



BIOREGIONS

Forest bioeconomy in action

Perceptions on the Bioeconomy in North Karelia

Results from a regional survey targeted at government and industry

Contents	Survey report: Government and industry perceptions on the Bioeconomy in North Karelia
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1. Executive summary

The Bioregions Facility launched its Bioeconomy Perceptions Regional Survey in North Karelia in the period September-November 2021 in the local language, Finnish. The Survey was targeted at different groups within government and industry, to understand how they perceive the bioeconomy, its benefits, and its challenges. More specifically, the Survey aims at achieving six target outcomes: i) understand how business and policy actors perceive the bioeconomy; ii) revisit value chain priorities and related communication efforts; iii) identify barriers & supporting conditions; iv) assess “willingness to engage” with the bioeconomy; v) get insights on how to improve collaboration with government & industry and; vi) find key leverage points for bioeconomy development by identifying overlaps with other policy areas. Here we present six key highlights, one per target outcome, of the Survey in North Karelia.

- Respondents generally perceived **bioeconomy as promising**, and specifically to address environmental challenges. Respondents see the contribution to energy transition, and to a low-carbon economy, as the most relevant positive impact of the bioeconomy.
- North Karelia business and policy actors suggest that **nature-based tourism, bioenergy and wood construction** are the bioeconomy sectors with **highest potential for growth in North Karelia**.
- **Limited co-operation among different stakeholders** (policy, business, etc.) is perceived as the most important **barrier for bioeconomy development**. Several **supporting conditions** were rated in between important and extremely important, namely **investment in innovation**, availability of scientific information, public procurement programmes and adequate regulation.
- Both **government and industry** respondents indicated that their sector or department is **willing to develop the bioeconomy**.
- **Government and industry respondents felt very similar about who is responsible for different tasks in moving the bioeconomy in North Karelia forward**. Both groups indicated that they are equally responsible for investments in research, development, and innovation and for ensuring positive environmental and social impacts. In addition, both groups emphasised that the government is more responsible in communicating and promoting the bioeconomy among the general public.
- According to respondents, **bioeconomy has strong goal alignment with environment related policy areas**, especially climate change mitigation and clean energy. Other policy areas with very high overlap with bioeconomy are biodiversity conservation, circular economy, and rural development. Bioeconomy was considered to have less goal alignment with social and economic policy areas.

2. Regional context

North Karelia, in easternmost Finland, is a sparsely populated region with a population of 163,000 living in an area of 21,585 km² (Forest bioeconomy in North Karelia (2019)¹). North Karelia is a very natural area, with 89% of the land area covered by forests (1.5 million ha). 96% of the forest area is commercial forest. Wood stocks are estimated at 195 million m³ with an annual growth of 8.9 million m³/year. The total volume of wood harvested annually is around 66% of the annual growth (about 5.9 million m³). With such an abundance of managed forests and low population density, it is no wonder that North Karelia has a very high biomass availability per capita (North Karelia Forest Bioeconomy Profile (2021))². More than two-thirds of this available biomass is roundwood. The wooded area in North Karelia is dominated by conifers: about 60% of the forest area is dominated by pines, 25% by spruce and 15% by deciduous trees (North Karelia Forest Program 2021 - 2025)³.

Within the Finnish Bioeconomy Strategy⁴, bioeconomy refers to an economy that relies on renewable natural resources to produce food, energy, products and services. “The bioeconomy will reduce dependence on fossil natural resources, prevent biodiversity loss and create new economic growth and jobs in line with the principles of sustainable development.”

In North Karelia, the forest bioeconomy is the cornerstone of the region’s business and industry sector. In North & East Finland⁵, the sector “agriculture, forestry and fishing” reaches almost 8% of employment. The strongest industrial sectors in North & East Finland are forest industry, metal industry and construction (North Karelia Forest Bioeconomy Profile (2021)). Within the North Karelia metal industry, the forest machinery and timber logistic sector plays an important role, comprising the biggest forest machine manufacturing hub in the world. The region’s forest bioeconomy is very strong with more than 500 companies involving bioeconomy. These companies have a turnover of €2 billion and employ more than 6,600 people of which 600 are experts (researchers, developers, trainers, and administrative employees) (Forest bioeconomy in North Karelia (2019)). The GreenHub⁶ plays a key role in promoting collaboration in the forest bioeconomy in North Karelia. The GreenHub business and knowledge community brings together companies, researchers and experts in the forest bioeconomy to foster cooperation.

Within the bioeconomy, North Karelia aims to be a forerunner in wood construction, produce a wide range of value-added bioproducts, create jobs, ensure ecosystem services, have an efficient use of forest

¹ Forest bioeconomy in North Karelia (2019): <https://www.pohjois-karjala.fi/documents/33565/2422473/Forest+Bioeconomy+in+North+Karelia+2019.pdf/c6410a1a-02e5-e489-1bd2-519520385621?version=1.4>

² North Karelia Forest Bioeconomy Profile (2021): https://bioregions.efi.int/wp-content/uploads/2022/01/NK-Regional-profile_October-2021.pdf

³ North Karelia Forest Program 2021 – 2025: <https://metsakeskus.maps.arcgis.com/apps/MapSeries/index.html?appid=3e2b8c3f85b747f0a39ad8261504cf0e>

⁴ The Finnish Bioeconomy Strategy: https://biotalous.fi/wp-content/uploads/2014/08/The_Finnish_Bioeconomy_Strategy_110620141.pdf

⁵ North & East Finland is the NUTS2 entity containing North Karelia. It is used as an approximation for North Karelia because the information is not available at NUTS3 level.

⁶ <https://www.greenhub.fi/>

industry by-products, promote climate smart forestry, apply research to business, use digital forest data and provide education at all levels (Strategy of North Karelia 2040 (2020)⁷).

North & East Finland was considered a “strong +” innovator in 2019’s Regional Innovation Scoreboard and its innovation performance has increased over time (North Karelia Forest Bioeconomy Profile (2021)). North & East Finland is rated 9 out of 10 for its maturity in bioeconomy readiness and thus it can be considered to have a very mature bioeconomy Research & Innovation ecosystem.

