendations from the point of view of the organization are: “Some participants asked for the full participants’ list for connecting with new partners. However, due to GDPR regulations, we could not openly share these. It is important to include a full consent form during the registration that specifically asks the participant if it is OK to share the information with the others on beforehand. Now, without written consent, it was not allowed to share connection details to everyone. The program was very full, and as the day proceeded, interaction became harder and harder. The presenters were proposed to make use of interaction software. However, this is not sufficient to make an interactive session. The presentation has to be adapted as well to make the software worthwhile.”

2.4.6 Module 6

Module 6 was the “Social event” including a social dinner with the Power4Bio group. The venue was “Chez Bobonne” Schuitenkaai 4, 1000 Brussel. Number of participants was 28.

2.4.7 Feedbacks (post event survey)

Most participants (13 people) received direct invitation. The main reasons for attending this event were to attend the technical visits (12 persons), to have access to networking (13) and listen to the presentations (13). The overall rating of the event was excellent (12) and very good (2). Participants liked the following: the technical visits, new experiences, wide variety of presentations/presenters, the professional organization and sharp timing with high level of content. There was basically nothing to be disliked. The event was very organized according to 1 participant, and extremely organized according to 13 people. Prior to the event, all the information that participants needed was provided according to 15 participants. Additional information participant shared was the following: “Thank you for the organization! Organization at the highest level, very professional. I really appreciate the preparation of the event. Everyone could learn a lot of interesting things about the bioeconomy. Very interesting event worth recommending. The study visits were also very interesting, and we had the opportunity to get acquainted with the bioeconomy from a practical point of view. Thank you for everything. Perfect: venue, sound, screen, food. When is this event happening again?”

2.4.8 Main findings of SWOT

2.4.8.1 Availability and use of resources

The very strong agri-food sector, with good availability of by-products/effluents/waste, the great amounts of organic waste from separate collection and the already existing integrated value-chains for biomass valorisation are considered strengths, while it is a weakness that most separate organic

waste streams are still being used for the production of compost instead of more valuable products. Furthermore, it is difficult to guarantee the quality of separately recycled organic streams in the long run.

Strengthening collaboration with the chemical sector to valorise waste streams (effluents and gases) from the chemical sector is an opportunity, but it might be a threat that the available quantities are not sufficiently large or stable throughout the year when very specific resources are needed (for high-value production of biobased products).

2.4.8.2 Infrastructure and industrial factors

It is a strength that a very strong agro-industrial and chemical industry is available, and the strong networks and federations are willing to start innovative initiatives. Bioeconomy developments are, however, cross-sectoral and this brings often cultural or structural barriers between value chain partners from, different sectors.

Newly started initiatives in the harbours are willing to develop the infrastructure for biobased opportunities. This includes new pipeline networks, co-siting arrangements between different companies and opportunities for international trade of resources. As a threat the following can be stated. Vested interests are high in a strongly industrialised region. Biobased initiatives that do not align themselves with these vested interests or do not strengthen existing industrial processes, are more difficult to set up.

2.4.8.3 Research and innovation

In this context the following can be considered as a strength: One of the highest public and private expenditure rates in R&D in Europe is in this region. There is a world-class research infrastructure and universities (KU Leuven is Europe's #1 innovative university) are worldwide well-known. Different pilot infrastructure sites for the bioeconomy have been set-up (Biobased EU Pilot Plant, Food Pilot, Biotech Pilot, Bio-aromatics Pilot.) At the same time, the field of research activities is very dispersed, there is no common research agenda and no overview in the diversity of initiatives.

Creation of a research agenda, stronger internationalisation of the researchers in the bio-economy field, strengthening links between different institutes (Flanders Biotechnology institute, agricultural research institute, VITO) and strengthened collaboration with agricultural sector in innovation could all serve as opportunities. As threats we can mention that the lack of alignment and collaboration leads to internal competition of research groups and the lack of collaboration makes that critical mass in research capacity is not achieved for large European collaborations.

2.4.8.4 Funding

Public funding for new investments is available also for larger amounts. Proximity of the European funding agencies makes alignment with EU funding requirements easier to achieve. On the other hand, as weakness private funding for investments is rare, and especially large amounts of funding are not available (> 5 MEUR) from private investors. Biobased activities remain seen as high-risk, and specialised funding actors are not present in the region.

Collaboration between public funding agencies and private VC and angel investors could provide leverage to obtain large enough funding for new large-scale investments. (Opportunity) Market risks and technological risks might remain high. (Threat)

2.4.8.5 Market/Economic aspects

As a strength, strong industrialisation implies that strong international companies are present in the region, and they can provide an entry to large international markets. It is known, however, that price-competitiveness of biobased materials is low, especially on international markets with low-quality alternatives are often cheaper and Flanders is a small region with a small local market. (Weakness).

It could be an opportunity to increase focus on high-quality products with added value, both in terms of environmental performance as in functionality and to increase collaboration with the chemical sector to ensure market acceptance of new products. High-quality value chains need structural support in terms of standards, regulations and legal framework. This support is not sufficiently up to date with biobased materials. (Threat)

2.4.8.6 Transition towards bioeconomy

Strengths are as follows: The Flemish government published its vision in 2006 to achieve 7 transitions by 2050. One of those is the transition to a fully circular economy, and this includes all efforts to turn to a more biobased economy. Ever since, the bioeconomy has been part of the public policy. Several sectors – e.g. food sector, energy sector, chemical sector - are engaged in the transition to the bioeconomy. Research programmes are designed to help the transition, such as the spearhead cluster program to speed up the transformation of the Flemish industry. The spearhead programme contains a part that develops new biobased initiatives in coherence with the overall transition agenda. As weaknesses count that the agricultural sector is not yet sufficiently involved and large part of the chemical sector is still dependant on fossil-based resources, and the scale of these activities (approx.15% of all EU oil refining happens in the trilateral region FL-NL-NRWF) makes it difficult to switch resources.

An opportunity could be that Flanders may become a leader in biobased innovation by implementing the first demonstration plants for biobased solutions, such as the CCU plant at Arcelor. This could bring a lot of beneficial side effects in terms of research, attractivity of the region, skilled labour and spill-over effects. Other priorities (recession or energy policy priorities) could, however slow down the transition.

2.4.8.7 Public and institutional support/Governance/Policy framework

Strengths: There is a very active public policy framework that is currently being revised in collaboration with the stakeholders. Generous innovation support from public sources makes that the bioeconomy theme remains on the table and remains an important policy theme. At the same time, as weakness the incoherence of the bioeconomy theme with other (EU) themes makes it difficult to develop a strong framework across different policy domains (energy policy, circular economy policy, water policy, environmental and waste policy….)

The revision of the bioeconomy action plan for Flanders is an important opportunity to show the state-of-the-art in Flanders on a broader level, and to raise awareness of the opportunities for Flanders with policy makers. Furthermore, the capacity of the bioeconomy to contribution to CO2-neutral solutions has to be emphasised in order to gather support across policy domains. It is a threat if the dispersion of responsibilities and initiatives within the public domain remains large, despite common efforts for concertation and alignment between actors.

2.4.8.8 Social and environmental aspects

Strengths: There is a relatively strong awareness in Flanders about the nature of the bioeconomy, its benefits, and opportunities. It is no longer an unknown concept. Besides, a large number of stakeholders are actively involved establishing a strong dissemination platform. As a weakness we could point out that the trade-offs related to the bioeconomy are still confusing for the public (land for food vs non-food, bioenergy problems, international trade of biomass without sustainability guarantees,…)

Opportunities: Increased involvement of the agricultural sector may lead to more visible initiatives that make the bioeconomy concept more concrete. Bioeconomy can contribute in practice to the reduction of CO2 emissions, and thus can gain large social acceptance with large-scale projects. Threats: Past bad experiences with bioenergy may show bioeconomy initiatives in a very bad light (imported wood pellets from Canada for bioenergy production…) The bioenergy debate is still the most present debate on the bioeconomy, and there is no consensus about the role of bioenergy in the regional energy mix.

2.5 Lviv (Event organiser: UNFU)

As a result of the measures taken due to the COVID-19 Pandemic, it was decided to hold the cross-visit online in Ukraine on 19 May 2020. As this was the first virtual cross-visit, the organization of the cross-visit had to be reconsidered, especially from a technical point of view. This also meant that some modules of the cross-visit could not be hold or had to be reorganized or postponed (field visits, social events). The cross visit was organized by 11 colleagues: three from the Ukrainian National Forestry University (UNFU), three POWER4BIO partners, two policy makers and three stakeholders. The organization itself took three months. The organizers tried to avoid possible technical risk factors (e.g. connection failure) by informing the partners in advance about the connection and settings. As the cross-visit took place online, the allocated budget was enough. The conference program can be found at the following link.

The cross visit was attended by a total of 36 participants, including business stakeholders (Economic development agency “PPV Knowledge Networks”, Lviv Regional Biocluster), policy makers (Lviv Regional State Administration) and the 10 POWER4BIO regions were represented by at least one expert.

The cross-visit included an introductory session from the Lviv region and developments in the region, followed by the analysis of the regional bioeconomy sector, and a draft strategy for the development of the bioeconomy of the Lviv region was outlined.

2.5.1 Module 1

The virtual cross visit was opened by Mr. Kiyko, Head of the Department of Furniture Production Techniques and Wood Product Technology of the Ukrainian National Forestry University (UNFU). In his opening remarks, Mr Ingacio Martin, the project coordinator of POWER4BIO emphasized the importance of cross-visits as an opportunity to increase the visibility of achievements and to share ideas also with stakeholders and policy makers. Ms Garcia, leader of the WP5 spoke about the way of developing the regional bioeconomy strategy in Lviv involving stakeholders from government, universities, industry, and the Forest Sector Council.

Mr. Kiyko, and Mr. Vorobey, Managing Director of PPV Knowledge Networks, introduced the region, covering the following topics: resources, developments, opportunities and trends in bioeconomy, and the impact of Covid-19.

2.5.1.1 Introduction of the regional situation

The main arguments in favour of a regional bioeconomy are carbon thinking (especially reducing CO2 emissions), the existence of renewable resources and the alignment with the objectives of the European Union. Regional bioeconomy development, strengthening of public-private partnership, gathering knowledge and resilience of the industry as well as increased interest from the European Union are the motivating factors for the strategy development. The bioeconomic potential with emphasis on the economic progressiveness of the region, the already established public-private partnership, the labour force available, the activities of the Forest Sector Council, which serves as a regional RBH for all interested stakeholders and the favourable location of the region can all contribute to the successful implementation of the bioeconomy strategy.

2.5.1.2 PPV Knowledge Networks and the green economy development in the Lviv region

The PPV Knowledge Networks, an economic development agency provides services in project management, consulting, analytics for businesses and organizations and focuses on industries that have potential to generate high added value. The Rozdil Industrial Park, which is one of the projects of the agency, aims to accommodate “green industries" that deal with products for resource efficiency, post-use materials and bio-based materials and products. In addition, a cross-border Belarusian and Ukrainian project to produce energy from biomass was presented, however, Mr. Vorobey also highlighted that resources, like timber can be used not only for energy purposes, but also for panel production.

One third of companies in the Ukrainian forestry sector have reduced the production volume and even a quarter have temporarily stopped the production due to Covid-19, and 75 % of forestry companies expected at least 50 % drop in turnover in 2020.

2.5.2 Module 2

In module two, Mr. Kiyko outlined the milestones of the elaboration of the bioeconomy strategy, followed by Mr. Ilkiv’s (UNFU) analysis of the bioeconomy in the Lviv region, then the methodology of the bioeconomy strategy was summarised by Ms. Yakuba (UNFU).

2.5.2.1 Main methodological ideas regarding the elaboration of the bioeconomy strategy for the Lviv region

There are significant forest resources in the Lviv region: 31.8 percent of the region is forest, in addition, the forest sector’s share of turnover in the region reaches 14 %. These forest resources and the activities of the Forest Sector Council, which operates under the umbrella of the State Regional Administration, are the pillars of the methodology of the bioeconomy strategy.

Of the milestones of the bioeconomy strategy, 2017 should be highlighted when discussions on bioeconomy began. Since the start of the POWER4BIO project until the presentation of the draft strategy, 11 events have been dedicated to the development of a bioeconomy strategy in the Lviv region, including four Forest Sector Council meetings, three round tables and special workshops and a visioning workshop. Participants from industry, NGOs, the Forest Sector Council, regional authorities, research institutes and the media were also involved in the development of the regional bioeconomy strategy.

