



Building Bioeconomy Innovation Ecosystem in Cross-border and Rural Context

RD12CluB team visited Hedmark, Norway and Värmland, Sweden to study the best practices of bioeconomy innovation ecosystem development in rural and cross-border context. Hedmark is part of the leading bioeconomy region in Norway and Värmland has a European best practice smart specialization approach for triple helix co-operation. Furthermore, the team identified potential areas for co-operation in the Baltic Sea Region network of bioeconomy hubs.

This report accounts for the findings and reflections of the team after the benchmarking visit on October 29 – November 2, 2018.

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2019

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Foreword

Benchmarking visits offer networking opportunities as well as opportunities to learn, exchange experiences, get new contacts and inspiration. Benchmarking visits are also great tools in order to understand the competencies available in the RDI2CluB network, and how the hub should operate to tap into the competencies in the network. Deeper understanding of the potential of the network enables the partners to identify new project ideas. The social interactions during the visit strengthens the bonds between the partners, and make it easier to commit to joint actions.

A major challenge during the planning phase was simply what to focus on. We could have gone a lot of places seeing a lot of bioeconomy cases in the region, but due to geographical distances and the fact that we only had a few days, we chose to focus on Paper Province in Värmland and Østerdalen / Glåmdalen in Hedmark. Unfortunately, we weren't able to meet all expectations from all of the visitors. To do so, we probably would have needed a couple of weeks for the visit.

In order to plan the visit and the contents of the visit, the Norwegian partners used established networks and contacts in Hedmark and nearby Värmland region in Sweden. But even if we got some help, there were still a lot of details to match into the benchmarking agenda. And when you gather people from different organisations and nations, there are of course a lot of information needed on the practical details of the visit.

We would like to thank a lot of people and companies for helping us out pre and during the visit. Our Swedish colleagues in Paper Province & their collaborators did a great job for us on the Swedish part of the visit, organising everything at the Karlstad University and Karlstad Innovation Park. We would also like to thank Maarud, Stora Enso Skoghall, Norsk Massivtre, Solør Bioenergi, Forestia, Norwegian Forest Museum and of course Campus Evenstad, Statsbygg and the Norwegian Moose Centre at Evenstad.

Finally, we would like to thank our sponsors; Stora Enso, Glommen Skog and Grue Sparebank for providing great meals in Norway.

On behalf of the Norwegian team,

Runa E. Skyrud, PP6 Tretorget AS

February 14 th, 2019

Benchmarking Method

In RDI2CluB project, we embark on four benchmarking visits to explore the bioeconomy innovation ecosystems of European best practice bioeconomy region and our partner regions during 2018-2020. The purpose of these benchmarking visits is to support the transnational learning process and to gain ideas and good practices for development of regional innovation systems (bioeconomy clusters and bioeconomy innovation ecosystems). Moreover, the benchmarking visits add value to the project outputs. They enable the discovery of joint action plans and understanding of the innovation capacity of regional hubs involved in the network.

The benchmarking visit to Hedmark, Norway, and Värmland, Sweden, was organized on October 29 –November 2, 2018. The purpose of benchmarking was to study the best practices of bioeconomy innovation ecosystem development in rural and cross-border context, and to make recommendations for further development. The team also identified potential areas for co-operation in the Baltic Sea Region network of bioeconomy hubs and bilaterally between the partner regions.

The benchmarking team consisted of the experts from 12 RDI2CluB partners with external stakeholders and multiplier group members from Central Finland and Vidzeme (Latvia). Team included representatives of bioeconomy triple helix actors ranging from policy, research and business. The team participated in workshops, presentations, networking sessions and site visits included in the visit programme. The programme is attached in annex 1. In addition, the partners had reviewed the Bioeconomy Strategy for the Inland Region 2017-2024 as a background material.

Each of the benchmarking team members documented their findings to a benchmarking survey that contained sections for lessons learned, potential joint action with benchmarked region as well as thematic questionnaires. The focus of the thematic questionnaires was transnational innovation ecosystem development, i.e. cross-border co-operation, and the innovation ecosystem development in rural context.

Hedmark's Bioeconomy Profile

Bioeconomy in Hedmark

Hedmark region is located in Southern Norway next to the border with Sweden. Around 20 per cent of the forest resources in Norway can be found from Hedmark and it is a leading forest cluster region in Norway. The forest cluster consists of nearly 300 companies. Wood construction is a strong sector in the cluster. In addition, Hedmark is a national leader in bioenergy. In the national context, the share of bioenergy from energy consumption is around 10 per cent, whereas Hedmark reaches 25 per cent. The forest bioeconomy cluster connects cross-border to businesses in Värmland, Sweden, that houses the Paper Province cluster.

A part from forestry, bioeconomy in Hedmark builds on a strong agricultural sector. Hedmark produces one third of potatoes in Norway, one fifth of grain and one of every four chicken. Animal husbandry covers 75 per cent of the agricultural profits in the region. The production is diverse involving cattle, sheep, pigs, poultry and fur animals.

The agricultural sector is supported by vocational and higher education institutes of the region. Studies are offered e.g. in heritage farming, organic farming, animal husbandry, green care, nature tourism and nature management. Inland Norway University of Applied Sciences offers Bachelor Degrees in biotechnology, agricultural engineering and organic farming. Located in Hamar, BIOINN brings together biotechnology research and business cluster attracting more specialized companies and experts to the region.

The relative strengths of Hedmark compared to the Norwegian national averages in bioeconomy development are apparent from the bioeconomy readiness wheel (Picture 1).