The forest bioeconomy is a vital part of the North Karelian Smart Specialisation Strategy, also in addition to playing a key role in their Roadmap towards becoming an oil-free and low-carbon region (Forest bioeconomy in North Karelia (2019)). The North Karelian Smart Specialisation Strategy⁸ consists out of two essential parts. 1) New solutions for the forest bioeconomy, and 2) Technologies and materials as enablers of growth (Figure 1).

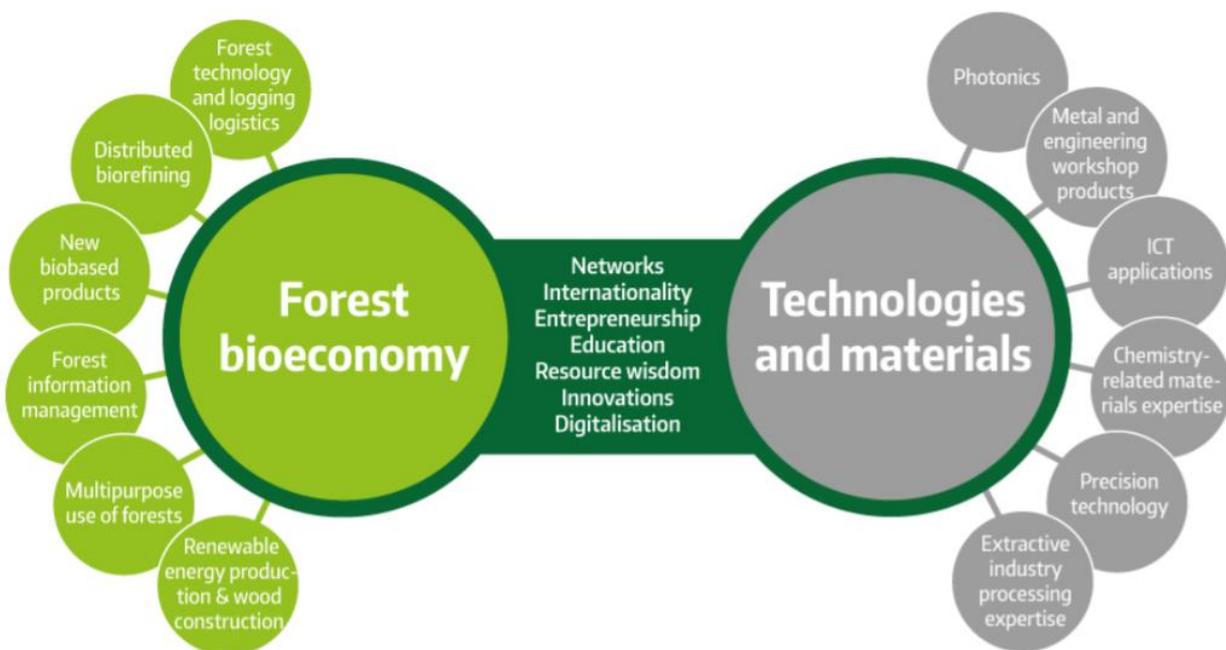


Figure 1: The core of North Karelia’s smart specialisation is comprised of two essential elements: 1) New solutions for the forest bioeconomy; 2) Technologies and materials as enablers of growth. Six of the region’s areas of expertise are defined for both Forest bioeconomy and Technologies and materials. Source: North Karelian Smart Specialisation Strategy

⁷ Strategy of North Karelia 2040 (2020): <https://www.pohjois-karjala.fi/documents/33565/9020841/197+Pohjois-Karjalan+strategia+2040.pdf/ef0a0b6b-8abf-3863-391f-879d6d7c5141>

⁸ North Karelian Smart Specialisation Strategy: https://s3platform-legacy.jrc.ec.europa.eu/documents/20182/0/North_Karelia_Smart_Specialisation.pdf/24c3511c-4b48-470c-a7be-ccf777a52763

3. Results

3.1. About the respondents

We targeted groups working within government and industry in North Karelia. More specifically, we were interested in the perceptions of intermediate and high-level managers / decision-makers within municipal and regional governance, and local industry and business leaders, entrepreneurs, clusters, local industry associations and membership groups, farmer/forester associations, land managers and cooperatives within the private sector. All respondents fit into these groups. Most private sector respondents were entrepreneurs. It should be remarked that three out of the eight industry respondents indicated that they work in the tourism sector. Other industry respondents had a background in forestry and business development/consultancy. Most respondents from government indicated to work in economic and business development.

We received a total of 17 responses to the survey, with a close-to-equal distribution between government (53% of responses) and industry (47% of responses) (Figure 2). Response rates were low, although due to survey dissemination methods it is not possible to estimate accurately the number of people who received the survey. The majority of respondents were male (59%) (Annex A1). The ages of respondents were rather equally distributed among different age groups, though no responses were received from the “under-25” age group – likely due to the survey’s aim of reaching industry leaders and mid-to-high-ranking government officials. The majority of respondents both live and work in North Karelia, but there were also those who commute to the region for work (24%) or work outside of the region (12%). Interestingly, there was also a fairly even divide between respondents who live in urban areas (53%) vs. those who live in rural (41%) or semi-rural (6%) areas.