The regional bioeconomy consists of three components: the forest sector, the agricultural sector, and the food industry. The two main resources are the agricultural and forest residues, since 58 % of the Lviv region territory is occupied by agricultural land and forest land makes up 32 %.

2.5.2.2 Results of the analysis of the bioeconomy for the Lviv region

The dynamics of the development of the forest, agricultural and food sectors in the Lviv region were summarized by turnover and number of employees. Among the further resource potentials in the regional forestry sector post-consumer wood, residues of forest products, waste generated during logging were highlighted. There is also great potential in straw, which is currently almost unused and remains in the fields.

2.5.2.3 Results of the situational analysis - The presentation of Ms. Yakuba

SWOT analysis was used to assess the prospects for bioeconomic development in the Lviv region. During the workshop, the experts (representatives of regional authorities, business, science, and public organizations) were divided into four groups, and evaluation parameters were formulated using the method of brainstorming, then the parameters were evaluated and weighted.

2.5.3 Module 3

The field visit was postponed until COVID-19 restrictions were eased.

2.5.4 Module 4

Mr. Kiyko presented the draft bioeconomy strategy. Whereas the bioeconomic strategy of the Lviv region is inseparable from the Development Strategy for the Lviv region and may be affected by the measures taken due to COVID-19, the draft bioeconomy strategy for the Lviv region consists of three components:

- specific actions and measures
- components of the Development Strategy for the Lviv region for the period 2021-2027
- impacts of COVID-19

The competitiveness of the Lviv region's bioeconomy can be strengthened by three factors: the forestry sector, which plays a leading role in the Lviv region's bioeconomy, the transition from the linear model of the economy to the circular model and investing in human capital.

2.5.4.1 Specific actions and measures

The bioeconomy strategy is divided into four main sectors: resource availability, innovative education and knowledge dissemination, partnership between sector leaders and government, and the competitiveness of bioeconomy, from which - based on the SWOT analysis - seven challenge sectors have been identified:

- Resource support for the bioeconomy
- Waste management
- Competitiveness
- Public-private partnership
- Cooperation
- Knowledge and education
- Dissemination

For each challenge, strategic measures - suggested by the regional stakeholders -, strategy components, specific actions and the range of actors involved were identified.

2.5.4.2 Components of the Development Strategy for the Lviv region

Competitive economy based on smart specialization and clean environment are components of the Lviv region's Development Strategy for 2021-2027 and are closely linked to the regional bioeconomy strategy.

2.5.4.3 Impacts of COVID-19

COVID-19 has a significant impact on the economy and the implementation of the bioeconomy strategy, under both pessimistic and optimistic scenarios. To neutralize the negative effects, the paradigm of development needs to be changed, focusing on knowledge and education, promotion and raising attractiveness for the regional bioeconomy.

Some challenges and key messages were identified in the answers and questions session:

- There is a need for a special scientific program related to bioeconomy.
- Effective measures and projects should be presented to improve liquidity conditions.
- Liquidity, the regulatory environment and governance are interlinked.

2.5.5 Module 5

The online event cannot strictly follow the order of modules outlined in the project; therefore, the workshop was included in the fifth module. The aim of the workshop was the evaluation of the draft bioeconomy strategy by recommendations and comments of the participants of the cross-visit. The evaluation of the bioeconomy strategy was based on brainstorming approach, complemented by a priority table of specific activities linked to strategic components. In addition, all representatives were asked to address the following questions:

- How to develop the regional bioeconomy in the poor awareness conditions?
- How to develop the regional bioeconomy in the lack of financing conditions?

Some key findings from participants:

- The attractiveness of the region for foreign investments is based on the existing bioeconomy potentials, the public-private partnership, and the favourable business conditions (cost of labour force).
- The potentials in agriculture need to be better highlighted.
- There is a need for the presence of large companies related to bioeconomy.
- Responsibilities and monitoring need to be defined.

2.5.6 Module 6

Since it was an online cross-visit, the social event was not held.

2.5.7 Feedbacks (post event survey)

Participants were informed about the cross-visit via e-mail invitation, and the POWER4BIO website also highlighted the event (the participant received the link to the event after filling out a registration form), but most attendees received direct invitation. The participants attended the event mainly to gain information about the bioeconomy development in one of the Central and Eastern-European

countries. They were of the opinion that they would recommend the event to their colleagues and friends and the overall rating of the event was “very good”. In fact, the attendee did not provide feedback on anything they did not like about the event. In general, the participants considered the event to be constructive, meaningful and of optimal duration. From the presentations, participants received 70% of the required information, but the workshop provided an opportunity to ask additional questions.

2.5.8 Main findings of SWOT

In the conducted SWOT analysis regarding bioeconomy prospects in the region, eight factors were analysed:

2.5.8.1 Availability and use of resources

Significant bio-resources are available in the region, of which forest-based resources stand out. However, the utilization of these resources is not yet satisfactory. With the advent of new biotechnologies, the region’s bioeconomy opportunities may improve. However, it is essential to prioritise bioeconomy in public policy.

2.5.8.2 Infrastructure and industrial factors

Industrial parks have emerged in the region, which is an important step towards the development of the bioeconomy, however, the low GDP inhibits the development of the bioeconomy and progress may be slowed by difficulties in complying with legal requirements. Training in product export could improve the competitiveness of the bioeconomy-related industry.

2.5.8.3 Research and innovation

Network of regional educational and scientific institutions and an industrial hub have been established, strengthening the role of research and innovation in the region, which can be enhanced by developing more international cooperation on bioeconomy. However, cooperation between business, academia and government is still weak and there is a risk, that the impact of labour migration will affect several areas.

2.5.8.4 Funding

There is potential in increasing the use of biomass resources in the region, thus paving the way for further domestic and foreign investment in the bioeconomy sector. However, a development strategy for the bioeconomy sector of the region is not yet available, in addition the cost of credit resource for business is high.

2.5.8.5 Market/Economic aspects

The location of the region is favourable from market point of view, as it is also close to the border. The growing demand for biofuels offers further good business opportunities. However, to take advantage of these opportunities and capabilities, it is necessary to improve the information supply of the bioeconomy-related sector and to develop priority in the planning and distribution of bioresources.

2.5.8.6 Transition towards bioeconomy

Bioeconomy, as a smart specialization, is an integral part of the Development Strategy of the Lviv region, in addition, industrial hub, clusters and associations also contribute to the transition towards bioeconomy, however, the implementation may be affected by the impacts of COVID-19. Another favourable opportunity is the growing demand for biofuels and their prices on the European and world markets.

2.5.8.7 Public and institutional support/Governance/Policy framework

Although the bioeconomy has been included in the Lviv Region Development Strategy, incentive laws are still lacking and there is shortage of skilled personnel in the sector.

2.5.8.8 Social and environmental aspects

It can be stated that the burden on the environment is drastically reduced by biotechnology. The wider involvement of society in the bioeconomy is not yet widespread, mainly due to a lack of awareness, at the same time, stakeholders have been actively involved in the development of the regional bioeconomy strategy. However, the risk of deteriorating political situation and growing instability on the South-Eastern border of Ukraine may cause further challenges in the implementation of bioeconomy.

2.6 Central Germany region (Event organiser: DBFZ)

The cross-visit to Central Germany as the sixth POWER4BIO cross-visit took place online on 23-24 June 2020. The concept for the event began to take shape in December 2019, and concrete preparations started in April 2020. Two colleagues from DBFZ were involved in the organization itself and another seven people were engaged in the online implementation of the event. Since it was an online cross-visit, the organizers had to prepare for several technical challenges (e.g. connectivity, number of possible attendants per tool, tools for interactivity), and thorough preparation and testing was also required. According to the organizers, another challenge was to effectively involve stakeholders with different interests in contributing and participating in the event. Therefore, an internal brainstorming was launched to identify industries interested in participation and active discussions started with the Bioeconomy Cluster about the event and topics. The budget initially allocated was not enough, but the budget available due to travel restrictions was able to cover the costs incurred. The conference program can be found at the following link.

The cross visit was attended by a total of 80 participants, including researchers on the topic of bioenergy, bioeconomy and recycling management, national and regional policy makers from bioeconomy sectors, experts from associations, business enterprises, and partners from the 10 POWER4BIO regions.

On the first day of the cross-visit, regional experts gave an insight into the bioeconomy in the Central Germany region. The presentations by representatives of the bio-based industry focused on technological innovation and best practice examples. The first day ended with a podium discussion on regional challenges of bioeconomy acceleration. The second day was dedicated to an interactive workshop with a central theme of “Overcoming regional bioeconomic challenges”. On the third day of the POWER4BIO cross-visit to Central Germany, a technical visit was organised for the POWER4BIO partners. Gerd Unkelbach, Head of Business, Area Sustainable Chemistry of the Fraunhofer Center for Chemical-Biotechnological Processes CBP, introduced the pilot plant facilities for different biorefinery processes

at the Fraunhofer CBP Leuna site. Fraunhofer CBP is a branch of Fraunhofer Institute for Interfacial Engineering and Biotechnology IGB.

2.6.1 Module 1

The first day began with a presentation by Dr. Nora Szarka (DBFZ) and Laura García (DBFZ), in which the Deutsche Biomasseforschungszentrum (DBFZ) was introduced, followed by a summary of the aims, achievements and main activities of the POWER4BIO project.

Following this, Dr. Dieter Konold from Project Management Jülich, outlined the goals of the German bioeconomy strategy and its political relevance, including regional aspects and solutions, such as:

- supporting networking of regional actors,
- exploiting bioeconomic potential for rural development,
- improving the cooperation between the Federal Government and Federal States to better coordinate measures and to support region-specific initiatives.

Prof. Dr. Matthias Zscheile, the Clustermanager of the BioEconomy Cluster, outlined the bioeconomy of the Central Germany region. Of the federal states that form the Central Germany region, Saxony-Anhalt was analyzed based on available biomass sources, infrastructure, products of bio-based companies, supply chain, research & development, and networking. Pilot and demo plants (polymer synthesis, biogas residual, fermentation, bioenergy, hydrothermal carbonization plant) operating in the region were also highlighted as best-case examples.

2.6.2 Module 2

The best business and innovation cases of five SMEs were presented in Module 2, including a company producing modified starch, which can be used as a coating material in agriculture and the packaging industry, an enterprise, that produces insect protein, a firm which develops fibre-reinforced shaped wood profiles and shells, an enterprise that produces fibres and cosmetics based on non-consumable milk proteins, finally, a company working on the development of garlic-based nematicide. Presenters identified as challenge the lack of specific standards for the registration and certification of bio-based products, the need for new regulation of sustainable products and for complex funding landscape and lobbying for bioeconomy to gain competitive advantages.

Romy Brödner and Martin Graffenberger from DBFZ presented a project based on the analysis of a model region that maps and quantifies the state of the regional bioeconomy in a structured and replicable way. Dr. Alberto Bezama from the Helmholtz Center for Environmental Research (UFZ) outlined the SUMINISTRO analysis model, which serves to identify the social, economic and environmental aspects of sustainability in the regional value chains.

2.6.3 Module 3

Two online field visits were planned, one to the Fraunhofer Interfacial Engineering and Biotechnology Institute IGB and the other to Corvay Specialty Chemicals GmbH, but the second field visit did not take place due to the personal circumstances of the speaker.

Gerd Unkelbach (Head of Business, Area Sustainable Chemistry of the Fraunhofer Center for Chemical-Biotechnological Processes) introduced the pilot plant at the Fraunhofer CBP Leuna site. Fraunhofer CBP supports SMEs, universities and other research institutions in bringing their products to market and provides process development and optimization, process analysis, process and product expertise,

and represent the complete process chain from laboratory to industrial scale. Through examples, Mr. Unkelbach gave an insight into biotechnological processes, the cultivation of microalgae, scale-up chemical processes, and product isolation. The presentation was followed by a question-and-answer session.

2.6.4 Module 4

The topic of the panel discussion moderated by Dr. Alberto Bezama (UFZ) was "The challenges of bio-economy acceleration at regional level". The panellists were Prof. Dr. Hermann Lotze-Campen (Potsdam Institute for Climate Impact Research), Prof. Dr. Matthias Zscheile (BioEconomy Cluster), and Mr. Flavio Conti (European Network for Rural Development). During the panel discussion it was highlighted that bio-based products need policy support to be competitive, as the goal should be to substitute the fossil economy, which requires sufficient biomass capacities, but also an increase in demand. In addition, the gap between research and industry needs to be bridged, since research project takes years, while industry must enter the market fast.