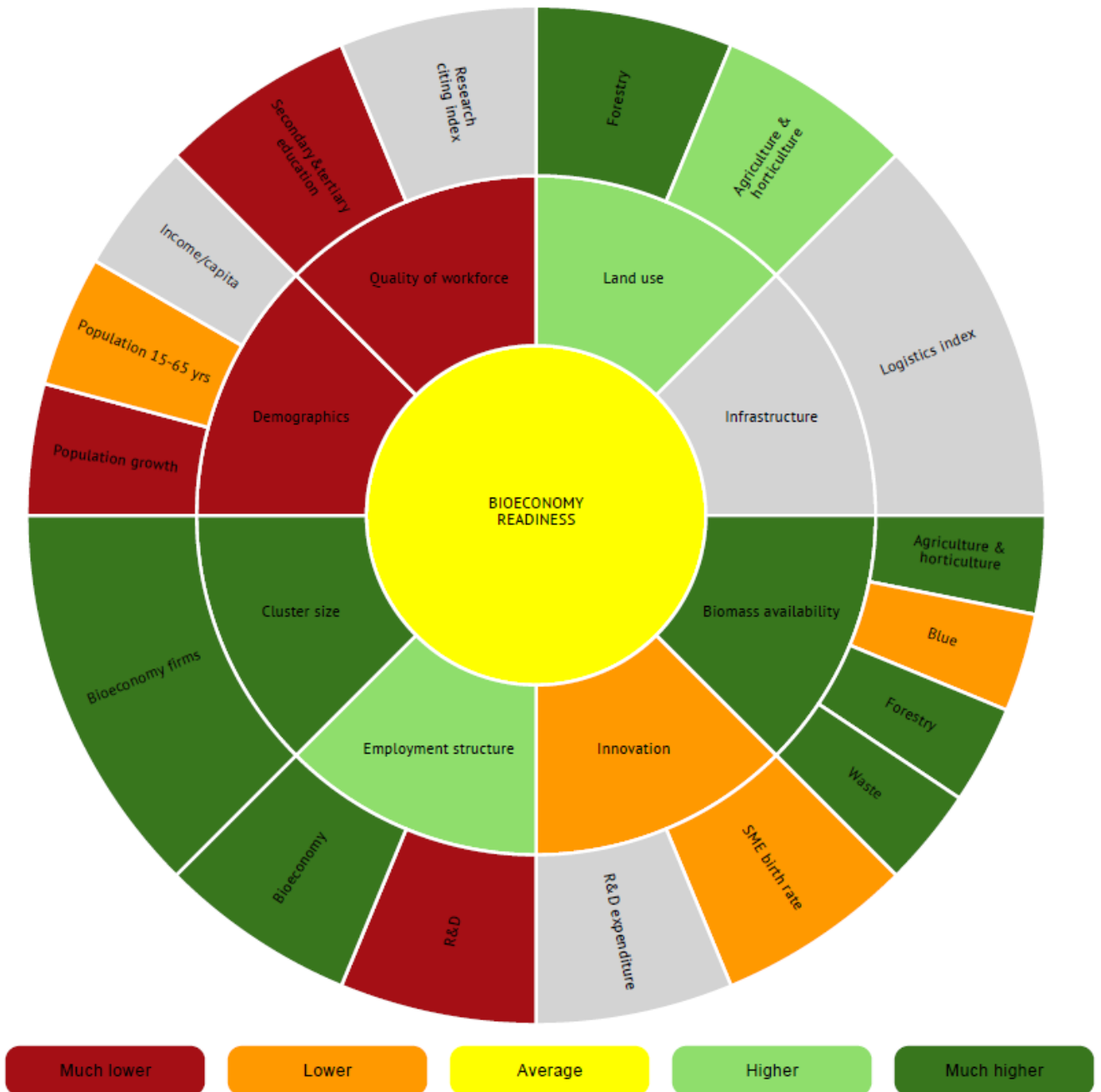
Bioeconomy Strategy in Hedmark

Approved in April 2017, the Bioeconomy Strategy for the Inland Region 2017-2024 has been compiled in collaboration between Hedmark County Authority, Oppland County Authority, the County Governor of Hedmark and the County Governor of Oppland. Many regional stakeholders have participated in the process through meetings, workshops, visits to companies and consultations. With the strategy, the Inland Region is ready to play a leading role Norway in developing the bioeconomy further in a green, carbon neutral future.

The national leader position of Inland Region in bioeconomy development is based on the ownership of a significant proportion of Norway's land-based biological resources, strong professional and expert environments as well as complete value chains for the management and development of a number of bio-based products. With this potential and strengths, the Inland Region has claimed its vision as becoming a leading powerhouse for a sustainable bioeconomy in Norway. The regional authorities in Inland are committed to this vision as a political priority.

The Bioeconomy strategy of Inland Region is aiming to guide the work towards achieving a national position as a bioeconomy region and to position the Inland Region for a potential

regional research boost and increased participation in international research programmes such as the EU’s Horizon 2020. The strategy involves forging links with relevant and complementary technical and development environments in other regions, in and outside Norway.



Picture 1. Bioeconomy readiness for Hedmark in 2016 compared to Norway

Concrete measures and actions of the strategy have been formulated into an action plan. The practical action areas stated in the strategy are:

1. Knowledge and expertise: The Inland Region must have access to the knowledge and expertise it needs to develop the regional bioeconomy.
2. Market and competitiveness: The Inland Region must have attractive entrepreneurial and development environments for bio-based value creation.
3. Biological resources and return streams: The Inland Region must be a leader in the development of the sustainable and knowledge-based production and use of bioresources
4. Cooperation: The Inland Region's focus on the bioeconomy must provide the basis for a joint, result-oriented effort that is attractive to all relevant stakeholders and binding for all those involved.
5. Visibility and communication: The Inland Region must influence and be a driving force in the bioeconomy and provide information to business and society.

The responsibility for implementing the strategy will lie with the steering group, which consists of the four strategy owners. Still, the implementation of the action plan requires coordination between public stakeholders, as well as between public, business and knowledge and expert institutions (triple helix). To enforce coordination, a Council for Bioeconomic Growth in the Inland Region (BioCouncil) will be established. This council will consist of six to eight national leaders representing research and expert environments as well as business.

Hedmark Bioeconomy Innovation Hotspots



1. Heidner Biocluster for innovations in sustainable food production
2. Biotechnology research center of INN University
3. The Norwegian Forest Seed Station, Hamar University
4. Glommen Skog SA
5. Tretorget
6. Living Lab for Zero Emission Building, Evenstad Campus of INN University
7. Evenstad Innovation Centre, Evenstad Campus of INN University
8. INN School of Business and Social Sciences
9. Mjøsen Skog SA
10. Røros Food

Cross-border Co-operation in Bioeconomy

The benchmarking team set out to study the development of Bioeconomy Innovation Ecosystem/Bioeconomy Cluster in Norway and Sweden as well as the cross-border co-operation between the regions. The connections between bioeconomy clusters of different fields and cross-border were explored. The team also learned about innovative company cases from the regions. The main question proposed to the team was whether the Värmland and Hedmark form one unified bioeconomy innovation ecosystem - or two separate ones.

Success Factors and Best Practices

The bioeconomy has long tradition in both Hedmark and Värmland. The tradition supported with the availability of biomass resources offers a strong basis for growth and innovation. The local, regional and national political commitment to bioeconomy development is strong and backed with funding. The reviewers found that national programmes and political commitment to rural development in Norway and bioeconomy in Sweden gave a strong premises for the development of the bioeconomy innovation ecosystems and clusters. Both regions also represent a bioeconomy triple-helix where the focus in bioeconomy development is shared by regional administration, academy and business. It was observed that the businesses in both regions have developed a strong position nationally in the bioeconomy field.

Värmland represents a targeted approach to funding with prioritized research areas and a highly functioning triple helix co-operation. The regional strengths in RDI are clear and backed with good organization, resourcing and co-operation, thus paving the road for EU funding programmes including Horizon 2020. The ability to strongly prioritize RDI areas regionally as well as the innovation hubs presented (Karlstad Innovation Park) showcase mutual trust between the regional actors in business and academy. Trust is necessary for open innovation processes, but building trust takes time and practice in dialogue and co-working. Trust can be considered one key asset of the regional innovation system in Värmland.