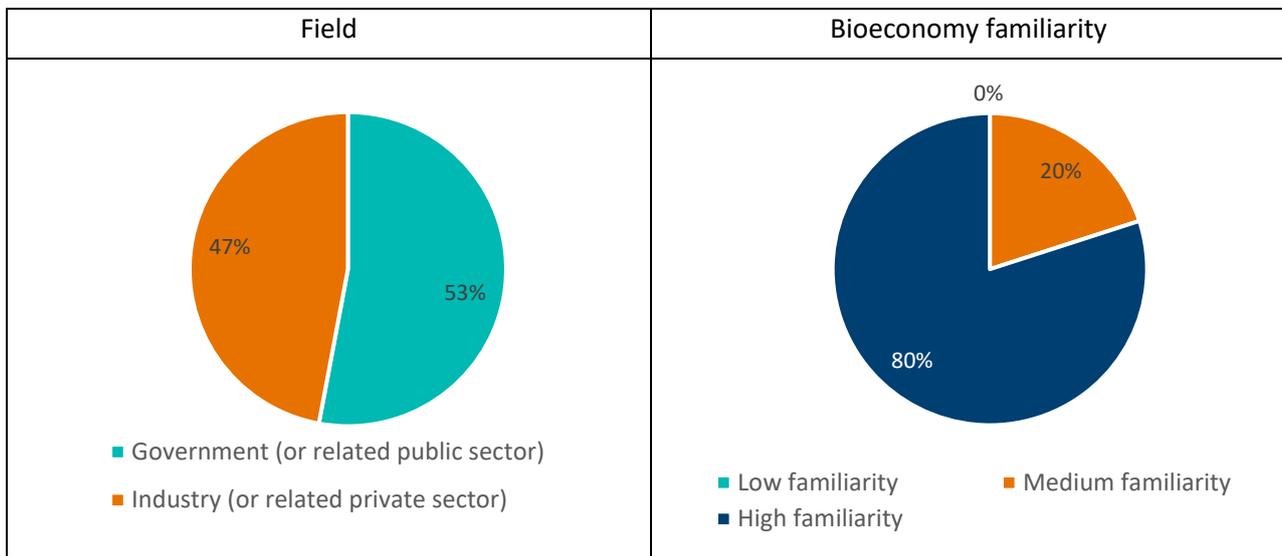


Figure 2: Characterisation of respondents according to field and bioeconomy familiarity. Additional charts related to the characterisation of the respondents can be found in Annex 1.

Most respondents reported good familiarity with the bioeconomy, with 80% indicating high familiarity and 20% saying they had medium familiarity with the bioeconomy (Figure 2). None of the respondents reported having low familiarity with the bioeconomy. This may indicate a generally good understanding of the bioeconomy across government and industry in North Karelia; however, given the relatively small number of respondents to the survey in the region, this result could also reflect that the government and

industry individuals who were motivated to answer the survey were already involved with the bioeconomy in some way.

3.2. Understand how business and policy actors perceive the bioeconomy

Respondents were asked which concepts and sectors they see as part of the bioeconomy, what are the main benefits and risks of the bioeconomy in their region, and what is the perceived level of public awareness.

Nature-based solutions and *Carbon neutrality* were understood by all respondents (100%) to be a part of the bioeconomy (Figure 3). This aligns with regional strategy and bioeconomy aims in North Karelia which highlight lowering the region’s carbon footprint and ensuring its ecosystem services (See context). *Sustainable consumption* and *Use of biomass*, both more closely related to dominant bioeconomy sectors in North Karelia, were indicated by 80% of respondents to be a part of the bioeconomy. Interestingly, *Economic prosperity*, *Technological advancement*, as well as *Degrowth*, were least considered by respondents to be a part of the bioeconomy. Summarising, respondents see sustainability concepts and nature-based solutions completely linked to the bioeconomy. This coincides with the definition of bioeconomy in the Finnish Bioeconomy Strategy (See context), and surpasses the EU definition of bioeconomy, that is centred on the use of biomass and overlooks nature-based tourism, and related value chains based on ecosystem services. On the other hand, the bioeconomy is not considered the most relevant sector for economic and technological development but is neither linked to degrowth.

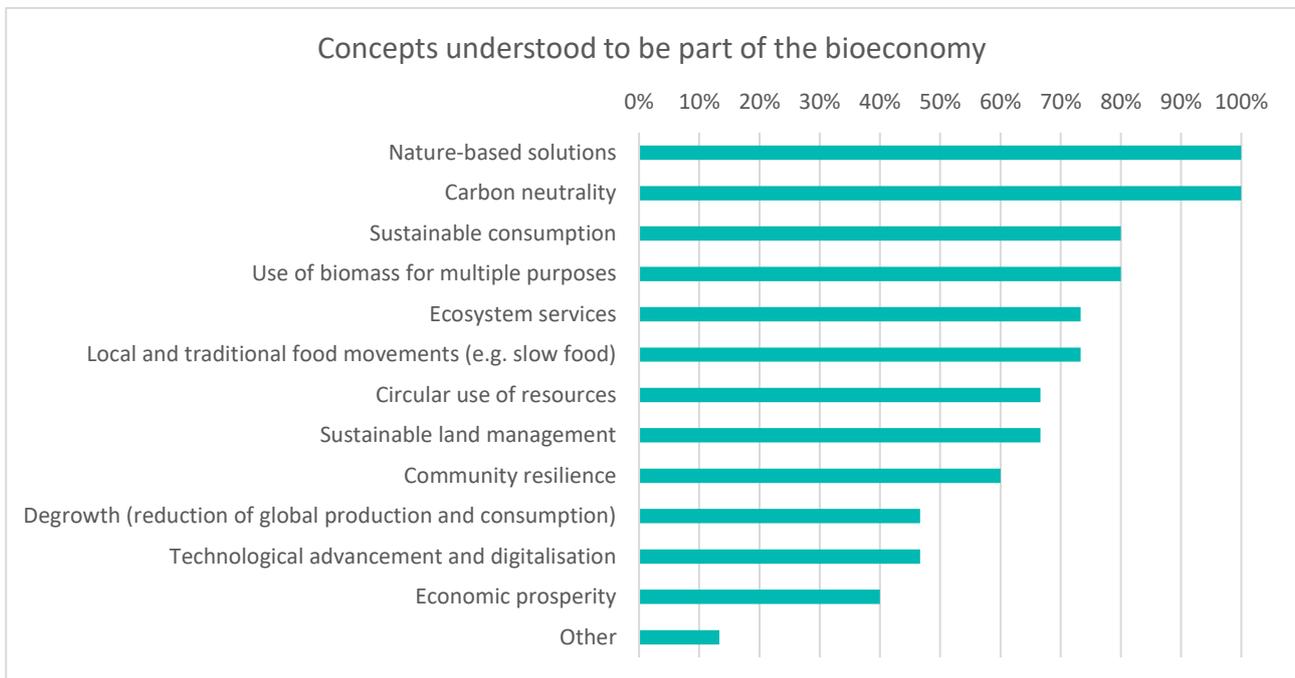


Figure 3: Proportion of survey respondents that understand certain concepts to be part of the bioeconomy. Respondents were allowed to select as many concepts as desired. Proportion is expressed as percentage of respondents.