Several times during the two days, between presentations, participants were encouraged to use an interactive tool and answer questions such as which sector of the bioeconomy they operate in, what is the main biomass source in their region, what are the main take-aways of the sessions, what specific example they can give on the topics.

2.6.5 Module 5

The second day of the cross-visit began with an overview of the regional bioeconomy challenges:

- Cooperation between sectors
- Lack of supporting legislation, legislation inflexibility, lack of incentive systems benefiting bio-based economy
- Market competition is leaded by market
- Funding to impulse SMEs
- Difficulty to coordinate actions between different financial instruments
- Information with the detail of regional level

The following workshop session was built around the topic of "Overcoming regional bioeconomy challenges based on collective experiences and knowledge". With the active involvement of the participants (by using an online polling tool), the following issues were discussed, then the inputs were prioritized:

- How to incentivize the systemic contributions of bioeconomy?
- What impact a bioeconomy strategy might/should have?
- In which ways could the gap between R&D and industry be closed?

The problems and the suggested solutions were very similar to the aspects mentioned by the companies on the first day of the cross-visit: harmonisation of regulations, the simplification of procedures, showcase of good practice examples, higher acceptance from the citizens, need for legislative support, awareness raising and networking between cross-sectoral (industry and R&D) actors. Among the potential impacts of the bioeconomy strategy, the impact on the performance of SMEs and on cross-sectoral cooperation, as well as the orientation towards local value chains and the improved use of bio-based side-streams, were highlighted.

The presentation of Prof. Dr. Anna Aladjadjiyan (Bulgarian Biomass Association) did not take place due to technical problem, but the presentation was made available after the cross-visit.

2.6.6 Module 6

Since it was an online cross-visit, there was no social event.

2.6.7 Feedbacks (post event survey)

Since the cross-visit was interactive, participants were also able to comment on the cross-visit during the event. However, no replies were received to the post-event survey sent out right after the cross-visit due to a technical error.

There were two main forums through which participants could hear about the event: websites and email. Participants were able to obtain information about the event from the POWER4BIO website, and the invitation was also sent by e-mail, besides that, the event was also visible on the DBFZ dissemination channels and on other online bioeconomy platforms.

2.6.8 Main findings of SWOT

In the conducted SWOT analysis regarding bioeconomy prospects in the region, eight factors were analysed:

2.6.8.1 Availability and use of resources

There are diverse biomass sources in the region (agriculture residues, wood residues, food waste, algae, microorganism, etc.), which are suitable for the development of building blocks for bio-based products and biochemicals. However, their availability highly depends on regional conditions, and import. There are further opportunities for the already exploited innovative use of waste resources, which can attract cooperation with surrounding regions and increase trust in technology owners and investors.

2.6.8.2 Infrastructure and industrial factors

High-tech research facilities, laboratories, several pilot projects, and demonstration plants are available in Central Germany, in addition the infrastructure is good, but precisely because of the many bioeconomy initiatives and projects, there is a risk of incoordination and disconnection between research and industry, and there is still a need to implement process technologies. There are further opportunities in a stable raw material supply and logistics through which bioeconomic activity can increase.

2.6.8.3 Research and innovation

In Central Germany, there are not only research and scientific institutions, but also active research networks, industrial clusters, and good examples of successful cross-sectoral cooperation between industry and research. However, the gap between industry and research still exists, as a research project takes an average of 3-5 years, while industry must enter the market within 1-2 years. Although data on bioeconomy are available, they are presented at an aggregated level, although disaggregated data would be required. There may be further research and innovation opportunities in the beech forest in the region and chemical industry.

2.6.8.4 Funding

On the one hand, EU funding is available, on the other hand, the R&D funding at national level covers several areas related the bioeconomy, and finally, bioeconomy is taken into consideration in the innovation strategies of the regions. However, there is a lack of initiative of bioeconomy actors to accede to potential funding opportunities, and the funding is non-sufficient for projects, which are no longer eligible for R&D funding, in addition, there is a risk that several activities from different sectors compete for the available funding. There are further opportunities to attract investors and develop innovative financial instruments to support new entrants.

2.6.8.5 Market/Economic aspects

From a market and economics point of view, the presence of the chemical and the wood working industries, as well as bilateral partnerships and networks, are considered strengths. However, the concept of bioeconomy is still unknown to many companies and the uncertain market access due to unstable demand for bio-based products counts as threat.

2.6.8.6 Transition towards bioeconomy

Although there is no specific bioeconomy strategy for the region yet, initiatives are already under-way, and the value chain for beech, sugar beet, cereals, bioethanol and biodiesel has already been defined. Central Germany is the technology hub for bioeconomy, which is expected to draw the attention of industry and political actors to the development of the regional bioeconomy, and experiences with regional bioeconomy strategy are also positive in Germany.

2.6.8.7 Public and institutional support/Governance/Policy framework

Institutional support is implemented through innovation strategies and programs. National strategies, regulations and programs provide the framework for bioeconomy, sustainable development, circularity, and waste management. The bioeconomy governance for the whole Central Germany region has not yet been developed, which would be important for integrative support. It is a threat that there are no unique rules in the EU for the registration and certification of bio-based products, and the registration process is often the same as for chemicals.

2.6.8.8 Social and environmental aspects

Among the strengths, it should be emphasized that the existing R&D projects and initiatives examine the sustainability of the bioeconomy sector at regional level (LCA, SLCA specific value chains). However, the awareness of bioeconomy and bio-based products is not broad in society. The generation of monitoring indicators and frameworks are key steps towards the follow up of sustainability within bioeconomy activities at national and regional level. Transition towards bioeconomy in the region with a coal mining background is a delicate process to be deal with care.

2.7 Nitra (Event Organiser: SUA)

An online cross-visit to the Nitra region took place on 23rd and 24th of September 2020 as part of the POWER4BIO project. The event provided participants with an opportunity to exchange knowledge, a space for dialogue and presented the state and development of the bioeconomy in Slovakia and the Nitra region. During the first day, experts and policy makers presented the position of the bioeconomy in the updated research and innovation strategy at national and regional level, activities and projects

implemented by the Bioeconomy Cluster and the BIOEAST initiative. The program also included an interactive part using mind-mapping software. On the second day, examples of good practice in the field of organic farming, plastic recycling and the production of nutritional supplements were presented. A portfolio of support services for entrepreneurs provided by the Slovak Business Agency was also presented, and at the end, the participants were introduced to innovative start-ups, finalists of the EIT Food RIS Innovation Prizes 2019 and 2020. The conference program can be found at the following link.

2.7.1 Module 1

Number of total **attendees was 58**, number of consortia partners was 33, number of Community of Interest members was 6, number of business stakeholders was 19, number of researchers was 33, number of policy makers was 6.

In the first module, two moderators from regional partners (Drahoslav Lančarič; Danka Moravčíková) greeted the participants and introduced the venue (Research Centre AgroBioTech) through oral presentations. They introduced the thematic structure of the agenda for both days and explained the "philosophy" of the content of cross-visit.

2.7.2 Module 2

Number of total **attendees was 58**, number of consortia partners was 33, number of Community of Interest members was 6, number of business stakeholders was 19, number of researchers was 33, number of policy makers was 6.

"Group work for developing or improving the regional bioeconomy" was organized in the module 2. Participants in the module were able to listen to five presentations about (1) the transition towards bioeconomy in Slovakia: position of bioeconomy in updated national RIS3 (Stanislav Hronček, Ministry of Agriculture and Rural Development of the SR), (2) Bioeconomy issues, barriers and challenges in regional context (Ján Veteráni, Viera Juricová, Nitra Self-governing Region, SUA), (3) Bioeconomy cluster as a key driver and institutional support in developing regional bioeconomy (Katarína Blicklingová, president of Bioeconomy Cluster), (4) BIOEASTsUP - supporting bioeconomy implementation and strategic thinking at the national and international level (Dana Peškovičová, National Agricultural and Food Centre), (5) SECCO2 network and collaboration possibilities among SECCO2 partners and P4B regions (Melinda Benczi, SECCO2 project representative).

The objectives of the presentations were: (i) to present the process of development of the regional bioeconomy strategy in a wider context aiming to highlight the interconnection and interlinks with ongoing process of RIS3 update, (ii) to point out the main problems and challenges in Nitra region related to preparation of bioeconomy strategy based also on the knowledge obtained by the implementation of P4B project, (iii) to explain the role of BEC in the process of the bioeconomy strategy development, (iv) to show the coordination and support role of the BIOEAST initiative, (v) to present cooperation possibilities and (vi) to motivate participants of the meeting to contribute to share their experiences in order to improve the concept of the regional bioeconomy model.

During the module, moderated discussion, chat and mail communication and mind mapping software were applied to support the contribution of the participants.

The results of this module were a structured model of strategic priorities for developing the regional bioeconomy strategy and concrete recommendations on solutions and actions. Based on the experiences gained in this module the following recommendation was made by the moderator: "*It is not necessary to put pressure on participants to interact immediately (in this "online era" most of them have to participate in more meetings with different topics everyday…). It seems that sometimes it is more efficient to let them think individually about the presented topics and respond after the online event."*

2.7.3 Module 3

The field visit was organized in the module 3, where 6 companies were introduced to the participants. During the online filed visits, number of total **attendees was 55**, number of consortia partners was 29, number of Community of Interest members was 4, number of business stakeholders was 19, number of researchers was 31, number of policy makers was 5.

Title 1: Research infrastructure for bioeconomy. Presented by Lucia Gabríny (director of the Research Centre AgroBioTech)

The objective of the presentation was to present laboratories of the AgroBioTech Research Center dealing with biomass and food - Laboratory of biomass gasification, Laboratory of bioenergy sources, Laboratory of analysis of biomass for bioenergy, Laboratory of cereal technology/Plant materials and point out the mission and goals of laboratories, and their research equipment and infrastructure.

The participants got an insight into the work of Research Centre AgroBioTech. The AgroBioTech Research Centre (ABT RC) of the Slovak University of Agriculture in Nitra is a university-wide, specialized facility which performs concentrated innovative research in the relevant fields aimed at conducting new methods and procedures in research, especially within applied research, with the express goal of transferring its results into practice. The ABT RC is equipped with state-of-the-art research infrastructure, thereby enabling the centre to conduct research at the highest level, applicable in practice, and consistent with the core needs of the priorities of agrobiology, the processing technology of agricultural products and the agri-food industry, biotechnology, genetic technologies, agroecology, bioenergetics, and bioeconomy. Its mission is to act as a regional Centre for applied research, integrating crucial research activities that will allow the centre to achieve a synergetic effect in using and enhancing the research potential of the Slovak University of Agriculture.

Title 2: Company BÚŠLAK (ecological agriculture). Presented by Ladislav Matyó, Director

The objective of the presentation was to present innovative business philosophy in the Slovakian agriculture sector. This Slovak company was established in 1995. Its main activities include plant production, dairy production, and oil production. The business philosophy is based on following principles: environmentally friendly production, organic or natural products, no waste from the production, oil production without chemicals and synthetic additives, keeping permanent high quality of production and products, producing attractive products with added value, utilizing synergic effects inside the company. The cooperation with research and development institutions is focused on results which are applicable in the production, and on projects which can add extra value to the products.

The main statements of this presentation were that the innovative business model not frequently occurring in the Slovak agriculture sector. The Director emphasized the role of the improvement of collaboration platforms in the field of research and innovation.

Title 3: GENERAL PLASTIC (plastics recycling). Presented by František Doležal, Director General

The objective of the presentation was to present innovations in plastic sector. General Plastic was founded in 2002 with focus on recycling of PET bottles with washed flakes and PET regranulate as the end result of production process. The company has expanded its production by PET preforms for producers of non-alcoholic drinks, vine and oils and recycling and producing of LDPE shrink foil. In 2015 the company doubled the capacity of PET preforms production. It is the biggest PET recycle company and the biggest producer of PET preforms in Slovakia. General Plastic, a.s. received a positive opinion from the European Food Safety Authority for the decontamination process in 2018. According to the type of processed PET bottles, washed PET flakes are produced in shades: clear, blue, green, mixed and crushed.