In both Värmland and Hedmark, the presented cases showed the inclusion of youth into the bioeconomy development with support to start-ups and integration of regional or business development projects in the studies. Reviewers found that the students gain a lot of support in both regions for developing their business ideas further, which can be considered as a strength in the regional innovation system. Reviewers were also impressed by the networks, culture and professionalism of the people working in the bioeconomy field in Värmland and Hedmark. Awareness of bioeconomy as well as the respect for forestry and agriculture were perceived to be high.

We present here briefly the best practices that gained most interest by our reviewer team. The programme of the visit had more extensive examples of the smart specialization in Värmland, Sweden, than Hedmark, Norway. Therefore, the findings are also more focused on the success factors and strengths of the bioeconomy innovation ecosystem and cluster in Värmland. Some reviewers found that the triple helix co-operation was not as visible in Hedmark as in Värmland.

Even though this can be explained by the programme structure, the perception can also suggest that there is lesser evidence or lacking joint narrative on the benefits of the co-operation in Hedmark's wood cluster compared to Paper Province, Sweden.

Karlstad Innovation Park

Karlstad Innovation Park involves research and business from the field of bioeconomy as well as the Paper Province cluster, making it a great example of a bioeconomy innovation hub located in a rural region of Värmland.

Karlstad Innovation Park has a mission to create and develop more sustainable companies in the Värmland region. The innovation park houses 70 companies and clusters. The idea is to provide a one-stop shop for an entrepreneur to develop their idea into commercial innovation with the connections to people with different backgrounds and expertise. In the start-up lab, starting entrepreneurs can get office space with 10 EUR a month for the first 6 months. The start-up lab is a well-connected environment to come and work on a business idea and to interact with the other starting entrepreneurs, as well as the established ones.

One method to enable connections is that Karlstad Innovation Park has just one coffee machine which create haphazard contacts and informal discussions between people. More formalized idea generation and sharing events include meet-ups every Wednesday where people are able to pitch their ideas for feedback and discussion. In addition, Karlstad Innovation Park can create teams for problem solving with a value star method. By bringing together diverse expertise - developers, students, engineers and societal actors, new ideas can emerge to solve challenges along the value chains.

Smart specialization academy

Smart specialization academy of Karlstad University is a renowned European best practice case. The starting point has been an OECD study in 2004-2007 that gave recommendation on connecting the higher education with the regional development strategies for a globally competitive and locally engaged development. In short, to operate in a more strategic manner by integrating the triple helix partners of the region under a joint story with shared targets and action plans. This resulted in Research and Innovation agreement (2010-2014) with a strive to create strategic linkages between the Paper Province Cluster, regional strategies and University in Karlstad.

The process continued in 2015-2020 with Värmland research and innovation strategy that contained the Academy for smart specialization as a tool for transformation and renewal of the private and public sectors in Värmland as well as the development of the research and education at Karlstad University. The academy involves students and researchers to the regional transition and projects.

Looking at the research excellence, the main pillar of the academy is forest-based bioeconomy with fields of digitalization and welfare solutions, advanced manufacturing and complex systems, systems solutions with photovoltaics and nature, culture & place based digitalized

experience. Cross-cutting fields are value creating services and gender solutions that provide greater innovation potential to the technology-oriented fields.

The academy model provides a platform for steering and day-to-day management of projects with a supply of competence and talent. In addition, the bioeconomy incubator services and RDI infrastructure management connect to the academy. It also facilitates impact assessment, coordination and attracting new funding. The academy provides a clear profile for building strategic international alliances, getting attention and making a policy impact. Funding comes 1/3 from Region Värmland, 1/3 Karlstad University and 1/3 external funding (e.g. EU programmes). Karlstad University has been involved in 21 Horizon 2020 projects and coordinating 3-4 of them at a time.

Paper Province Cluster

Paper Province is a forest bio-economy cluster based in Karlstad Sweden focused on priority sectors of paper and packing as well as heavy machinery and production technology. Paper Province operates in surrounding area of Värmland Sweden and it has more than 100 member-companies. Priority development areas are energy efficiency and bio fuels with paper and wood. Emerging industry in the cluster is advanced packing. According to European Cluster Collaboration Platform (2018) over 200 firms are working in the forest-based economy in Värmland region and it is the highest centralization of expertise and competence in packing, paper and pulp in the world.

Paper Province works to improve and develop the competitiveness of its member companies and the Värmland region through cooperation. The operations revolve around innovation & development of new wood-based products, securing the supply of skilled workforce, internationalization and regional mobilization for sustainable future.

Sting Bioeconomy

Housed in Karlstad, Sting Bioeconomy is a new specialized incubator connected to the Sting incubator programme that is a leading incubator in Nordics that has propelled especially digital innovations and start-ups to the markets. At Sting, the start-up entrepreneur are coached by some of Sweden's leading entrepreneurs and former venture capitalists. The start-up can get 300,000 SEK in seed funding from Propel Capital, free office space, access to Sweden's best recruitment service for start-ups and connections to Sting's international network of investors and business contacts. The Sting Bioeconomy is connected to the proven Sting programmes and networks for start-ups, but situated in the heart of the forest-bioeconomy innovation ecosystem in Karlstad with opportunities to involve the networks of forest-bioeconomy as well.

Case: Bioeconomy Region

The Bioeconomy Region is an Interreg project funded by the regions of Värmland and Dalarna and Säfte Municipality in Sweden, plus the county municipalities of Akershus, Hedmark, Oppland and Østfold in Norway, in partnership with Paper Province and the European regional

development fund Interreg Sweden-Norway. The project also has a large number of partners from the worlds of business and academia in Norway and Sweden.

The project goal is to help small and medium-sized enterprises to speed up the whole process from innovation and commercialisation to industrial transformation. In one sense, the project is building a common bioeconomy innovation ecosystem cross-border.

Innovative Company Cases

During the benchmarking, we visited a few companies as examples of innovation-oriented business in the region. The findings of the team are presented here.

Stora Enso was found to be future-oriented with visions on new innovative products out of wood and a clear story for the transition to bioeconomy. On the perspective of sustainability, Stora Enso is making efforts to ensure that more trees are grown than harvested and is aiming for efficiency in their production. Water protections is also well-managed.

Maarud potato chip factory was complemented for their programmes to develop farming methods and farmer competences and co-operation. Maarud provided an example that combined local entrepreneurship and international markets. The open access principle of the research results on potato breeding for the benefit of the whole industry, also competitors, was seen as a good practice example. In Maarud, it is believed that a good reputation of the industry is a benefit for all. Maarud has also introduced a new management model that involves top-management into the daily processes to support the workers and lower management.