The bioeconomy is perceived as clearly linked to primary production. Respondents perceive *Agriculture* (100%), *Forestry* (100%) and *Fisheries and aquaculture* (80%) as part of the bioeconomy (Figure 4). In contrast, only 67% of respondents consider *Waste management* as part of the bioeconomy, and roughly 50% consider *Biotechnology and pharmaceutical* sectors as part of the bioeconomy. Among secondary sectors, *Energy* (100%), *Construction* (87%) and *Tourism and recreation* (80%) are the sectors that receive

widest consideration. *Food and gastronomy* (67%), *Textile and fashion* (47%), *Chemistry* (33%) and *Machine industry* (33%) are among the sectors least considered to be a part of the bioeconomy. The lack of recognition for *Textiles* is worth noting, given its strong development in Finland during the last decade. Similarly for *Machine industry*, while North Karelia has the biggest forest machine manufacturing hub in the world (see context), this is not considered to be part of the bioeconomy.

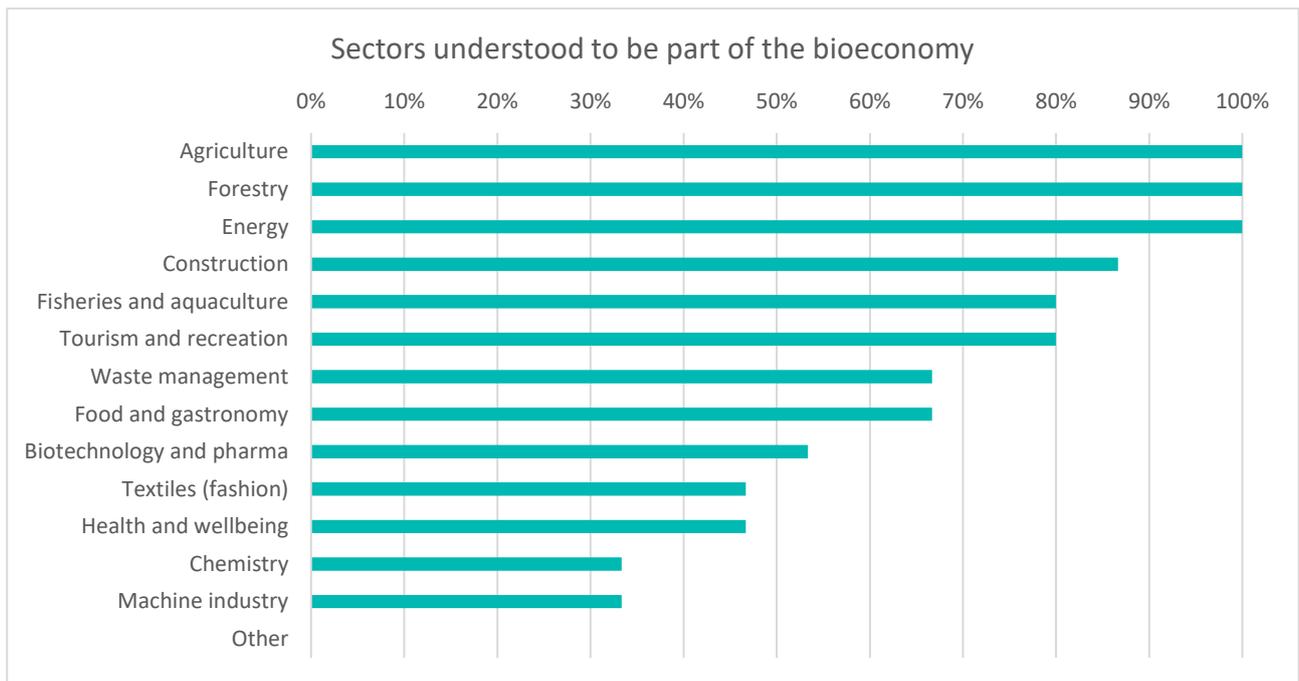


Figure 4: Proportion of survey respondents that understand certain sectors to be part of the bioeconomy. Respondents were allowed to select as many sectors as desired. Proportion is expressed as percentage of respondents.

As shown in Figure 5 below, based on true/false statements, the vast majority of respondents (>90%) agreed on the positive impacts of the bioeconomy, e.g., that the bioeconomy creates new jobs, reduces our dependence on fossil fuels, provides benefits to rural areas, and provides business and innovation opportunities. On the other hand, a relatively low, but significant, proportion of respondent do perceive some risks of the bioeconomy as inducing *deforestation* (36%), *stress on natural systems* (36%), and *not enough biomass to implement the bioeconomy* (31%).