Title 4: ŽI DOBRE (pharmacological product). Presented by Andrej Ondrejmiška, Responsible Leader

The objective of the presentation was to present innovations in wine sector. The family company established in 2010 aimed at solving the waste problems in wine production by exploiting the organic mass and innovative processing of grape skins and grape seeds. They offer unique pharmaceutical product Polyfenol and are closely cooperating with the RC ABT on various scientific studies.

Title 5: Supporting services for bio-based entrepreneurship: regional office of the Slovak Business Agency. Presented by Milan Fiľa, Slovak Business Agency (regional office in Nitra)

The objective of the presentation was: (1) to present portfolio of existing different supporting schemes and mechanisms; (2) to stimulate entrepreneurial spirit; (3) to present examples of supported SMEs within the sector of bio-based entrepreneurship and supported SMEs in Nitra region; (4) to point out contemporary situation (2020-2021) and adapted forms of offered services (plans versus corona crisis).

Slovak Business Agency (till 28/2/2014 the National Agency for Development of SMEs) is crucial, and is the oldest specialized non-profit organization for the support of small and medium-sized enterprises (SMEs). Slovak Business Agency was founded in 1993 by a common initiative of the EU and the Government of the Slovak Republic. It is the unique platform of public and private sectors. The SBA offers more than 100 services and instruments - Financial Instruments, State Programmes, International Projects, EEN, Better Regulation Centre, ESIF Projects, National Business Centre.

Title 6: Innovative start-ups/finalists of the EIT Food RIS Innovation Prizes 2020. Presented by Adriana Kolesárová, EIT Food Hub at SUA in Nitra

The objective of the presentation was to present the support for young innovators and start-ups in agri-food sector at the SUA in Nitra with the EIT Food Hub scheme/project. EIT RIS Innovation Prizes is one of the largest start-up competitions in the agri-food vertical in Southern and Eastern Europe. EIT Food is looking for early-stage entrepreneurs and companies with innovative products or services that could transform the European agri-food sector. The prizes are awarded to most innovative companies to support the development of new products and services which can help transform the food system, making it healthier, more sustainable and more trusted.

2.7.4 Module 4

The so called *"Feedback session and wrapping up the discussion on the recommendations based on the field visits and group work"* session was organized within the module 4.

The objective of the task was to collect feedbacks on chosen best practice examples and on the quality of their online presentations and to gain the reflection of presenters from business sphere on the event. Last, but not least to present different types of stakeholders in the region in order to point out the existing possibilities for interlinking their activities.

The invited stakeholders consisted of representatives from research and academia, business sphere (different sectors, start-ups), and representative of agency which is offering services for entrepreneurs and for start-up entrepreneurs. The field visit aspirated to provide the participants with an overview on existing innovation regional ecosystem that could be utilized for the bioeconomy development in the region. The above declared objectives were met.

Based on the experiences of this module, the impacts were summarized in the following points:

- Improved networking and further collaboration between business and research/academia (concrete inspirations),
- Enlarged scope of knowledge of all presenters and participants about the regional ecosystem and increased level of utilization of existing possibilities.

2.7.5 Module 6

Due to the impacts of the COVID-19 situation the online programme (webex meeting) could not follow strictly the modules outlined at the beginning of the project.

2.7.6 Feedbacks (post event survey)

Based on answers given to the post-event survey, the cross-visit was well organized because the 53 percent of participant rated the event 9, 20-20 percent gave 10 and 8 grades to the cross-visit. The most liked part of the cross-visit was the field-visit, it was rated by the 66,7% of the participants. Because of the Covid-19 pandemic, the cross-visit was organized via Microsoft Teams. Accordingly, some technical issues arose during the event such as audio quality issues (4 participants mentioned in the post event survey) and a sometimes, the slide did not display properly (1 participant mentioned in the survey). Based on the suggestions of the 8 participants, the interactivity of the online event needs to be further improved.

2.7.7 Main findings of SWOT

2.7.7.1 **Availability and use of resources**:

Strength: There is an increasing tendency in the share of renewable energy sources (RES) from agriculture in total production of RES in Slovakia, especially in agriculture-based biofuel production. **Weakness:** Two major weaknesses were mentioned. First was the use of biomass (including waste) as a raw material for further processing, which is inefficient in the Slovakian P4B region. Second was the insufficient utilization of biomass potential from so-called white areas, e.g., for energy purposes. Three major **opportunities** of the region are the following: (1) active sustainable forest management, efficient use of indigenous resources of wood raw materials; (2) increasing demand for biomass triggering the need to increase production through an increase in hectare yields (limited possibilities for increasing cultivation areas) while taking into account environmental criteria and environmental protection requirements; (3) the need for a gradual (cascade) use of biological resources and an increase in added

value in the verticals concerned. Competitive use of land to produce food and animal feed and to produce renewable resources for material and energy uses is one of the major **threats** in the region. Furthermore, due to increasing demand for renewable energy, the access to wood raw material became difficult in the last decades.

2.7.7.2 Market/Economic aspects

The major **strength** is the many small "green" projects (relevant to the bioeconomy) implemented at the level of cities, regions and by non-profit organizations, NGOs. The low level of involvement of farms in the processing of primary agricultural products and the associated low value-added creation are one of the major weakness. Although, lower added value of wood industry, or relatively high export of raw wood and timber without higher added value and lack of new business models for private operators interested in the bioeconomy were also mentioned as **a weakness**. Seven **opportunities** were mentioned which were the following: (i) development of business activities in rural areas and creation of new value chains in the framework of the bioeconomy; (ii) long-term improvement of the position of agricultural entities in value chains, (iii) diversification of activities of agricultural and forestry entities related to the introduction of circular bioeconomy, the acquisition and processing of biomass, waste management, wood processing; (iv) increasing the contribution of the forestry-wood sector to the green economy within its potential to increase employment, resource efficiency, climate change mitigation, renewable energy production, low carbon economy; (v) strengthening advices on the bioeconomy theme; (vi) increasing the share of domestic production with higher added value and higher form of processing using biotechnologies and innovative technologies and (vii) use of digitisation and innovative technologies in agriculture. The major **threats** are the continuous focus of producers and processors on production volumes and low costs, without emphasis on added value and that the bioeconomic solutions are usually less economically efficient than fossil-based products in the first years.

2.7.7.3 Transition towards bioeconomy

The participation of the SR in the BIOEAST initiative and in the project BIOEASTsUP and building cooperation with countries of Central and Eastern Europe in support of bioeconomy and relatively significant success of the Slovak entities involved in projects supporting bioeconomy mainly within BBI JU, but also INTERREG, Horizon 2020 are the major **strength**s in this session. Insufficient involvement of Slovak subjects in Thematic Networks, Expert Working Groups (EIP-AGRI Focus Groups) and projects for EIP Operational Groups in the field of bioeconomy was mentioned as a **weakness**. The **opportunities** are the following in this region regarding this topic: (1) support for the involvement of Slovak participants (including farmers themselves or their representatives) in European Programmes; (2) allowing support of the bioeconomy through the measure Cooperation by setting up operational groups and their support in pilot projects within the EIP; (3) cooperation with international excellent workplaces and centers of competence; (4) networking and partnerships at international level, the use of international initiatives and platforms of the forestry-wood sector; (5) increasing synergies through cooperation based on quadruple, respectively quintuple helix concept; (6) support for the development of clusters and associations in the bioeconomy as drivers for promoting cooperation. **Threats** were not mentioned in this session.

2.7.7.4 Public and institutional support/Governance/Policy framework

Strengths are the following in this topic in this region: (1) the bioeconomy as part of the RIS3 strategy under the domain "Healthy Food and the Environment"; (2) dynamic development of the circular economy. Several **weaknesses** were mentioned such as unclear position of agriculture within national priorities, absence of a national strategy for the bioeconomy; inconsistency and fragmentation of policies relevant to the bioeconomy and ambiguity of its position and role in development policies; a poorly functioning system of advisory services for farmers; the lack of and unavailability of data for the development of a strategy for the bioeconomy and its subsequent monitoring and evaluation. Four **opportunities** were mentioned (i) to prepare and approve the Strategy for the Development of Bioeconomy in Slovakia; (ii) to include the support for the bioeconomy in the CAP 2021-2027, including allocation and relevant interventions; (iii) at sector level - strengthening cross-sectoral links with relevant sectors for the bioeconomy (environment, economy, health, finance, etc.) – to establish a Bioeconomy Council; (iv) to change the societal paradigm through strong European support for the use of wood as a green, renewable and recyclable raw material. **Threats** concerning these topics are a following: unclear definition of the bioeconomy, which may create confusion as to the eligibility of activities financed under the CAP (e.g. setting demarcation lines); increasing demand for biomass can lead to an increase in agricultural production prices, which can also lead to an increase in food prices and endanger the food security of some population groups; inconsistencies between European methodologies for national bioeconomy policy making; unwillingness and unpreparedness of the Slovak banking sector to finance innovation in the field of bioeconomy

2.7.7.5 Societal aspects

The main **strength** is the growing interest of society (especially the young generation) on topics close to the bioeconomy. Three **weaknesses** were identified. The first is the low level of information and public awareness of the benefits of bio-based products over fossil-based products. The second is that the bioeconomy – incomprehensible terminology for the public (e.g. differences/synergy between the bioeconomy, the green economy and the circular economy. The third is the non-existing concept of education at primary, secondary schools, universities for the field of bioeconomy. The major **opportunity** is the change a thinking of the younger generation. The preference of fossil-based products over biological products (price, distrust) is the main threats.

2.8 Andalucia (Event organiser: CAGPDS).

The POWER4BIO regional cross-visit to Andalusia happened on October 20th and 21st 2020 where the status of implementation of the Andalusian Circular Bioeconomy Strategy was explained, followed by practical examples and innovative projects as well as interactive sessions and a round table for sharing ideas among the participants. The conference program can be found at the following link.

This 2-day event was held online due to the current situation in which we find ourselves with COVID-19. However, this did not mean a problem for the participation in which between the two days almost 100 attendees of different nationalities were estimated. This visit is part of the actions of the POWER4BIO project, which aims to empower the regions to use the potential of the bioeconomy in their territories, accompanying them in the development and improvement of its policies, establishing collaboration frameworks and making available first-rate information on cross-cutting issues such as technologies or investment opportunities.

On the first day of the visit, the presentations of the Andalusian Circular Bioeconomy Strategy, the Bioeconomy Cluster, DIH-Agrotech and ICT-BIOCHAIN took place. In addition, it was presented how the POWER4BIO project is contributing to the Andalusian Circular Bioeconomy Strategy and connecting actors from different regions for the establishment of stable collaborations to increase the possibilities of initiatives in the circular bioeconomy in Andalusia. In addition, the participation of the attendees was encouraged through the mentimeter mobile application, which was very well received and pointed out some views of the attendees on issues such as the barriers and opportunities of the circular bioeconomy. On the other hand, we were very lucky to have an excellent panel of presentations in which entities with extensive experience in initiatives that carry the principles of circular bioeconomy in their DNA, such as Cítricos del Andévalo, DCOOP, CICAP, Biorizon Biotech, Aborgase and the BIOSWITCH (BBI JU) and Reinwaste (InterregMed) projects. To close the first day of sessions, top-level experts presented their vision on how the bioeconomy can be a development engine to overcome the current situation due to its strong local component among the participating entities were the Almería University, Wageningen and Eurada.

During the second day of the program, the visit focused on activities that allowed us to learn actual success stories in the territory that are implemented and whose viability is a good sample for future initiatives. In this case, participating entities were the Cajamar Foundation, Innovaoleo, CeiA3, La Caña Group and Byproduct place. The topics addressed focused on the viability and importance of biorefineries (especially of the olive grove, Innovaoleo), of the necessary training to implement this type of biorefineries (through CeiA3's Master's program focused on bioeconomy for the next academic year) and the work being carried out by the La Caña Group generating added value to the by-products they generate in the agribusiness as well as the work that the Cajamar Foundation has been developing for more than 40 years in this area and the market place developed by Byproductplace.

2.8.1 Module 1

Number of total **attendees was 65**, number of consortia partners was 15, number of Community of Interest members was 2, number of business stakeholders was 5, number of researchers was 30, number of policy makers was 10.

The objective of the first session was to give a short overview about the bioeconomy and circular economy in Andalusia. 4 presenters (Dr. Sol Cuenca, Mr Manuel García, Dr Ana Cabezas and Dr Nati Pérez) were involved in this session.