Forestia is part of the Norwegian Wood Cluster. From the cluster work, Forestia is looking to get support for attainment of talented work force. In the future, co-operation for increasing industrial development and joint innovation projects is aspired as well. So far, the cluster co-operation has not been extensive as there is a lack of experience and culture for co-operation in the mechanical wood industry. The common innovation needs of the industry may relate introduction of circular economy models. For example, due to challenges with the availability of virgin raw material in the future, there is a need to introduce recycled materials to the production. In addition, innovation on production of recyclable or reusable products is called for.

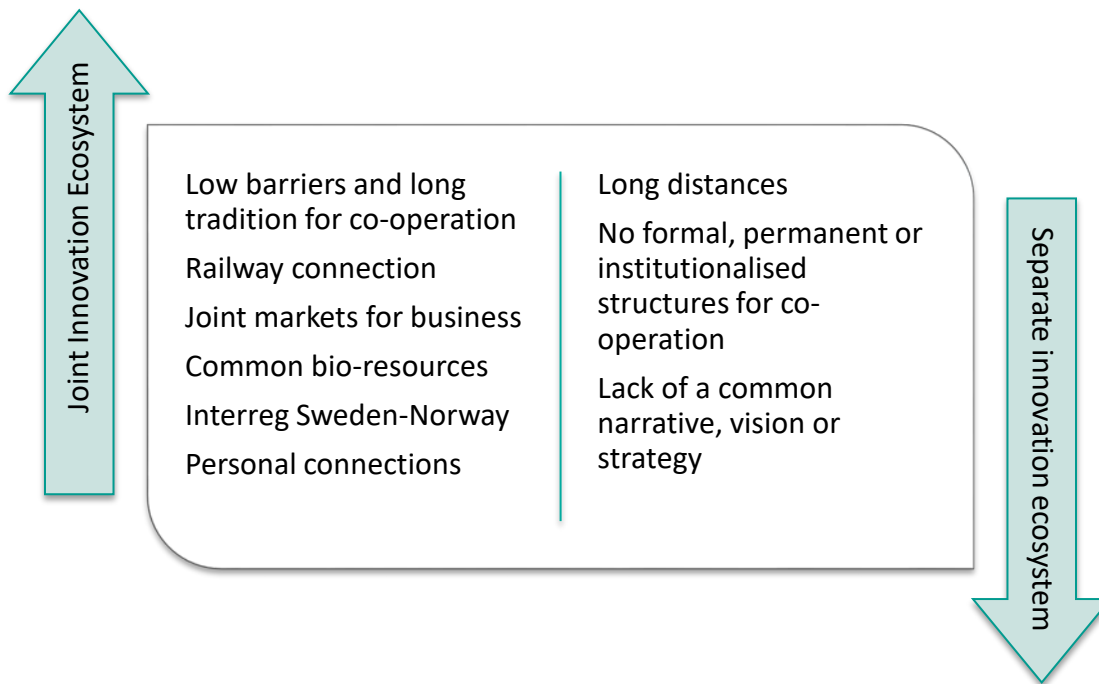
Forestia showed an example on how to involve personnel into the product and process innovation work. Personnel have the skills and expertise needed and by tapping into the skill pool the company can optimize processes. Forestia has built a culture of continuous improvement where the quality is improved step-by-step with the commitment and enthusiasm of the workers.

Due to generation shift and wide retirement, Forestia has been recruiting a lot new young people. Young workers come with a new ways of thinking and working, but the stability of the work force has remained good and new workers have proven to be committed to the company. This suggests that Hedmark region is able to attract also young people to rural living.

Nordisk Massivträ was noted as an innovative company that is developing new materials and experimenting with new ways to assemble. Nordic Massivträ also featured interesting co-operation with designers and installers as well as advanced logistics.

Cross-border Innovation Ecosystem

The question about whether there are two or one bioeconomy innovation ecosystem in Värmland and Hedmark divided opinions to some extent. However, majority of the observations concluded that there are two separate innovation ecosystems, even though the connection across border were deemed strong in forest-based bioeconomy and business sector. Still, the two regions act more as allies than competitors which also gives a good premises for developing co-operation further. There seem to be strong shared values, such as sustainability.



Picture 2. Identified factors motivating joint of separate innovation ecosystem

The regions are not connected in a joint brand or narrative in a way we observed in Biobased Delta. Co-operation is less formalized and institutionalized. Co-operation is driven by projects as well as active individuals and actors, such as Tretorget, but there is no official agreements to support the activities. For example, the co-operation does not extend to the higher education or research with any obvious structure. However, despite the lack of official structures for co-operation, many innovation services in Karlstad seem to be open access also for actors outside the region – although locating at Karlstad will enhance the connectivity to the network and help engaging in the innovation programmes and processes.

Regions from Sweden and Norway work together on project-level, but no permanent co-operation processes for smart specialisation are established. Still, there would be potential for

deeper regional co-operation as the regional strategies in Värmland and Hedmark have several common aims – especially in forest-based bioeconomy.

The co-operation in business is the most prevalent and the forest-based bioeconomy value-chains and markets seem interconnected. The forest biomass streams connect the companies cross-border. Still, differences in policies, e.g. for bioenergy, influence the competitiveness, creating national differences in the development of bioeconomy. Paper Province seems to be able to capitalize on the cross-border biomass supply from Norway. Personnel connection across border and mobility between the regions seems common which supports clusters on both regions.

Looking at Hedmark and Värmland, it seems clear that the bioeconomy innovation ecosystems and clusters can complement each other and further cross-border co-operation can add value to both regions. For any innovation ecosystem, but especially a rural one, the value of strategic networks and alliances cannot be overstated. Global markets require global competitiveness and the fast pace of innovation, e.g. new products from wood means that the best talent and expertise needs to be at hand for creating competitive advantage.

Cross-border co-operation can add value to rural regions by strengthening the innovation processes with the help of a larger pool of talent, expertise and RDI infrastructure. A part from knowledge exchange and shared resources, joint markets can give SMEs and start-ups more opportunities for growing their business and testing their innovative products and services. Co-operation across the value chains (e.g. wood-based value chains) is advantage especially for business competitiveness. Talent attraction becomes easier with a more prominent bioeconomy sector and booming innovation activities.

Hedmark and Värmland have complementary bioeconomy strengths and research focus areas that can jointly form a stronger innovation ecosystem benefitting companies from both sides of the border. The differences can be partly attributed to the national policy choices affecting the bioeconomy sectors across the years. Nevertheless, the national policies in both countries are favorable to the bioeconomy development, innovation co-operation and focus towards solving global challenges. One major difference that can affect the co-operation in practice is the higher agglomeration and presence of larger business players in Värmland compared to Hedmark.

Based on observations, the business culture is similar in Norway and Sweden which helps the cross-border co-operation. Norwegian and Swedish companies seem to have similar management culture (lean management, innovation management, cooperation culture, Corporate Social Responsibility) and any competition seems to bring a positive change – continuous drive to innovate. The culture of innovation cooperation and management is based on bottom-up approach. Apart from engaging employees in the innovation process, the companies facilitate capture of in-house innovation and continuous upskilling of the employees (e.g. Forestia). Employees are valued in both countries and their experience, development and job satisfaction is prioritized. Employee is appreciated and given opportunities to develop, create new ideas and solutions, and create a sense of affiliation.