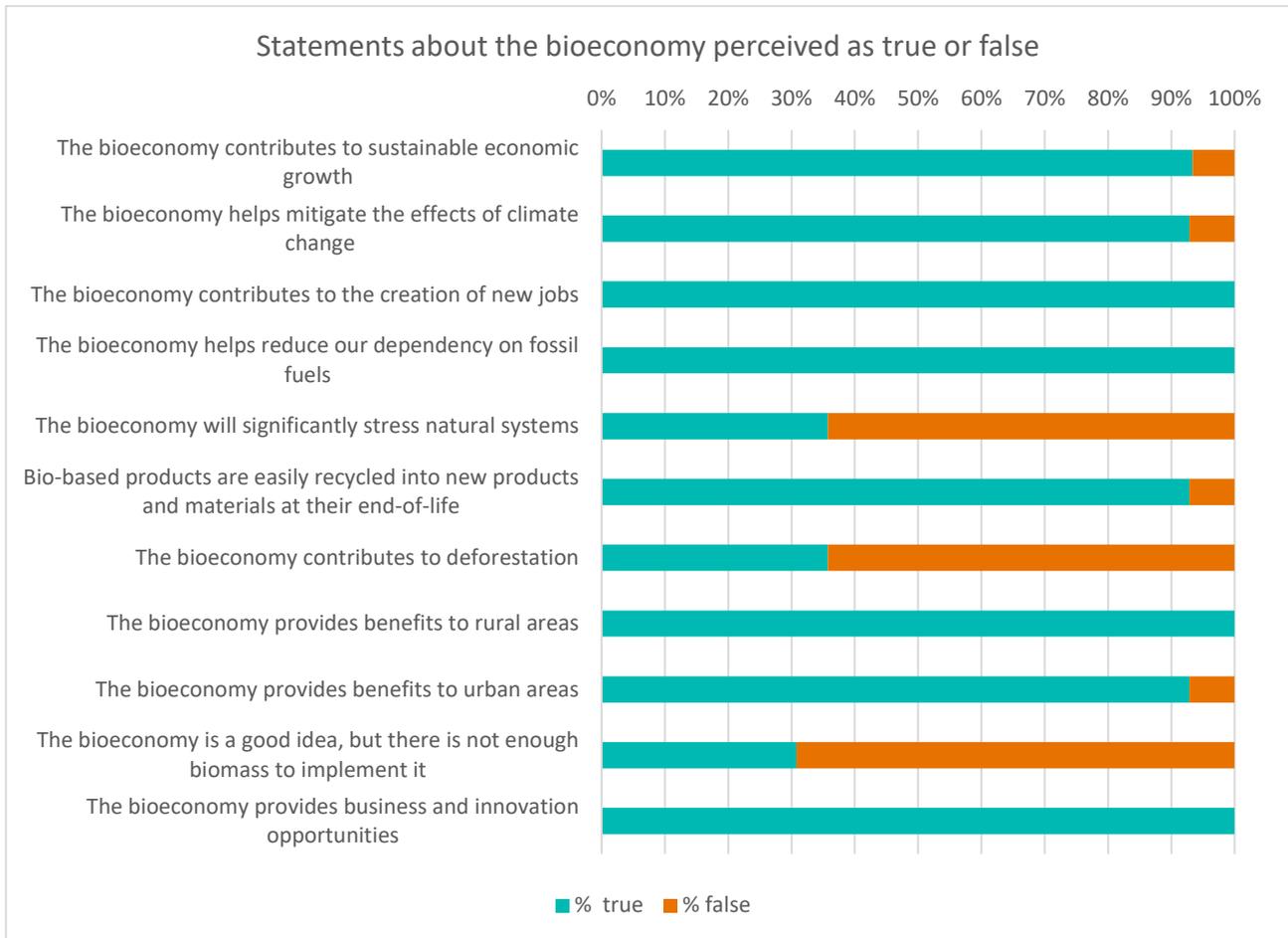


Figure 5: Proportion of survey respondents that marked bioeconomy statements as true (blue) or false (orange). Proportion is expressed as percentage of respondents.

When asked about the single most important benefit of the bioeconomy, *Renewable energy to replace fossil fuels* emerges as the most frequent answer (40%), followed by *Transition to a low-carbon economy* (20%). (Figure 6). These top responses, jointly accounting for the majority of answers, both refer to the emissions-reduction and energy-related facets of the bioeconomy. Benefits such as *Helping conserve biodiversity and ecosystem services*, *Reduced material consumption and waste*, *Job creation and economic growth*, and *Providing wellbeing for people*, were less acknowledged, each only considered to be the most important by 7% of respondents (1 individual). *Fostering technological innovation* was not considered to be the most important benefit by any respondent.