The **methodology** of this module was the following: The moderator started the event sharp on time and once number of participants reached a certain level near to number of registered participants. If number of participants is low, gave 5 minutes to wait for more participants. Then gives a few key points regarding the development of the event. Each presenter was introduced by the moderator while each speaker gave his/her talk using a PowerPoint presentation as support. Moderator thanked to speakers and provided questions from the chat.

Several **recommendations** were made by the regional partner on the content of this module, which were later considered when organizing next cross-visits. These were the following:

- Definition of tight time slot for each presenter.
- Appealing agenda with themes and examples of interest to a wide audience, easy to follow, with time for networking.

- Good preparation in advance and good communication skills are assets of course.
- Previous tests of online platform to deliver the event with speakers. Technical issues can happen however currently we all have quite good internet systems but having a couple of organisers with all material ready in case something goes wrong is a good idea.
- Boost participants to ask questions by making the first question.
- Make interactive sections.
- Full event no longer than 2 hours.

2.8.2 Module 2

Number of total **attendees was 65**, number of consortia partners was 15, number of Community of Interest members was 2, number of business stakeholders was 5, number of researchers was 30, number of policy makers was 10.

The **second module** aimed to explaining the work being developed by several entities regarding biomass resources, logistics, bioproducts and bioenergy and future market development which are the 4 target objectives of the Andalusian Circular Bioeconomy Strategy. For this reason, four modules were planned. 8 presenters (Mr Pablo Antonio García, Dr Nati Pérez, Ms Nerea Serrano, Ms Manuela Hernández, Dr Juan José García, Mr José Caraballo) were involved into the discussion. Similar **methodology** was applied in this module that we used in the first module.
Based on the presentations given in the module, the following findings/lessons learned were made:

- The bioeconomy is implemented in Andalusia in a wide range of entitites from academia, industry and the administration.
- More cooperation among all actors of the bioeconomy related value chain is needed to further advance in the region development as bioindustries and biorefineries at large scale are to be fully explored with a lower number of them running already.
- All entities that participated in the event highlighted the great potential of biomass in Andalusia with a major expansion to happen in near future.
- Participants from other regions were very interested in all success cases presented and aimed to keep in touch for further cooperation.

Several **recommendations** were made by the regional partner on the content of this module, which were later considered when organizing next cross-visits. These were the following:

- Align the aims of the events to organise with stakeholders to be able to offer them something such as visibility for their business, collaboration opportunities, knowledge exchange or the opportunity to explain their ideas/vision to expand their collaborations with other stakeholders (project collaborations, writing propossal applications for calls such as Green Deal, other funding opportunities…).

2.8.3 Module 3

The Module 3 – so called Field visits - was organised in online platform where different practices were introduced through presentations.

Number of total **attendees was 46**, number of consortia partners was 15, number of Community of Interest members was 2, number of business stakeholders was 5, number of researchers was 30, number of policy makers was 10.

Title 1: Viability study in biorefineries. Presented by Dr Sol Cuenca

The presentation was about biorefineries and their success through the presentation of an Andalusian example. The presenter emphasized the role of Andalusian agricultural biomass bioproducts in the pharmaceutical industry, human food, animal nutrition, cosmetics, chemicals and bioenergy. The presenter talked about the importance of the collaboration among different stakeholders (industry-academia-administration) in order to implement new biorefinery at industrial scale.

Title 2: Olive biorefinery: boosting sustainability of olive value chain. Innovaoleo. Presented by Mr José María Pinilla

The presenter introduced a case study on the sustainable olive value chain in Andalusia. Based on the presentations the following findings/lessons learned were made:

- To be feasible, a biorefinery project has to bring together and align many actors from very different sectors. These collaborations require new business agreements, strategic alliances or joint ventures that are not always easy.
- It is important to evaluate the possibility of obtaining multiple products in a cascaded approach to improve overall sustainability. Analyse the biomass options downstream of the production process.
- It is important to involve the business model, actors who already operate in a target sector, ensuring market access. Especially in innovative products or market niches that are difficult to enter.
- It is a key to take advantage of existing services in the already installed bio-industries to reduce the initial investment.
- The implementation of models such as collaborative innovation seems to be a key to guarantee success and shorten market access times.
- Biorefineries require long maturation times with important important investments in R&D.

Title 3: Grupo La Caña - Valorization of agro-industrial by-products in Grupo La Caña. Presented by Mr Ms Beatriz Molina

The presenter showed a case study on the valorisation of agro-industrial by-products in Grupo La Caña. Presentation of Grupo La Caña emphasised the role of different entities and highlighted several R&D projects in using by-prducts from avocado such as AVOCEMTUM project and Operative Group AGUACAVALUE. Based on the presentations the following findings/lessons learned were made:

- Waste reduction
- Transformation into useful products with greater added value.
- Positive assessment in society for those companies that optimize their relationship with the environment.
- Reduction of carbon footprint.
- Better adaptation to environmental regulations.

Title 4: Bioeconomy in ceiA3: resources, approach and master programme. ceiA3. Presented by Ms Lola de Toro & Prof. Julio Berbel

In this presentation, Ms Lola de Toro, Chief Executive Officer explained their resources and some projects they develop. On the other hand, Mr Julio Berbel, Professor at University of Cordoba, explained the new Master Programme on Bioeconomy. Based on the presentations the following findings/lessons learned were made:

- The Campus of International Excellence in Agrifood (ceiA3) is the result of the integration of the Universities of Almería, Cádiz, Huelva and Jaén, led by the University of Córdoba.

- ceiA3 is very active in projects related to the bioeconomy.

Title 5: Water strategy in Cajamar: 45 years of innovation and change. Cajamar Foundation. Presented by Mr David Uclés
The objective of this presentations was to show the water strategy of Cajamar from the traditional examples to the new innovative incubator.
In this presentation, a traditional view for water utilisation and solutions in the agrifood industry was shown in the context of Almeria province where Cajamar Foundation is located.
Title 5: Byproductplace: a digital platform for the commercial exchange of by-products and waste. - Welcome to a Circular Economy. Presented by Mr Ildefonso de Castro Parra, CEO & CFO
The objective of this presentation was to get an insight on the potential problem of Andalusian waste treatment/recyling.

2.8.4 Module 4

The Module 4 was the Feedback session and wrapping up the discussion on the recommendations based on the field visits and group work, which was hosted by Dr Nati Pérez.

Number of total **attendees was 46**, number of consortia partners was 15, number of Community of Interest members was 2, number of business stakeholders was 5, number of researchers was 30, number of policy makers was 10.

The objective of this module was to summarise the examples and projects on bioconomy already in place or under development in Andalusia. The following findings/lessons learned were made at the end of the module:

- There are many bioeconomy examples and projects in Andalusia already in place, however there is a need more investment to advance for example in the installation of biorefineries.
- Innovation, Knowledge and ICT play important roles in the bioeconomy development.
- The production system should be based in a major percentage in bioindustries but for this the vulnerability of farmers and the primary sector must decrease. Job creation is a serious need where the primary sector could be important by attracting the younger generations but to make it more attractive to them, innovation is key.
- Pilot plant cases are crucial as an initial point to create this bioindustry in the longer term.
- Funding opportunities for rural development in the regions is for so very important.
- The current situation within the COVID-19 pandemic has to be taken as a momentum for the system to change as there is a huge need to revitalise the economy where the natural environment plays a key role.
- More public awareness is needed in order to achieve the change and the further expansion of the bioeconomy.

2.8.5 Module 5

Number of total **attendees was 46**, number of consortia partners was 15, number of Community of Interest members was 2, number of business stakeholders was 5, number of researchers was 30, number of policy makers was 10.

The Symposium was organised in the module 5. Three presenters (Prof. Paco Egea, University of Almería, Mr Esteban Pelayo, EURADA., Dr Berien Elbersen, Wageningen University.) were involved in this

module, where the participants discussed on the bioeconomy at regional level involving the audiences in the discussion. Each speaker gave his/her view on bioeconomy aspect related to them. Also answered two questions raised by moderator:

- How bioeconomy effects their work and the importance in their daily basis and projects they are involved in.
- Their vision regarding the bioeconomy in the coming years, relation to Green Deal, Covid-19 issues, regional importance.

Based on the roundtable discussion the following findings/lessons learned were made:

I) Vision on bioeconomy in the near future:

- Conversion of our economy to a biobased and circular economy requires system changes. COVID epidemic helps to create a momentum for system change:
- Limit to depletion of natural resources,
- More awareness of how we live on this planet,
- Climate change impacts are increasing and more visible,
- •We are vulnerable which makes leading a healthier life more important (food, surrounding)
- We need to revitalise our economy, need new Jobs!
- We need to do this in harmony with the natural environment.

II) Requirements for development of circular bioeconomy:

- Market demand for biobased circular products needs to grow (awareness, education, companies & industries need to take up their responsibilities in relation to products put on the market, communication).
- Knowledge and R&D development: Good data, good public private cooperation in research & education
- Policies need to be put in place that facilitate the process of public and industrial awareness and action, provide solid facts & figures, stimulate and safeguard those actions that deliver public goods (clean sufficient water, GHG mitigation, biodiversity conservation), particularly those goods not paid for by the market.

III) Recommendations: barriers to address

- Absence of bioeconomy strategy
- Lack of transparency and policy coherence
- Fragmentation of policy instruments
- Timeframe of policy is uncertain: Long term vision and policy continuity are needed to build up investor confidence and to catalyse investment.
- Biomass availability: The sustainable mobilisation of sufficient and good quality biomass is essential to build the bio-based economy. Obstacles are among others low cooperation of farmers and foresters, absence of whole-year availability of the biomass (seasonality), uncertain provenance, challenging logistics, low quality and sustainability.
- Need for research and innovation that are required to design a bioeconomy that fits to the regional potentials
- Vague goals and no operationalisation in policies
- Public awareness and stakeholder acceptance, and lack of demand-side policy.

IV) How to extend bioconomy at regional level:

- Incorporation of knowledge, technology, and innovations to the production system

- Fostering bioindustries: to achieve business diversification and jobs, which diminish vulnerabilities.
- Bio-inputs, to boost resilience to stress.
- Digitalisation of agri-food chain
- Biomass valorisation
- Compost, feed, soil restorations, energy
- Extraction industry: Nutraceuticals, pharma, cosmetics
- Lignin, cellulose, hemicellulose catalysis conversion C5-C6 platform bio blocks and H2 production
- Alternative crops, biomaterials and compounds eg Hemp, Cannabis
- Shifting to a Clustered value chains, also including linking in land and small producers with richer coastal cities
- Valorisation of externalities
- Investors attraction and important role of financial entities, as an example Cajamar is committed with Bioeconomy implementation, mainly in South and East Spain

2.8.6 Module 6

Due to the impacts of the COVID-19 situation the online programme (webex meeting) could not follow strictly the modules outlined at the beginning of the project.

2.8.7 Feedbacks (post event survey)

23 participants answered to the questions raised in post-event survey. The main reasons of the participants for attending this event were that the topic in the cross-visits linked to their job (18), and to get insight best practices/examples (11). But the networking possibility was also highlighted by 13 people. The 95.7 percent of the respondent answered that the cross-visit met their expectations. 8 participants rated the conference as 9 on a scale of 1 to 9 while 7 participants gave 8.

2.8.8 Main findings of SWOT

2.8.8.1 Availability and use of resources

The existence of a strong base for production capacity of biomass resources from agriculture, livestock production, agri-food, forest and fishing sectors; availability of other flows of biomass resources of interest that can be recovered such as sludge from sewage systems and biowaste produced at local level; progressive optimization in the management of biomass resources generated by the agricultural and agri-food sectors due to the extensive experience that exists concerning its bioenergetic use and the concentration of biomass resources with potential use in certain areas of Andulasia makes it a strong region for bioeconomy potential. ***Despite the strong ,raw material base,*** the seasonality of resources and logistics; limited knowledge on the characteristics of a great variety of biomass resources with potential as raw material to produce innovative bioproducts; deficient management of the by-products derived from livestock production; insufficient management of forest resources; ignorance of the balance between the potential demand of alternative raw materials to biomass and the availability of the latter are some of the weaknesses the region is facing. ***The*** development of new techniques for the transformation of resources and the application of new technologies through implementation of digitisation; possibility of increasing the competitiveness of the primary and secondary sectors

through the development of new bioproducts; excellent regional weather conditions to produce biomass; existence of a biotechnological environment adapted to favour the use of the biomass resources generated; increase of the volume of residues in dumps; existence of new management methods for solid urban biowaste; advantages of the transformation of by-products and waste into resources concerning the saving of greenhouse gases, a guarantee of the sustainable development and contribution to the mitigation of climate change; normative changes in the European and/or national legislation in order to favour, stimulate and even force to achieve the full re-use of by-products in the production lines are new frontiers for the region which presents unexplored opportunities to expand bioeconomy. Strong market competition due to availability of biomass resources at better prices and of major quality in other regions; reduction of the biomass resources available because of climate change; changes in legislation that can harden the requirements to recover or manage biomass resources poses a threat to the future of bioeconomy across the region.