Recommendations

The participants of the benchmarking visit gave their recommendations for developing the regional innovation system in Hedmark. The following list presents a summary from 19 respondents' answers.

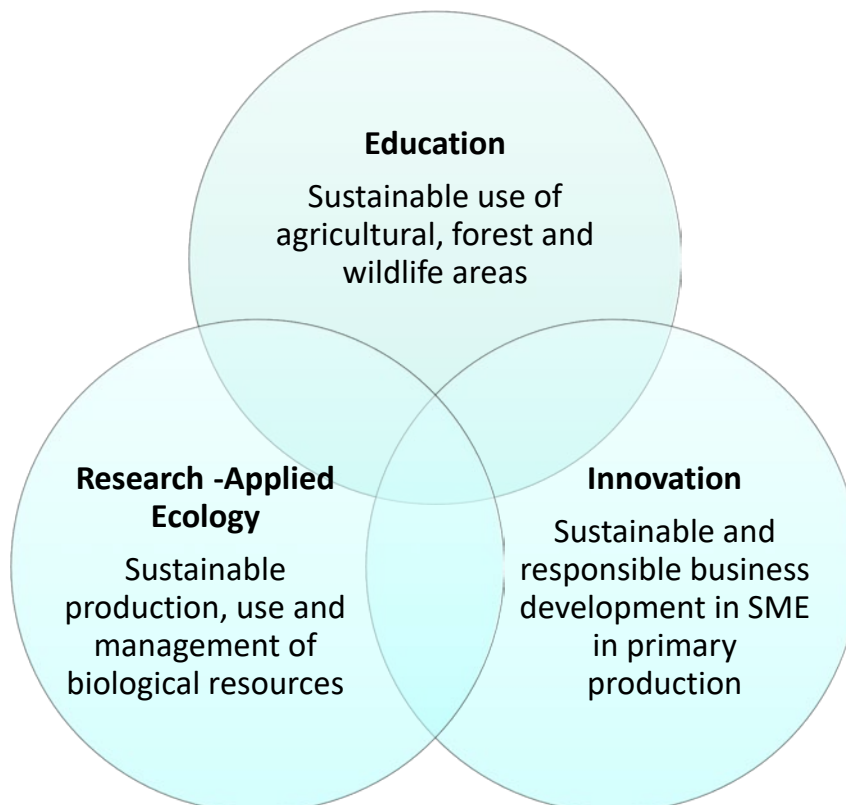
1. Connect INN University with the Karlstad University and Sting Bioeconomy Incubator to create a stronger cross-border co-operation in research, development and innovation. The connections and building of joint processes can be supported by the Open Virtual Biobusiness Hub.
2. Hedmark region could build a stronger joint narrative and co-operation structure on their bioeconomy strategy. The aspects of co-operation and communication are well presented in the bioeconomy strategy, but no links to the regional strategy were communicated by the actors met in Hedmark.
3. Open Virtual Biobusiness Hub can help to strengthen the triple-helix co-operation in Hedmark and increasing the interaction across the distances. Open Virtual Biobusiness Hub can form a one-stop-shop for the start-ups to get access to the range of supporters available in Hedmark. The Open Virtual Biobusiness Hub could help improve innovation management, create the possibility of establishing cooperation, support process of creating new ideas and solutions.
4. Focus research and regional development actions in the triple helix based on projected potential of developing new competitive bioeconomy products and services to the markets with the strengths of the triple helix actors. More targeted public procurement and research aims agreed jointly. Think of Zero Emission Programme across all the (bio)economy sectors.
5. Bioeconomy Region project could provide a good forum for evaluating potential to involve Värmland to the BSR network of bioeconomy innovation hubs.
6. The wood-based bioeconomy value chains and agro-food value chains could be connected, e.g. regarding the utilization of side streams. In relation to this aim, the Heidner Biocluster and Paper Province could be connected.
7. Business sector should have a stronger role in the triple-helix co-operation in Hedmark. Business leaders should engage more directly into the decision-making on targets and action plans.

Building an Innovation Ecosystem in Rural Regions

Distances are a major factor for the development of the innovation ecosystem in the rural context of Hedmark Region. Agglomeration of talent, infrastructure and resources are seen as a prerequisite to competitive innovation ecosystem, but these conditions are difficult to accomplish in a rural context. Based on the interests of the Norwegian partners and the fact that the issue is common for the RDI2Club partnership, we set out to explore the practices and opportunities for bridging the distance gap.

Case: Evenstad Campus

Campus Evenstad is part of the Inlands Norway University of Applied Sciences (INN University). INN University has campuses in Lillehammer, Hamar (Biotechnology), Baestad (Agriculture), Elverum, Rena (Business studies) and Evenstad. The total student population is over 13,000 with a staff of 950. INN University offers multidisciplinary studies in 42 Bachelor degrees, 31 Master degrees and 5 Doctoral programmes.



Picture 3. Campus Evenstad Scientific Profile

Evenstad Campus has been operational already over 100 years. The Campus has a colorful history that has been captured as a cartoon to tell the story of the road to bright future. Campus has various research environments, test-beds and projects on ecology research. The education

is connected to the research and students are involved in the research projects. Campus offers many services for the students including gymnasium, dormitories and student pub.

The Evenstad campus has 70 employees and 220 students in study programmes focusing on Forestry and wildlife management. The level of international students is high with 40 international students studying at the Campus via Erasmus programmes and also from Asia and all over the world. Evenstad is the most sought-after campus in its field in Norway. The Evenstad Campus is strong in applied research, but also focuses on scientific research as a base for the applied projects. The PhD studies are mostly focused on the scientific research in ecology, including the boreal forest ecosystem dynamics and effects of climate change. The applied research has applications e.g. to hunting tourism and carnivore conflicts.

The campus is located at a beautiful, remote location, surrounded by mountains, forests and the river Glomma. Despite the remote location, the Campus is very international. Around 20 per cent of the students are international coming from approximately 20 different countries with support from Erasmus+ and NordNatur programmes. Doctoral students are part of an international doctoral school that is coordinated from Evenstad (www.lrsae.no). In addition, the campus hosts an international summer school annually. 50 per cent of PhD students are international.

Evenstad campus aims to communicate the research findings to the society for greater impact and to enhance sustainable development. They hope to guide the students and researchers to be in effective interaction and communication with the society. So far, one of the main tools of the communication strategy has been the Moose Center that attracts tourists and locals to the campus, especially in the summer time. The campus also houses facilities for conferences and meetings to increase interaction with the society and business.

Evenstad campus strives to communicate the outcomes of the applied research activities and boost sustainable business development in the local community as well as in global context. Furthermore, the Evenstad Innovation Centre applies the research outcomes in innovation services offered to local companies.