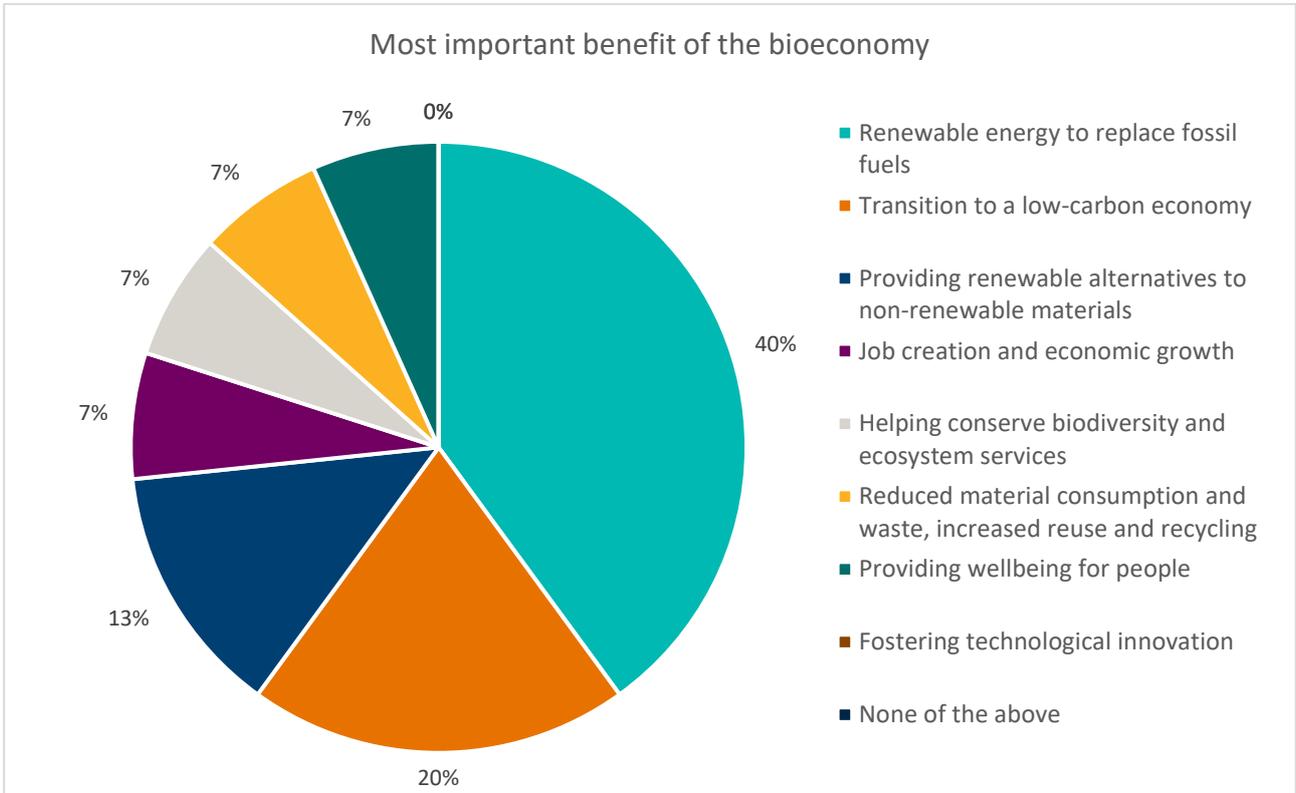


Figure 6: Proportion of respondents that perceived benefits of the bioeconomy as being the most important benefit out of eight predefined benefits. Respondents were limited to select only one benefit. Proportion is expressed as percentage of respondents.

While respondents generally agreed on the most relevant benefits of the bioeconomy, their perception of its single most important risk was more divided. Respondents considered: *Not enough biomass to supply the bioeconomy* (27%), *Impacts on ecosystem services* (27%), and *Increasing energy costs* (27%). Only very few respondents think that potential negative environmental and social impacts associated to wood imports from other countries are the most important risks of bioeconomy (Figure 7).

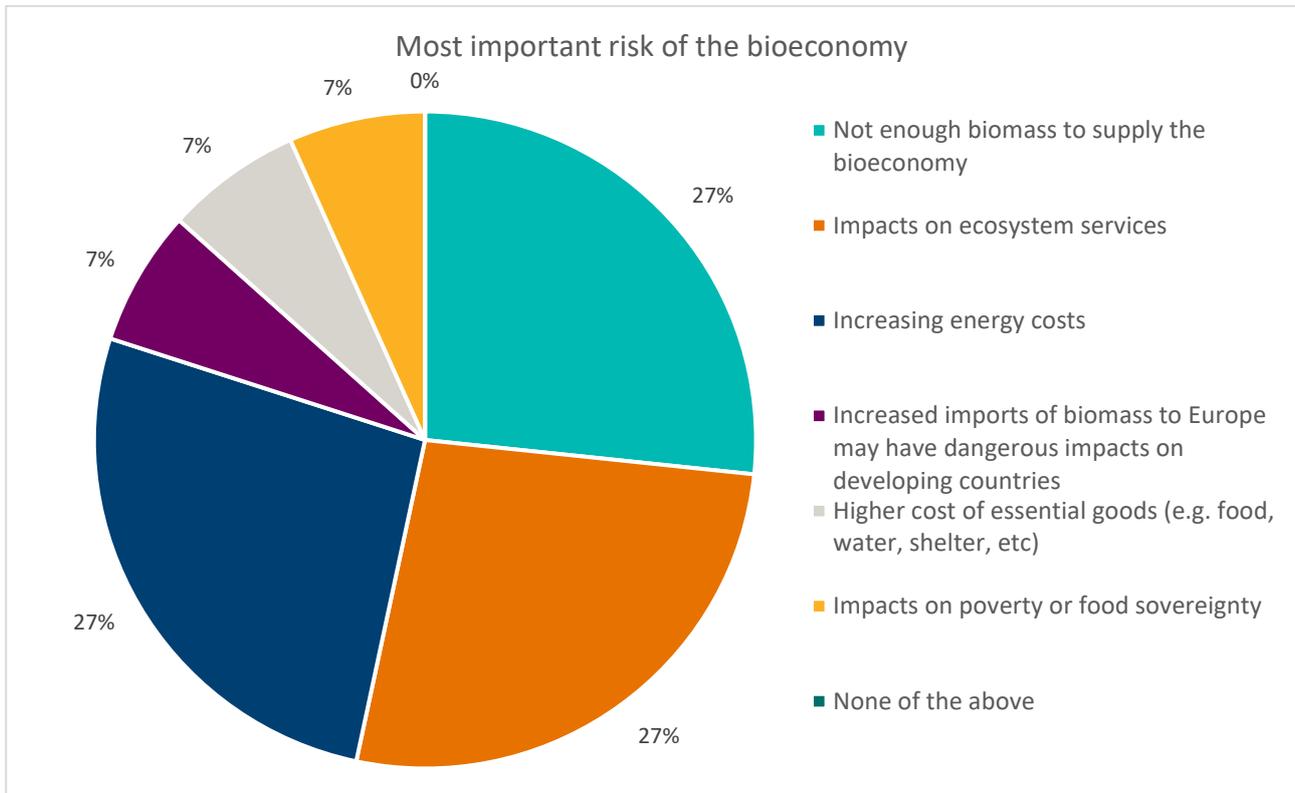


Figure 7: Proportion of respondents that perceived risks of the bioeconomy as being the most important risk out of six predefined risks. Respondents were limited to select only one risk. Proportion is expressed as percentage of respondents.

When asking about public awareness, 64% of respondents overall felt that the general public was not sufficiently informed on the bioeconomy. Slightly more industry respondents felt the general public was not sufficiently informed (67%) than government, 60% of whom felt the general public was not sufficiently informed.