2.8.8.2 Infrastructure and industrial factors

The existence of advance infrastructural system across the region increases its competitive advantage in bioeconomy. The existence of a well-adapted infrastructural network for efficient operation characterised by; important concentration of biomass resources in certain areas of the region, a fact that facilitates the logistics of their management; existence of storage facilities and collection centres for biomass resources in certain productive sectors; availability of logistic infrastructures for certain biomass resources that can be used in other value chains; existence of biomass transport companies that might deliver to new bio-based industries or biorefineries; use of the logistic development associated with the bioenergy sector in other value chains of bioproducts derived from the expansion of the circular bioeconomy. ***Weaknesses:*** the need to increase infrastructure for use as biomass collection centres or inexistence of appropriate collection infrastructures; existence of logistic centres optimized for a certain value chain owned by their stakeholders. ***Opportunities:*** important transport infrastructure network (roads, railroads, ports); the possibility of improving and computerizing the logistic operations by means of the use of ICT. ***Threats:*** high transport costs of certain flows of low-density biomass resources, transport costs very dependent on the volatility of the price of fossil fuels; excessive importance of the transport by road with its consequent impact on GHG emissions; deficiencies in the connection between the regional Andalusian centres and other international markets (Mediterranean Axis and Trans-European Transport Networks).

2.8.8.3 Research and innovation

Strengths: adaptation of the Andalusian scientific production to the European priorities proposed for industrial matters; some of them directly related to the circular bioeconomy; involvement of Andalusia in international projects related to the circular bioeconomy and in technology transfer groups in the sectors of interest for the circular bioeconomy; knowledge, experience, human capital, technological capacity and dimension in innovation areas related to the circular bioeconomy, as well as in leading companies; critical mass of scientific-technical staff in the field of the circular bioeconomy; network of research and training centres and infrastructures on agriculture and agri-food processing as well as technological parks related to sectors with a great potential for the circular bioeconomy; presence of important driving poles for productive innovation with implications in circular bioeconomy (agri-food industry, chemical sector, renewable energies); promotion of research oriented to the bioeconomy as a priority defined in the Andalusian Innovation Strategy 2020, RIS3 Andalusia, through projects of excellence. ***Weaknesses:*** funds that can be allocated to research and innovation to be insufficient; poor

links between scientific production and the market. Lack of patents and real applications of the research on circular bioeconomy; difficulty in the definition of strategies related to the circular bioeconomy in the medium- long term successive research programmes according to a complete alignment with the national and European R&D+i policies; lack of information, training and skills, networking, cooperation, etc. in circular bioeconomy to produce new innovative actions; poor number of spin-off or start-up companies based on the knowledge on circular bioeconomy compared to the size of the Andalusian system; insufficient adjustment of the training offer to the needs and specificities of the professional staff working in the agricultural, food processing, environmental, forest and fishing sectors related to the circular bioeconomy; lack of joint initiatives between the R&D+i system and the sectors associated with the circular bioeconomy, especially, in relation with the real needs of the above mentioned sectors. ***Opportunities:*** progress continues to be made in the field of research, as could be seen from the companies participating in our regional visit. We must continue to work in this direction; network of scientific-technological infrastructures that generate important environments of opportunities in the region, consolidation of the programme to support research groups that will contribute to the organisation of the research and development work developed by universities and other R&D+i centres of Andalusia; experience in the participation and leadership of European R&D+i projects; room for improvement in the exploitation of synergies between the different agents of the Science, Technology and Business System; "Carry-over" effect of the cases of success in the dissemination of processes and good innovative practices; territorial specialization strategy oriented to intensive and high added value segments with skilled human capital; attraction of research talent from other regions using particular programmes. ***Threats:*** resources of the R&D+i system may not be efficient enough to attract and retain the human capital of the Science, Technology and Business System; growing international competence in terms of resources, talent, technology and attraction of R&D+i investments; relative disconnection between the business structure and the Andalusian knowledge system. Moreover, the limited activity of many components of the latter results in the reduction of the improvement and development potential of the most innovative industry; limited number of companies that use the public R&D+i system compared to its size; insufficient appreciation of research in general and of researchers in particular, especially by the business fabric; incidence of the economic crisis in the number of companies classified as innovative, as well as in the expenditure on innovation; existence of barriers for the mobility between the R&D+i staff of the public and private sectors.

2.8.8.4 Funding

Strengths: possibility of submitting applications for funding to the calls of the Joint Undertaking for Bio-Based Industries, Green Deal call, Horizon Europe; availability of budget on the structural funds (principally ERDF and EAFRD) and European investment funds to fund actions to stimulate and promote the circular bioeconomy; possibility of funding projects through the Spanish Ministry for Economy and Business (CDTI, INIA…); existence of cross-cutting policies of the Regional Government of Andalusia that promote and support the circular bioeconomy. ***Weaknesses:*** lack of knowledge on how these financial instruments are articulated and how to access; poor flexibility of the funding instruments existing for Technology-based Businesses (TBB) that do not bear in mind the life cycle of business projects as a whole; difficulty to fund comprehensive projects due to the incompatibility between funds (divided by competences). ***Opportunities:*** possible synergies with other public funding lines available (national or European funding such as European Investments Bank or Structural Funds); collaboration network between some public, private and financial institutions; existence of both public and private

financial intermediaries (European Investments Bank, European Investment Fund); possibility of creating intermediate credit lines (combination of regional public resources with other at national or European level); positive evolution of the foreign investment in the region; growing interest for sustainable investment; visibility of the region at European level thanks to other projects. ***Threats:*** poor involvement of the private sector in R&D+i funding; limited access to credit to undertake or innovate, aggravated by the current economic situation; risk of sustainability of the R&D public sector in the current situation due to a lack of alternatives to direct financing; limitations in the access to traditional loan instruments (loans and credits); shortage of alternative funding and credit options; problems to access to private funding by the private sector, especially, SMEs.

2.8.8.5 Market/Economic aspects

Strengths: high value-added products with great market acceptance are produced, such as those derived from algae production, avocado, etc. An example seen in the cross-visit was the case of Cítricos del Andévalo, which generates its own biogas for heating and electricity self-consumption; existence of a consolidated market for biofuels; existence of a demand already established for particular bioproducts (plant debris for composting or manure for organic amendments) that can boost the demand for bioproducts; experience of Andalusia in the sustainable chemistry sector, both concerning the bioproducts that can be obtained and their current and/or potential markets, as it has been selected as demonstrator region. ***Weaknesses:*** strong competition from non-bio-based products; limited knowledge on alternative uses of different raw materials and their introduction in alternative value chains in the field of circular bioeconomy; lack of detailed analyses concerning the potential applications of by-products and the available waste of biological origin and companies potentially interested in them; lack of innovation business culture to face the technological adaptation to new products and manufacturing processes; reduced number of medium-large companies that will allow the development of business projects in the medium-long term; lack of a clear and recognized regulation of the products of biological origin. ***Opportunities:*** expansion of an innovative market vs the traditional one; existence of a consolidated activity in fields directly linked with new models of sustainable development (renewable energies, healthy food, etc.); growing social demand of sustainable products that can lead to the development and expansion of circular bioeconomy; importance of sectors such as organic farming, integrated production, animal feed, etc. for potential bioproducts' consumers; potential for the production of fertilizers and other products of major added value from biomass resources (sludge from swage systems, biowaste produced at local level). ***Threats:*** uncertainty concerning the development of the possible markets arisen from the productive areas that must be part of the Andalusian circular bioeconomy; difficulties faced by the business sector in general, and of innovative companies, in particular, to access to new markets or to keep the leadership quotas reached in certain areas compared to the international competitors; increase of the energy cost and uncertainty in its regulative framework, especially concerning renewable energies; competition with cheaper products derived from the fossil energy or with products of other markets regulated by different legislations; lower production performances of bioproducts.

2.8.8.6 Transition towards bioeconomy

Strengths: the new model is gaining ground over the fossil fuel based one due to social awareness and the new global situation due to COVID-19; important agro-industrial business fabric with capacity to participate in bio-based processes that also have experience in certain technological developments aimed at the efficient use of resources; experience in circular bioeconomy resulting from its selection

as model demonstrator region for sustainable chemistry; existence of a biotechnological ecosystem that favours the transformation and recovery of the biomass resources of Andalusia. ***Weaknesses:*** lack of technological developments specifically adapted to every type of biological resource and industrial process; little development of the integrated biorefineries and bio-based industries. ***Opportunities:*** the current situation, both economic and environmental, presents a great opportunity to accelerate the transition to the bioeconomy; great potential for the implementation of the use of biomass by applying biorefinery concepts in diverse Andalusian sectors (olive growing, fruits and vegetables...); development of bioindustries and biorefineries on a small scale in the Andalusian rural areas; possible transformation and/or remodelling of biodiesel production plants into biorefineries; growing interest in the use of resources of biological origin and the circular economy by part of the European industry; existence of support policies for entrepreneurs and the consolidation of innovative companies; existence of technologies for the production and use of biogas from biomass resources; increase of the bioenergy demand. ***Threats:*** high transport costs of certain flows of low-density biomass resources; certain legislative developments that hinder and hamper the use of by-products and waste; regulatory changes that may affect the transformation of biomass.

2.8.8.7 Public and institutional support/Governance/Policy framework

Strengths: development of new relations and collaboration methods and formulas for the development of innovative projects between the institutions and the companies associated with the circular bioeconomy of Andalusia; possible synergies between the sectors involved (suppliers, transformers and users of residues and bioproducts) in the region; progressive dissemination of the new model represented by the circular bioeconomy in the different centres of the Regional Ministries of Andalusia; development of policy and planning tools related to circular bioeconomy; political commitment in all the areas to the bioeconomy and the circular economy, which favours the organisation of events and forums where contacts are established. ***Weaknesses:*** unawareness of what the circular bioeconomy implies for certain business areas and the public sector; lack of facilitating schemes to create alliances between companies, sectors and research bodies in the field of the circular bioeconomy; lack of a single resource that gathers the whole regulation and funding opportunities related to the different raw materials, products and processes associated with the circular bioeconomy; rigid governing models in Public R&D+i Institutions that hinder the development of the circular bioeconomy. ***Opportunities:*** institutional support and commitment to the sustainability in the territory; regulatory provisions and planning tools in the field of environment and sustainability; technological dimension and development of the Andalusian Public Sector to allow it to act as a demand, public procurement of innovative solutions and companies' driver. ***Threats:*** bureaucratic burdens and excessive administrative procedures that entail important obstacles for entrepreneurship; administrative difficulties for the implementation and development of projects in the territory (for example, innovative projects).

2.8.8.8 Social and environmental aspects

Strengths: there is an opportunity to generate employment and to promote biodiversity and combat the effects of climate change; further progress in the sustainable and efficient use of natural resources***.*** ***Weaknesses:*** there is a need for even greater social awareness of the bioeconomy, especially at the educational level; unawareness of what the circular bioeconomy is and what it represents by great part of society; weaknesses in the promotion of the products and services that shape the Andalusian productive system and among them, those derived from activities associated with the circular bioe-

conomy. ***Opportunities:*** existence of entities that create synergies and of social communication networks on science that can disseminate the advantages offered by circular bioeconomy to society. ***Threats:*** lack of clarity in the dissemination of the circular bioeconomy concept, what hinders its understanding among the different stakeholders.

2.9 South Bohemia (Event organiser: USB)

On November 30th and December 1st 2020, the POWER4BIO online cross-visit to South Bohemia, Czech Republic, took place. On the first day, high -level speakers from Czech ministries, administration bodies, industry and academia presented and discussed the political and economic support of bioeconomy, research and education activities in the Czech Republic and South Bohemia. Several projects and initiatives gave an introduction to their activities in the field of bioeconomy, also the Bioeconomy Platform for the Czech Republic was explained to the participants. The conference program can be found at the following link.