Evenstad Innovation Center will help enhance innovation and commercialization of research results. The center focuses on environmental sustainability based on the information from applied ecology research. Companies are connected to the services often via Tretorget. In addition, they have an established network from previous projects. Funding for the companies to use the innovation services often comes from the Innovation Norway, self-funding or Regional Research Council of Inland Norway. Evenstad Innovation Centre offers the following services to the companies:

1. Test-bed facilities (biodiversity, renewable energy, fish hatchery and future local food production)
2. Open innovation in the value chain
3. State-of-the-art sustainable business development programs
4. Tailor-made incubator services

As an example of a test-bed facility, Evenstad campus has been developed as a living lab environment for zero emission building and living in line with their campus mission to reach zero-emissions. Evenstad campus warms up with bioenergy produced with Finnish Volter CHP-unit, which was the first installation in Norway. Heating system uses pellets from local supplier. The campus has also significant solar energy production with 63 000 kWh yearly and a charging station to electric cars.

The new main building of the Campus is a wooden zero energy building that has been acknowledged as one of the most environmentally friendly buildings in Norway in 2017. Campus is involved in a Norwegian national project, Zero emission neighborhoods, as a pilot site and a living lab environment where the emissions of construction and use phases of the building are studied to explore ways to neutralize the carbon impact of living. The campus environment offers possibilities, not only for testing of technologies, but also studying the human aspect, i.e. the ways the buildings are used.

The students of Evenstad are involved in the applied research and innovation projects through their studies. They also get support for working on their own business ideas, e.g. in the innovation camps. With the boost from innovation and practice-oriented studies, Evenstad has a high-level of student start-ups. Last year, 7-8 student-based start-up companies were formed.

Connectivity to Urban Innovation Ecosystems

Hedmark region does not have any major urban agglomeration. Instead, there are several smaller towns in the region. In practice, the closest major urban agglomeration is Oslo. The policies in Norway have encouraged people to live in rural regions and enable lively rural communities with good service levels despite low population density. Therefore, besides the urban connections, there is a great significance in connectivity between the numerous small municipalities and communities in the region.

Accomplishing a functional rural-urban connection in the innovation ecosystem development can unlock huge development potential and accelerate inclusive and sustainable economic development in the whole country. In bioeconomy, the importance of this connection is even higher as the sustainable biomass production is focusing on the rural areas while the consumers and markets are focused on the urban agglomerations.

The connections to urban innovation ecosystems was identified in the case of wood construction. The Zero Emission Pilot at Evenstad Campus and the wood construction companies for the wood cluster are connected with National RDI projects and programmes to the urban centers where wood constructions is promoted as a part of making cities more sustainable and climate friendly. The case of wood constructions has great potential as the wider Zero Emission Neighborhood project involves major research, industry and policy players in Norway. However, there was not much evidence detected of continuous urban-rural innovation co-operation and there is a risk that the connections are project-based and not benefitting the local SMEs in a broader sense.

Bridging the Distance Gap

The distances can be a challenge in developing a rural innovation ecosystem, as they decrease the level of interaction between people. Time spent travelling to network meetings are often more than the actual meeting. This is a huge disadvantage, as it hinders the co-operation in the regional innovation system. A part from the distance, the geography can cause other challenges as well. As indicated in the findings, the interaction between people along the river valley in Hedmark is quite easy, but crossing the mountains creates a barrier for the interaction.

The region's bioeconomy strategy of Hedmark states these goals: "Encourage more cluster projects and strengthen the interaction between stakeholders within innovation (triple helix, R&D institutions, business and funding agencies)" and "Develop arenas for information, dialogue and cooperation further, including from an international perspective". Measures identified to accomplish these goals include establishing new projects, strengthening the networks and good business anchoring. The benchmarking team recommends establishing regular meetings and events for the stakeholder interaction in Hedmark to support the implementation of the strategy.

Good practices to bridge the distance gap were identified during the visit:

1. Campus Evenstad example showed that competitive advantage can be gained despite the remote location when focusing on a scientific niche where international excellence can be accomplished.
2. Strong smart specialisation focus with dedicated triple helix support can result in a great impact in rural regions as well – Case Paper Province, Region Värmland
3. The fast train connections and well-maintained road network in Hedmark are very important. While many of the industry is located in the rural areas - most of the services, are scattered around in the towns, so there is a lot of daily mobility involved.
4. Norwegian policies support rural development and maintaining the remote areas habited. The INN University is also very dispersed with locations in many rural communities.

Technology is bringing unprecedented changes in rural areas (transportation technology, geographical information systems (GIS), computational technology and information and communications technology). Still, we have to have good service delivery, system performance and planning, data collection and research. All the needed capacity upgrades require learning, human capital and innovation processes. Investments in human capital can not only foster the creation of innovation but also, and most importantly for rural areas, the assimilation of innovation that is often produced elsewhere.

Innovation and technology can develop an increasingly knowledge based bioeconomy for rural regions. This can also decrease the role of geographical distances where information technologies enable the transfer and management of knowledge over great distances. For example, Evenstad Campus has very sophisticated web conferencing equipment and can stay well connected despite the remote location.

Still, we must also learn to build trust and creative interaction in digital environment in order to take full advantage of the possibilities that technologies offer to us. In addition, variety of talent and expertise are needed which highlights the importance of attracting skilled workforce and variety of professionals into the bioeconomy fields.

Recommendations

Capitalizing on the Bioeconomy Potential

In Hedmark, the forestry sector is well developed and the agro-food sector is also strong in national context. Research in bioeconomy is also strong and well connected to regional bioeconomy strategy. The team found three areas for further development. These include bioeconomy services, bioenergy and circular management of biobased side streams.

Ideas for development:

- Utilization of bioenergy for power and heating could be further developed. In the heating sector, the low value wood can be used for bioenergy which would strengthen local forestry and economy. Local SME's could get business in bioenergy.
- Value chains from forestry and agriculture side streams could be created added-value as well as linkages between agro-food sector and forestry sector. Cooperation between SME's in primary sector can be used for finding "Critical mass" of side streams in smaller productions, and therefore be a catalyst in developing new value chains.
- Nature-based services: Hedmark has great potential in recreation, nature-based and health-oriented tourism. Large areas of the forests, rivers and lakes, beautiful landscapes, local culture, heritage farming and food can attract the international tourists. The use of berries and other non-wood products of forests as well as fishing tourism could be further developed.

Building the rural innovation ecosystem with the help of OVBH

The innovation ecosystem of Hedmark is characterized by a big number of small pockets of expertise, whereas, e.g. in Värmland, Karlstad represent a distinctive hub of the triple helix co-operation in the region. Therefore, the triple helix co-operation for smart specialization and innovation management demand a very effective network co-operation across the distances in Hedmark region. The Open Virtual Biobusiness Hub offers a tool for bridging the distance gap in order to create a more connected triple helix, more innovation services to local SMEs and to create more international connections.