3.3. Revisit value chain priorities and related communication efforts

Respondents were asked to indicate which bioeconomy sectors have the highest potential for growth in North Karelia. The responses allow to revisit value chain priorities and related communication efforts, compare with current bioeconomy sectors and compare with bioeconomy strategies.

The sector identified by respondents to have the highest potential is *Nature-based tourism* (67%). *Bioenergy* and *Wood construction* were also regarded as having high potential by respondents (60%) which aligns with the overall emphasis on renewable energy in the results of this survey and the current interest in wood construction in Finland and Europe. Moreover, bioenergy and wood construction are sectors that are mentioned in North Karelian strategies and can be interesting areas of investment in North Karelia.

Non-wood forest products (40%) and *Advanced new materials for manufacturing* (33%) were considered sectors with a high potential by a moderate number of respondents.

Innovative and cutting-edge bioeconomy sectors such as *Textiles* and *Bioplastics*, both related to *Green chemistry*, were not considered to be sectors with a high potential in North Karelia. The low score for

Textiles is worth noting as Finland is leading the development of cellulose-based textiles, this is clearly an opportunity for North Karelia that seems to be less recognised by the respondents.

The Strategy of North Karelia 2040 (2020) (see context) emphasizes the potential of nature-based tourism in North Karelia, highlighting the need to develop and produce nature-based tourism products to meet the growing demand. Interestingly, nature-based tourism was not amongst the sectors most understood to be part of the bioeconomy by the respondents (Figure 4: Proportion of survey respondents that understand certain sectors to be part of the bioeconomy. Respondents were allowed to select as many sectors as desired. Proportion is expressed as percentage of respondents. Figure 4).

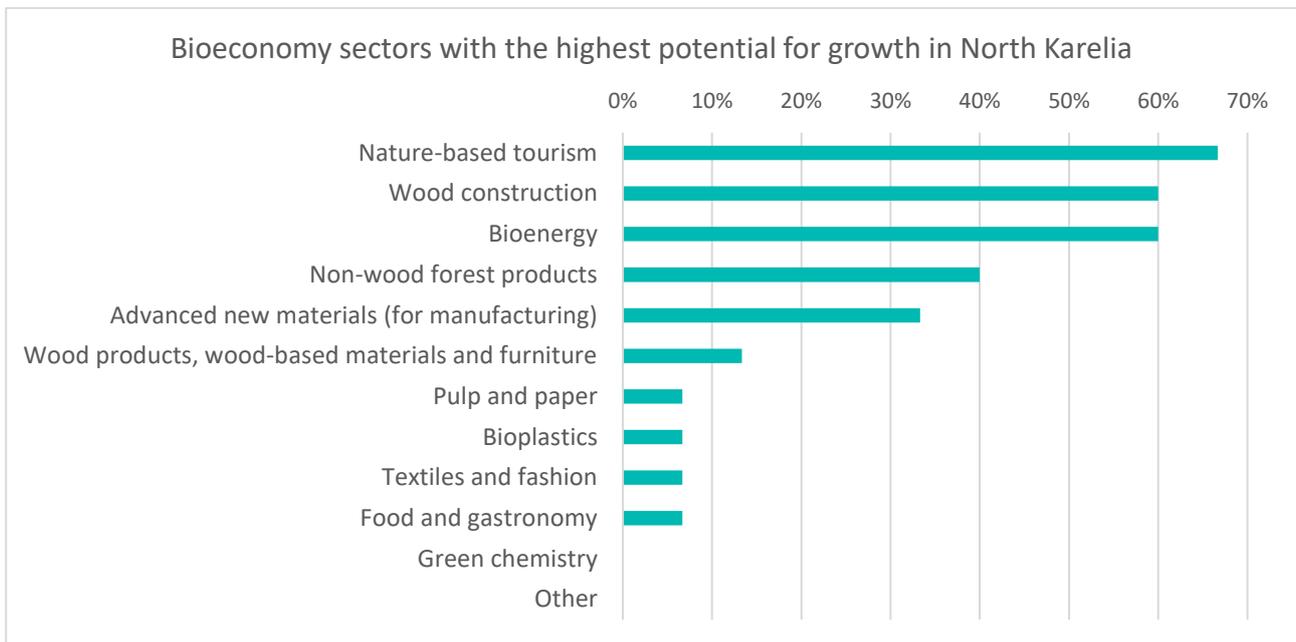


Figure 8: Proportion of respondents that selected bioeconomy sectors to have the highest potential for growth in North Karelia. Respondents were allowed to choose up to three sectors. Proportion expressed as percentage of respondents.

3.4. Identify barriers & supporting conditions

Respondents were asked to indicate the importance of supporting conditions and barriers for bioeconomy development in North Karelia. This information allows to ensure that the most important supporting conditions are met and to strategise about how to overcome barriers for bioeconomy development.

Investment in innovation was considered as the most important supporting condition for bioeconomy development (Figure 9). North Karelia works on further strengthening that supporting condition, through their membership of Bioregions Facility, a network that fosters regional innovation in the bioeconomy. All four other supporting conditions, *Availability of scientific information*, *Public procurement programmes*, *Adequate regulation* and *Performance-based payments for carbon sequestration*, were ranked on average around four (from 3.87 to 4.33), meaning they were all considered important supporting conditions.