The second day focused on the practical part of bioeconomy and regional bioeconomic activities. Main examples of bioeconomy practice within the Czech Republic and South Bohemia were presented as well as the practical activities and results of the work of the Regional Bioeconomy Hub (RBH) of South Bohemia. A short movie presenting three good examples of bioeconomic practice within the region and main outcomes from RBH meetings was introduced, too.

2.9.1 Module 1

Number of total **attendees was 82**, number of consortia partners was 23, number of Community of Interest members was 3, number of business stakeholders was 7, number of researchers was 57, number of policy makers was 6.

General welcome speech and outline of the cross-visit was shared by doc. Dr. Ing. Dagmar Škodová Parmová, Dean of Faculty of Economics, University of South Bohemia and doc. Ing. Eva Cudlínová, CSc., Czech leader – POWER4BIO, Faculty of Economics, University of South Bohemia.

2.9.2 Module 2

Number of total **attendees was 82**, number of consortia partners was 23, number of Community of Interest members was 3, number of business stakeholders was 7, number of researchers was 57, number of policy makers was 6.

Module 2 was composed of 2 sections. Title of section1 was “The political and economic support of bioeconomy in the Czech Republic and South Bohemia Region” and title of section 2 was “Situation within research and education activities in bioeconomy in the Czech Republic and South Bohemia Region”. In section 1 the moderator was Dr. Jan Vávra, Ph.D. - Faculty of Economics, University of South Bohemia and the following presentations were held Preparation of Circular Economy Strategy in the Czech Republic by Ing. Bc. Jan Maršák, Ph.D. - Ministry of Environment of the Czech Republic; Activities in bioeconomy, BIOEAST Initiative by Ing. Iva Blažková, Ph.D. - Ministry of Agriculture of the Czech Republic; Regional position of bioeconomy in updated national and regional RIS3 by Ing. Jan Jareš - JVTP – South Bohemian Science and Technology Park, corp.; and Bioeconomic activity České Budějovice City by Ing. Viktor Vojtko, Ph.D. - Representative of the Statutory town of České Budějovice.

Moderator of section 2 was Ing. Nikola Sagapova – Faculty of Economics, University of South Bohemia. In section 2 the following topics were presented Assessment of the biomass potential in Czech Republic by Markus Dettenhoffer, Ph.D. - Executive Director of CEITEC – Central European Institute of Technology. Project CELEBIO; Bioeconomy in National Forest Strategy and Forestry in Selected European Countries by Ratna Chrismiari Purwestri - Faculty of Forestry and Wood Sciences of the Czech University of Life Sciences Prague; Bioeconomy Platform of the Czech Republic doc. Ing. Hájek, Ph.D. - Faculty of Forestry and Wood Sciences of the Czech University of Life Sciences Prague; Regional Contact Organization South Bohemia contact for the European Research Area by Ing. Michaela Novotná South Bohemian Agency for Innovation Support and University of South Bohemia 2016-2019 by Bc. Josef Maxa - Faculty of Economics, University of South Bohemia Bioeconomy Courses

The objective of the module was to describe the Czech Republic's regional bioeconomy development and the mapping of bioeconomy potential and running bioeconomy activities in research and education at the regional and/ or national scale.

The presenter from CzechInvest could not attend the meeting at the last moment. Besides this there were no problems reported.

Major takeaways are as follows: "There is wide range of bioeconomy activities in the South Bohemia Region / in The Czech Republic from research and research results waiting for spin off opportunity, networking activities based on different project and/or as a result of voluntary activity of participating stakeholders to entrepreneurship in regional bioeconomy. To make further steps it is needed to have some political, legal and economic framework for these activities. The stakeholders are using networking (association, platforms etc.) to emphasize bioeconomy topics in existing strategies updates and also will likely to influence the shape of future national bioeconomy strategy. Discussion to the presentation České Budějovice bioeconomic activity – Incineration. The solution proposed is without any doubt an improvement of current state but from another point of view it is not fully reflecting the last accessible technologies."

2.9.3 Module 3

A Short video "POWER4BIO project - University of South Bohemia" was presented to the audience. On YouTube there are two videos available both in Czech and English language POWER4BIO CZ (8 min) https://youtu.be/UyTfLR3XKq4; POWER4BIO AJ (8 min) https://youtu.be/Po6vetHlSug; POWER4BIO CZ (1 min) https://youtu.be/B9UeuvsC20U POWER4BIO AJ (1 min) https://youtu.be/OwD-m-VBzsI The organizers reported that the Video was supposed to be changed after the recommendation of Christine Beusch – change of the map in the introduction and the set up within the YouTube channel were to be modified.

2.9.4 Module 4

Due to the impacts of the COVID-19 situation the online programme (webex meeting) could not follow strictly the modules outlined at the beginning of the project.

2.9.5 Module 5

The objective of the module was to present good practice examples and the development of South Bohemian RBH/ South Bohemian Association for Bioeconomy. The first section's moderator was doc. PhDr. Miloslav Lapka, CSc. - Faculty of Economics, University of South Bohemia. Topics presented were

Circular (bio)economy in the Czech Republic by Dagmar Milerová Prášková - INCIEN - Institute of Circular Economy, Prague; The Real Green Deal by Bc. Hana Gabrielová - CzecHemp cluster president; Modification of a polyurethane adhesive for gluing lignocelulosicmaterials using polyurethane recyclateas a filler by doc. Ing. Martin Jankovský, Ph.D.- Faculty of Forestry and Wood Sciences of the Czech University of Life Sciences Prague; Hydal project by Mgr. Vlaďka Matušková, MSc. - NAFIGATE Corporation and Garden and kitchen biowaste management in households by PhDr. Jan Vávra, Ph.D. - Faculty of Economics, University of South Bohemia.

The second section's moderator was doc. Ing. Eva Cudlínová, CSc. - Czech leader – POWER4BIO, Faculty of Economics, University of South Bohemia. Topics presented were Introduction to Microalgae Biotechnology by prof. RNDr. Jiří Masojídek, CSc. - ALGATECH – The Centre of Algal Biotechnology; Aquaponics as an example of long-term sustainable food production by doc. Ing. Jan Mráz, Ph.D. - Faculty of Fisheries and Protection of Waters, University of South Bohemia; Biogas station – decentralized sources of renewable energy by Ing. Miroslav Kajan - Town water management Třeboň; Outcomes of our RBH group works by doc. PhDr. Miloslav Lapka, CSc. - Faculty of Economics, University of South Bohemia. The main outcomes from the workshop were summarized by doc. Ing. Eva Cudlínová, CSc. - Czech leader – POWER4BIO, Faculty of Economics, University of South Bohemia. Major takeaways are as follows: "Presentations showed several bioeconomy businesses and practices that could represent both traditional and new high technology form of bioeconomy in the region and also in the country. The POWER4BIO project helps to bring the bioeconomy topic from the (mainly) research field into public sector, which might help to promote and make more visible existing activities, projects, businesses and also encourages stakeholders to start further activities in the bioeconomy field. Despite the COVID 19 situation that was not good for networking the South Bohemian Association for Bioeconomy was established as a follower of the POWER4BIO regional bioeconomy hub (RBH). The South Bohemian Association for Bioeconomy became a Regional Innovation Platform."

2.9.6 Module 6

Due to the impacts of the COVID-19 situation the online programme (webex meeting) could not follow strictly the modules outlined at the beginning of the project.

2.9.7 Feedbacks (post event survey)

81.6 % of conference participants attended by direct invitation. 5.3 % learned about the event through advertising. 13.2 % stated that they learned about the conference in a different way. 42.1 % attended because of the presentations. 23.7% stated that the reason was networking. 15.8% participated due to technical visits. 10.5 % said that the reason were lectures. The majority of participants, i.e. 79 %, marked the values 8-10 on the axis 1-10, where 10 means the most. The answers mean that there is interest among respondents to recommend the conference to their friends and colleagues. 31.6 % described the conference as excellent. 60.5 % as very good. 7.9 % described it as a good conference. Some participants pointed to minor technical problems. 71.1 % described the event as very organized. 26,3 % even described the event as extremely organized. 2.6 % marked it as somewhat organized. 52.6 % stated that they received most of the information. 23.7 % of participants received all the information they wanted. 21.1 % received some of the required information. Some participants reported positive feedback from the event. They thanked the organizers for organizing a conference on bioeconomic topics.

2.9.8 Main findings of SWOT

2.9.8.1 Availability and use of resources

In South Bohemia there are strengths in the context of preserved natural environment in general, rural landscape, wood wastes and agriculture tradition. There are some weaknesses regarding energy crops and the technological capacity for advanced use of bioresources.

Opportunities seem to be provided by the CO_2 neutral strategy of EU and the low prices of wood due to bark beetle attack in the Šumava Mts. and other forests in the region, or natural externalities that are preferred by tourism. It is a threat that subsidies are oriented towards traditional way of production and resources use, there is missing regular support from EU and the state, lack of legislation supporting bioeconomic use of resources.

2.9.8.2 Infrastructure and industrial factors

In South Bohemia strengths are provided by the high added values of experimental infrastructure of ALGATECH – The Centre of Algal Biotechnology, aquaponics - University of South Bohemia and a network of biogas station – an attempt for circular economy in town Třeboň. There are some weaknesses in the context of experimental businesses, dependence on international projects and high prices of products (mainly algal products).

Opportunities seem to be provided by increasing support of the EU and the EU's CO2 strategy followed by national Ministry of Industry and Trade, Ministry of Regional Development as well as Ministry of the Environment. The following is considered as threat according to the partners: Bioeconomy is currently non profitable sector from the economic point of view and infrastructure is missing in terms of highway and speed train corridor.

2.9.8.3 Research and innovation

There are strengths in the context of the Academy of Sciences, the University of South Bohemia in České Budějovice and the South Bohemian Association for Bioeconomy. There are some weaknesses regarding the traditional way of teaching separated subjects, the rare support allocated to interdisciplinary study programs by the universities and the confusing interrelations between the approaches of bioeconomy, circular economy and green economy.

Opportunities seem to be provided by the EU's CO2 strategy, the visible consequences of global climate changes and an increase in the number of good practices in bioeconomy. The dogmatic mainstream of neoclassical paradigm in teaching economy and not sufficient education in bioeconomy is considered a threat.

2.9.8.4 Funding

There are strengths in the context of H2020 projects in the region and other R&D projects financed by the EU. There are some weaknesses regarding subsidies oriented towards traditional way of production and resources use and the lack of state funding of commercial use of research projects results.

Opportunities could be provided by the fact that bioeconomy is embedded in the strategy of regional development in Smart Region South Bohemia 2019 – 2023 and the South Bohemian RIS3 (Regional Initiative Strategy) covers the domain of "Biotechnology for sustainable development". Threats lie

within the missing national bioeconomy strategy, confusing legislation and the lack of decisions by relevant institutions.

2.9.8.5 Market/Economic aspects

There are strengths in the context of traditional consumer preferences of local products: brand of food production in South Bohemia region, breweries Budweiser, local breweries, milk production Madeta, furniture Lišov. The lack of trust between businesses, organizations and the lack of market overview of potential partners, furthermore small benefits generated by co-operations (advantages and synergies not apparent) are weaknesses.

Opportunities could be provided by consumers being aware of meeting sustainability needs, increasing pro-environmental preference or environmentally friendly branding. Threats lie within the lack of decisions by relevant institutions, too competitive mind-set (cooperation versus competition), high prices of modern biobased technology and low economic efficiency in the phase of initiation.

2.9.8.6 Transition towards bioeconomy

There are strengths in the context of high potential of knowledge system in the Academy of Sciences and the University of South Bohemia in České Budějovice. Missing bioeconomy strategy at national level, scheduled for 2025 and the lack of public information on bioeconomy are weaknesses. Opportunities lie within the South Bohemian Association for Bioeconomy, a platform for information and networking and formulating bioeconomy strategy. The delay of modernization of the national economy and the delay in energetic politics changes, the transition to coal free energy planned for 2038, is considered a threat.

2.9.8.7 Public and institutional support/Governance/Policy framework

There are strengths in the context of the changes in consumers' preferences to environmentally friendly products and the active environmental NGO's in the region. The lack of pro-bioeconomy legislation, the lack of suitable institutions and the lack of bioeconomy agenda in political parties are weaknesses.