The following recommendations were given for Evenstad Campus in relation to utilizing the Open Virtual Biobusiness Hub:

- Open Virtual Biobusiness Hub can strengthen the interaction within the INN University. Connection and co-working with the other campus hubs of INN University could help to

connecting different expertise fields together in the innovation services, thus developing the available services to SMEs.

- Evenstad Innovation Center has potential to become even more internationally integrated - not only in terms of international students and research teams, but also in terms of offering innovation services to companies from other countries and entering into joint innovation model and RDI projects with the other innovation hubs in the BSR area.
- Evenstad Campus can utilize the platform for sharing the research outcomes in interaction with the public to enhance the implementation of the communication strategy. Data management from nature observation could be enabled with the platform. In addition, the platform can be used to connect local companies to the campus activities more systematically.

Lessons for RDI2CluB Partnership

As a take-home message, the models of regional triple-helix co-operation for smart specialization in Värmland were commonly mentioned. Partners from Baltic Countries, where development of bioeconomy strategies in national level is ongoing, gained insights on how the development is supported on national level. In regional level, Paper Province, Smart Specialization Academy, Karlstad Innovation Park and Sting Bioeconomy Incubator gained a lot of interest as operational models that encourage wide networking, co-working and creative encounters to support the innovation processes. All in all, one of the main take-home messages seems to be the importance of effective regional co-operation between different actors.

Across the partnership, there is an interest to involve Karlstad/Värmland to join the network of BSR innovation hubs and build innovation co-operation. Notably, Sting Bioeconomy incubator was seen as a promising contact and further co-operation is hoped for. Other ideas on future co-operation raising from benchmarking team's responses include:

1. Utilisation of biological side streams as a co-operation topic with Paper Province.
2. Karlstad Innovation Park as an example for private-public cooperation in smart specialization.
3. Norwegian experience to include students and researchers in entrepreneurship already in university stage.
4. Gender balance in bioeconomy sectors was studied and promoted in Värmland, Sweden, and could be an idea for RDI2CluB regions as well.
5. Swedish national network of bioeconomy regions was identified as an interesting case to enhance national level co-operation between regions on the bioeconomy development.

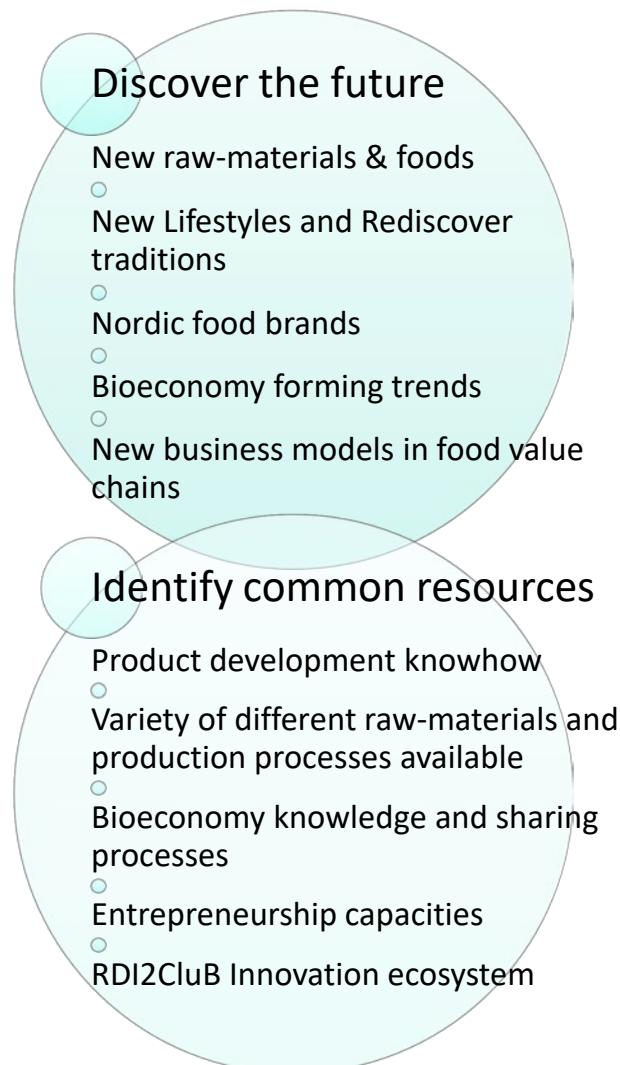
Central Finland

In the Central Finland – Hedmark axis, a lot of potential was identified in campus co-operation between Bioeconomy Campus in Tarvaala and Evenstad. The activities could involve student co-operation, staff exchange and innovation co-operation, e.g. on the topic of nature tourism, sustainable use of natural resources and forest based services. Expertise exchange on developing innovation services in a rural campus context should be explored jointly. Involvement of young people and students was widely seen important in boosting regional development of bioeconomy.

As a take-home message, the Bioeconomy Campus team noted the public outreach and communication strategy of Evenstad Campus. Also the specification of test-beds is something to learn from at the Bioeconomy Campus to clarify the innovation services to companies. One interesting development idea for Bioeconomy Campus was the system for employing students to work on an innovation without an 'owner' practiced in Paper Province to further and explore the commercialization potential.

Finnish external expert, Arto Vidgren, took part in the benchmarking visit and transnational workshop to explore the potential of RDI2CluB partnership in acting as a development platform

for 'Baltic Sea Cuisine' brands. With his partner, Arto Vidgren has created a development model called Fiftogram© Ecosystem modelling tool. The development model was used to collect and analyze information on the potential during the week and the results were presented in the last workshop day. The findings suggested that the potential exists and partners are willing to explore the co-operation possibilities further.



Picture 4. Findings of the Fiftogram© Ecosystem modelling on 'Baltic Sea Cuisine'

Vidzeme

For the Vidzeme team, the joint action areas of forestry and food production were seen promising. An additional benchmarking visit for the Latvian high-added value and healthy food cluster members to study the food focused Heidner Cluster was planned. NCE Heidner Biocluster is a research-driven cluster, with an objective to improve sustainability in the food production, by developing innovative products, services and know-how and thereafter exporting the results globally. There were also some promising contacts related to the packaging expertise

in Paper Province that can be helpful for the Latvian Food Cluster. All in all, the team highly appreciated the contacts gained for regional companies and the examples of sustainable and innovative forerunner companies.

Institute for Environmental Solutions (Latvia) is interested in establishing practical cooperation with Evenstad Innovation Center in the field of ecosystem services modelling, assessment and management of natural resources as well as integration of cutting-edge technologies (remote sensing, Internet of Things, Earth Observation) in nature research. Institute will invite expert speakers from Norway and Sweden to their bioeconomy stakeholder events carried out in spring 2019.