Examples of good practises of circular economy at local level, effective SMEs could be considered as opportunities. Threats: Pandemic of COVID-19 brings other priorities. Bioeconomy seems to be like a lateral experiment, not real transition of economy and there are no green parties either in regional and national governance or in the parliament.

2.9.8.8 Social and environmental aspects

Strength: There is increasing awareness of environmental threats and there are well preserved rural and forest landscape in South Bohemia region. It is a weakness that the Czech society is not ready for cultural, economic and institutional issues of the bioeconomy and there is a slow change of the society and social behaviour.

New approaches of knowledge production (inter- and trans disciplinarity, sustainability) and social ecology, environmental sociology could bring some opportunities. Plans for traditional industrial development of the region and the legislative barriers, particularly in the food cycle, are considered threats.

2.10 Mazovia (Event organiser: MAE)

Due to COVID 19, the cross-visit to Mazovia took place online for two days: January 20-21, 2021. On the first day, the morning session was an introduction to the economy of Mazovia presented by the Representative of the regional authorities. The presentations concerned the resources and potential of bioeconomy development in the agricultural and waste management sectors. Then the process of transition to the bioeconomy was presented, along with social aspects. The second part of the session on the first day dealt with the research and innovation situation in the field of the bioeconomy. Then, the bioeconomy development strategy document in Mazovia, developed as part of the POWER4BIO project by Regional Bioeconomy Hubs (RBHs), was presented. Information on public and institutional support for bioeconomy activities closed the first day of the POWER4BIO cross-visit. The conference program can be found at the following link.

2.10.1 Module 1

Number of total **attendees was 68**, number of consortia partners was 18, number of Community of Interest members was 35, number of business stakeholders was 1, number of researchers was 11, number of policy makers was 3. These numbers were the same in all modules.

General welcome speech and outline of the cross-visit was shared by Aleksandra Luks; Marek Pszonka; Ignacio Martin Jimenez; Mariusz Rukat.

2.10.2 Module 2

The objectives of the workshop were as follows: Presentation of the resources and potential of Mazovia in the development of bioeconomy, the situation of bioeconomy in Poland and in the region, research and innovation in bioeconomy. Presentation of the developed bioeconomy development strategy in the Mazowieckie Voivodeship. Presenters were Aleksandra Luks; Urszula Pawlak; Marta Król; dr Marek Hryniewicz; dr Piotr Wieczorek; Marek Pszonka.

Major takeaways were that there is certainly a large potential for bioeconomy development and there is a low public awareness of the bioeconomy. Recommendations for public awareness and implementation are needed.

2.10.3 Module 3

Title of the first “Field visit” was “The future of single-use food packaging according to BIOTREM. Biodegradable single-use tableware and packaging made from plant-based raw materials - by-products and waste of the agri-food industry”. Artur Bednarz, BIOTREM, provided insight into various aspects of the bioeconomy (product development and commercialization) and networking opportunities. BIOTREM uses extremely flexible technology that is easy to move and highly scalable. Thanks to the Biotrem technology, 1000 kg of raw material can be easily transformed into more than 10,000 plates or bowls. Product Biotrem: disposable wheat bran dishes fully biodegradable, compostable at home in just 30 days. Wheat bran tableware is an excellent alternative to disposable plastic or paper products. The market for biodegradable disposable tableware and packaging is one of the fastest growing sectors.

Title of the second “Field visit” was “Work of the KEZO Research Centre on energy systems including biomass”. dr inż. Patryk Chaja, Polish Academy of Sciences, Research Centre Energy Conversion and

Renewable Resources, presented the scope of activities at the KEZO research centre. It is a test-side for devices producing and storing heat, cold and electricity from RES as well as test side of software for management of generation and consumption of energy.

2.10.4 Module 4

Presenters were Artur Bednarz; Patryk Chaja; Marek Hryniewicz; Piotr Gradziuk; Urszula Pawlak; Marta Król. Objective of the module "Feedback session and wrapping up the discussion on the recommendations based on the field visits and group work"was to identify relevant innovations, technologies, knowledge and the needs and barriers for further developing the bioeconomy. Problem faced during feedback session was the low level of interaction.

2.10.5 Module 5

The symposium covered the following topics: "Assumptions and review of the bioeconomy development strategy for Mazovia; The future of single-use food packaging according to BIOTREM. Biodegradable single-use tableware and packaging made from plant-based raw materials - by-products and waste of the agri-food industry; Work of the KEZO Research Centre on energy systems including biomass". Presenters were Prof. Piotr Gradziuk; Artur Bednarz and dr inż. Patryk Chaja.

2.10.6 Module 6

Due to the impacts of the COVID-19 situation the online programme (webex meeting) could not follow strictly the modules outlined at the beginning of the project.

2.10.7 Feedbacks (post event survey)

Most participants (95%) received direct invitation. The main reasons for attending this event were to listen to the presentations (65%). The overall rating of the event was very good (45%) and excellent (25%). Participants disliked the following: the same presentations were held in Polish and in English, there were some technical problems with the sound. The event was very organized according to 70% of participants, and extremely according to 20%. Prior to the event, most information that participants needed was provided according to 50% of participants. Additional information participants shared was the following: It was a good idea to involve ECRN; more practical examples would have been useful.

2.10.8 Main findings of SWOT

2.10.8.1 **Availability and use of resources**

In Mazovia, the very strong agri-food sector with good availability of by-products / wastewater / waste and the large amounts of waste from separate collection are considered strengths. Most of the separate waste streams are, however, still used for other purposes instead of more valuable products which is a weakness.

It is a threat when very specific resources are needed, the available quantities are often not large enough.

2.10.8.2 Infrastructure and industrial factors

Strengths of the region are the very strong agro-industrial industry, large number of innovative initiatives and the large size of the region with a well-developed logistics infrastructure.

Large private interest in this highly industrialized region is considered a threat.

2.10.8.3 Research and innovation

The high-class research infrastructure and universities are strengths. But it is a weakness that there are no joint research programs and there is no overview of the diversity of initiatives.

Strengthening the links between different institutes and increasing cooperation with the agricultural sector in the field of innovation could serve as opportunities. Lack of cooperation is a threat as it results in the fact that the critical mass of the research potential is not reached.

2.10.8.4 Funding

It is a strength that public funding for new investments is available. At the same time, it is a weakness that private investment financing is rare and biotechnology-based activities are still perceived as high-risk activities.

As a threat it could be mentioned that the market and technology risks remain high.

2.10.8.5 Market/Economic aspects

It is a strength that Mazovia is a large region with a large local market. The price competitiveness of bio-based materials is, however, low which is a weakness.

Greater emphasis on high-quality products with added value, both in terms of sustainability and functionality could serve as opportunity. Value chains need regulatory support, and it is considered a threat.

2.10.8.6 Transition towards bioeconomy

Several sectors are involved in the transition to the bioeconomy strengthening the process although lack of awareness tends to weaken the process. The future of the transition remains unclear due to lack of prioritisation of bioeconomy in the different existing polies that threatens its sustainability.

2.10.8.7 Public and institutional support/Governance/Policy framework

Strength: There is an active public policy framework that is currently under development. Weakness: The inconsistency of the bioeconomy theme with other themes makes it difficult to develop a solid framework for different policy areas.

The Bioeconomy Development Strategy and Bioeconomy Action Plan is an important opportunity to show the state of knowledge in Mazovia at a wider level and to raise awareness among decision makers. The capacity of the bioeconomy to contribute to CO_2 neutral solutions is considered an opportunity, too. It is a threat that the dispersion of initiatives in the public is still high.

2.10.8.8 Social and environmental aspects

The large number of stakeholders is a strength, but the low awareness of the nature of bioeconomy, its benefits and opportunities in Mazovia is a weakness.

As opportunity the bioeconomy could contribute to the reduction of CO_2 emissions in practice, and thus can gain high public acceptance through large-scale projects. The failure to define the role of bioenergy in the regional energy mix, is however a threat.

3 CONCLUSIONS

Four cross-visits based on personal presence and six e-cross-visits via online platform (Cisco WebEx and Microsoft Teams) were organized in POWER4BIO using the AgriSpin[1] methodology. The COVID-19 pandemic necessitated a partial modification of the methodology applied to meet the needs of e-cross-visits. The methodology, adapted to the challenges out of compulsion, worked well all in all. The results of the project reached a wider audience due to the exploitation of online opportunities. According to the feedbacks, both personal and online cross-visits were successful, meaningful, and interesting and easy to follow. The main challenge of organizing online cross-visits resulted mainly from the technical problems. These were mainly due to the lack of knowledge coming from the use of different platforms (WebEx, Zoom, Teams etc.). Therefore, in the future, the POWER4BIO Consortia recommends that the cross-visits should take place on a same platform, thus facilitating the joining of the visitors and guests to the cross-visits. In the case of face-to-face cross-visits, it is important to note that those cross-visits that were organized as a stand-alone event provided the most results. By integrating the cross-visit into a larger event or organizing it as a side event, stakeholders became less active.

In line with the results of D2.2 deliverables (*Key performance indicators to evaluate regional bioeconomies*), we assessed the status of the bioeconomies in the 10 POWER4BIO regions during the cross-visits in order to help their work in development of regional bioeconomy strategies. To this end, we prepared regional SWOT analyses involving different stakeholders and Regional Bioeconomy Hub members participated in the cross-visits. The SWOT analyses covered the following topics identified in D2.2:

1. Availability and use of resources
2. Infrastructure and industrial factors
3. Research and innovation
4. Market / Economic aspects
5. Transition towards bioeconomy
6. Public and institutional support / Governance / Policy framework
7. Funding
8. Social and environmental aspects

The results of SWOT were used in D.5.3 (*Summaries of 5 new regional bioeconomy strategies*) to survey the regional biomass-based economy, and the results obtained during the cross-visits provided the basis for the preparation of D6.1 (*Report with the most promising paths and areas of cooperation for*

[1] http://agrispin.eu/wp-content/uploads/2017/08/Inspiration-booklet-Agrispin-2017.pdf

regions), which aimed to encourage the cross-border cooperation between Central and Eastern European regions. In general, the SWOTs gave the following results:

- While Western European regions have more developed and cross-sectoral well-embedded bioeconomies, Eastern European regions have a complete or partial lack of it.
- In Eastern European regions, the primary use of the biomass is widespread. Exceptions are those Eastern European regions that have bioeconomy centres and clusters with a long history (e.g., Nitra region).
- It is important to note that the potential of bioeconomies in Eastern European regions is currently being exploited through top-down approach. In this context, the policy level creates the regulatory and supportive framework that is essential for bioeconomy to make its way into the economy. This is supported by the fact that many decision makers and researchers were involved in these cross-visit, and by bioeconomy strategies and associated action plans being during development in these regions.
- In contrast, the bioeconomy based on bottom-up approach has spread in Western European regions. Namely, market innovation has forced the decision-makers to create a regulatory and supportive framework, thus promoting the development of a biomass-based economy. Cross-visits in the Bavaria region, the Andalusia region and the Flanders region were good examples of this.

During the cross-visits, the consortia paid attention to the introduction of platforms and organizations that can help strengthen the cross-border collaboration between the CEE regions. The cross-visits in Slovakia, Ukraine, the Czech Republic and Poland provided an opportunity for the most influential organizations to present their activities and facilitate the connection of regional actors to EU-wide networks (D6.4 – Report describing actions to promote participation of regional stakeholders in international networks and level of success achieved). Furthermore, through introducing the good examples, the organizers intended to play a key role in encouraging the establishment of cross-border business relationships by connecting relevant stakeholders.

The cross-visits also facilitated the operation of the organizations (RBHs, Community of Interest) created in the POWER4BIO Project, as these provided a venue for stakeholders to build business relationships. Regional Bioeconomy Hubs (RBHs) developed in WP5 have been actively involved in organizing cross-visits. With their help, the locations of the field visits were selected and they also took an active role in involving a wide range of regional stakeholders, such as member of Community of Interest (D7.3).

Based on the experience gained during the organization of Task 6.1, it can be stated that wider audiences of stakeholders can be involved in cross-visits, combining cross-visits based on personal presence and the use of online tools. We would highlight the importance of the learning by doing process during the cross-visits. The experience gained during the organization provided an immediate opportunity for correction to achieve the objectives of the project. Thus, both the regions and the task coordinators learned and taught during the project.