There is an interest to build connections between scientists in the field of the genetics and field crop breeders to study feed, agro-ecology and agricultural chemistry between Norway and Latvia. It is possible to offer a host in Institute of Agricultural Resources and Economics for few years on the frame of Marie-Sklodowska-Curie Actions or any other grant for international scientific mobility. Research co-operation between the regions, could be explored in the following interdisciplinary research directions:

1. Field crop genetics and breeding for integrated and organic farming systems;
2. Development of sustainable field crop growing technologies for various farming systems;
3. Evaluation of field crop quality for effective use;
4. Production of feed and raw materials;
5. Economics of sustainable development of bioresource industries;
6. Exploration of the possibilities of sustainable development of territories; and
7. Efficiency of production processes and company competitiveness.

Furthermore, for the director of Forest and Wood Products Research and Development Institute in Latvia, the Zero-Emission Pilot at Evenstad campus was a good example for developing alike building-project in Latvia. In fact, the building-project team visited Evenstad campus in January to gain further information and knowledge on the pilot. Hence, RDI2CluB benchmarking resulted already in additional, self-organized trip to this campus from Latvian ICT and wood-construction companies.

Świętokrzyskie Voivodeship

Świętokrzyskie Voivodeship team expressed interest to pursue innovation co-operation with the Norwegian or Swedish partners. The well-developed innovation ecosystems or clusters with good management could act as good practice examples for the Polish organizations. Many take-home messages were identified by the Świętokrzyskie team. Examples of good practices that could be applied in the bioeconomy development in Świętokrzyskie Voivodeship include:

1. Wood building products as the tradition in wood building in Poland died out in mid-20th century and wood as building material is slowly beginning to be seen as an economically viable and eco-friendly option.
2. Region Värmland model for triple helix co-operation for smart specialisation
3. The use of forest biomass

4. The cooperation between University students and companies
5. Involvement of many actors in bioeconomy issues
6. The activity of business accelerator and incubator, like Sting Bioeconomy is a good practices for our region

In addition, the Świętokrzyskie Voivodeship team expressed interest for co-operation in the topic of low-emission construction involving also bioenergy and wood construction. The potential for a pilot on construction of low-energy wooden houses in Polish context could be explored with the help of the expertise from Norway. All in all, the Zero Emission Building pilot in Evenstad gained a lot of interest and inspired many respondents. The Living lab for Zero emissions concept was seen very interesting.

Estonia

For the Estonian team, main take-home message was to start discussions on the opportunity to connect an Estonian bioeconomy hub to the BSR network. In addition, the Estonian team expressed interest in the expertise exchange with Hedmark on building bioeconomy innovation hubs.

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Disclaimer: The information presented in this report in relation to Hedmark, Värmland and their actors may include inconsistencies and misunderstandings because of the collective data collection method, and potential mistaken conceptions due to language and culture differences. If looking for information on organisations from Hedmark or Värmland, it is recommended to fact-check from other sources.

Annex 1. Benchmarking visit programme

Detailed programme for the transnational meeting and benchmarking visits of RDI2Club in Norway/Sweden Oct 29th to Nov 2nd, 2018

Monday, Oct 29

Arrival at Oslo Airport Gardermoen in Norway (OSL) – morning plane. Lunch on your own before 1200

1200 Departure from Oslo Airport by bus to Paper Province.

1300 Site visit at Maarud. Production of potato chips. Maybe you can get a taste.
<http://www.maarud.no/>

1800 Arrival in Karlstad – you're staying at Scandic Karlstad City
<https://www.scandichotels.no/hotell/sverige/karlstad/scandic-karlstad-city>

1900 Dinner in Karlstad

Tuesday, Oct 30

We will spend the whole day in the Karlstad Area (Sweden)

0700 Breakfast at the hotel

0800 Departure

- Paper Province <http://paperprovince.com/>
- Gold label cluster and their tools for entrepreneurship, accelerator and business incubator STING <http://www.stingbioeconomy.com/>
- Region Värmland. Smart specialisation and bioeconomy in Värmland.
<http://www.regionvarmland.se/>
- The Bioeconomy Region <https://bioeconomyregion.se/>
- Karlstads universitet - Academy for Smart specialisation. <https://www.kau.se/>
- Karlstad Innovation Park. An arena for innovation. <http://karlstadinnovationpark.se/>
- Lunch at Karlstad Innovation Park (paid by PP6)
- StoraEnso Skoghall Mill. The mill is one of the world's largest manufacturers of paperboard for liquid and foodstuff packaging.
<http://renewablepackaging.storaenso.com/about-us/mills/skoghall-mill>

Wednesday, Oct 31

0700 Breakfast & checkout

0800 Departure to Elverum (Norway) with site visits on the way

- Nordisk Massivtre. Plant for CLT production. <http://nordiskmassivtre.no/>
- Lunch of local bioresources at Skaslien Gjestgiveri (paid by PP6/sponsors)
<https://skaslien.no/>
- Solør Bioenergigruppen Bioenergy Production. Pellets, CHP, use of impregnated wood.
<http://solorbioenergi.com/>

- Forestia. Plant for production of particleboard <https://www.forestia.no/>
- Trebyen Elverum - The wood city of Elverum
<https://www.elverum.kommune.no/files/Veileder-trebyen-Elverum.pdf>
- During the day: Arrival in Elverum for those who haven't been participating on the Benchmarking trip to Paper Province. We're staying at Hotel Scandic Elgstua
<https://www.scandichotels.no/elgstua>

1700 Transnational workshop starts at Hotel Scandic Elgstua in Elverum (Norway)

2000 Joint dinner at Hotel Scandic Elgstua (paid by PP6/sponsors)

Thursday, Nov 1

0700 Breakfast at Hotel Scandic Elgstua (included in the stay at the hotel)

0800 Departure to Inland Norway University of Applied Sciences - Campus Evenstad

0930 Arrival at Campus Evenstad and Evenstad Innovation Center. Coffee & snacks

0945 Information and benchmarking walk around the Campus Evenstad

Campus Evenstad <https://eng.inn.no/about-inn-university/campuses/evenstad-campus>

Living Lab for Zero Emission <https://fmezen.no/campus-evenstad/>

Norwegian Moose Centre / Norsk elgsenter. Say hello to the moose...

<http://elgsenteret.com/en/home/>

1130 Lunch at Evenstad Innovation Center (paid by PP 4 Campus Evenstad)

1230 Transnational workshop

1440 Coffee & snack break

1500 Transnational workshop continues

1630 Departure to Elverum

1800 Guided visit to Anno Norsk Skogmuseum (Norwegian Forest Museum)

<https://skogmus.no/en>

2000 Joint dinner at Restaurant Forstmann next to the museum (paid by PP6/sponsors)

<http://www.forstmann.no>

Friday, Nov 2

0700 Breakfast at Hotel Scandic Elgstua (included in the stay at the hotel)

0800 Transnational workshop at Hotel Scandic Elgstua

1000 Coffee & snack break

1200 Lunch (paid by PP6/sponsors)

1300 Departure by bus to OSL - Oslo Airport Gardermoen

1430 Arrival at Oslo Airport