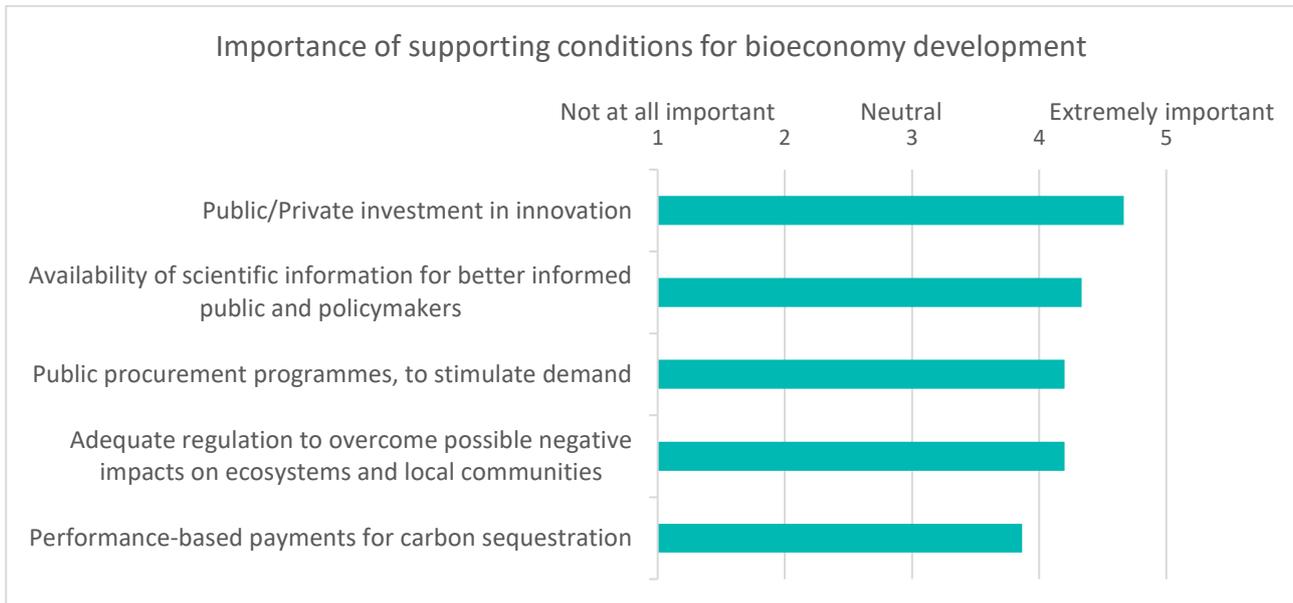


Figure 9: Importance of factors as supporting conditions for bioeconomy development in North Karelia. Respondents were asked to rank the factors from one (Not at all important) to five (Extremely important), the average value of the respondents' ranking is shown.

The barriers were generally perceived to be less important than the supporting conditions. Perceived to be the most important barrier to bioeconomy development in North Karelia is *Lack of co-operation among different stakeholders*. The GreenHub (see context) aims to overcome exactly this barrier through fostering collaboration in between companies, researchers and experts in the North-Karelian forest bioeconomy. The second most important barrier, according to respondents, is *Lack of technical feasibility and/or barriers to innovation* (Figure 10). This is interesting as technological advancement and digitalisation was one of the least mentioned concepts perceived to be part of the bioeconomy (Figure 3). Barriers *Lack of profitability and market demand* and *Lack of balance between different uses of forest* received an average score in between neutral (3) and important (4). Multipurpose use of forests is mentioned in North Karelia's Smart Specialisation Strategy as one of six areas of expertise for the forest bioeconomy, so it can be expected that North Karelia does have the expertise to assure a balance between different uses of forest. The two barriers perceived least important, *Lack of supportive policy and legislative environment* and *Lack of general social acceptance*, received an average score around three (Neutral).

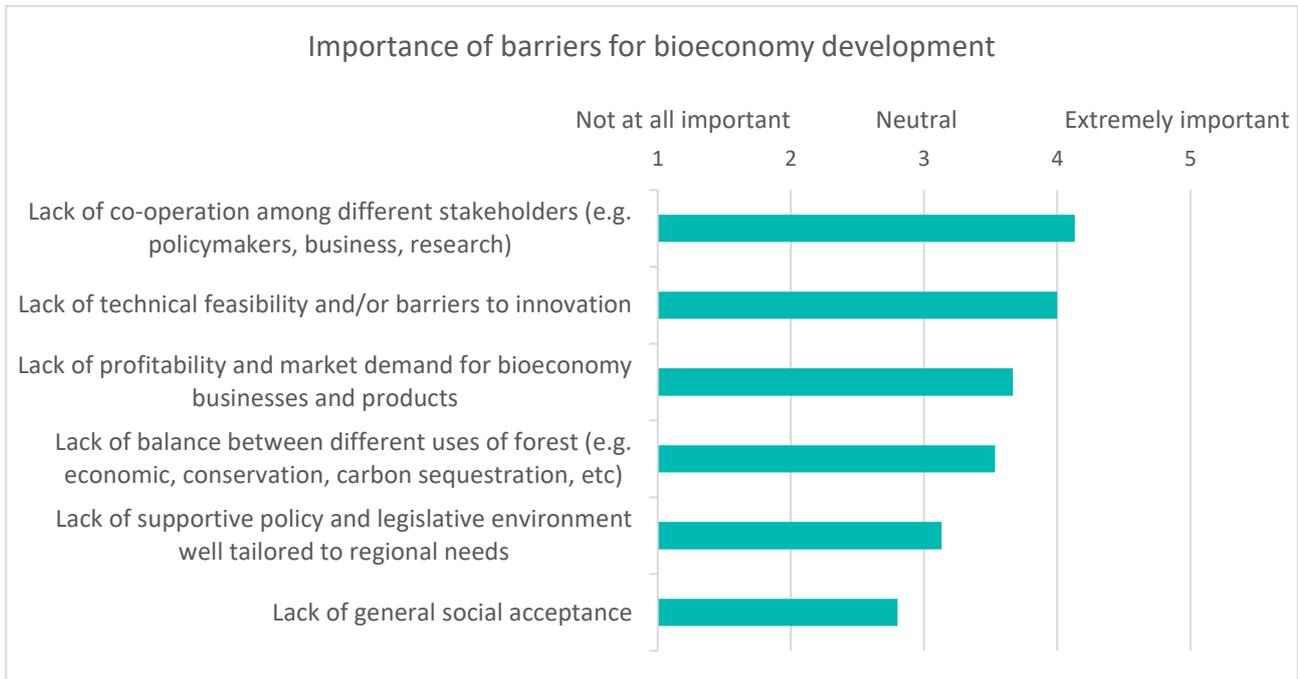


Figure 10: Importance of factors as barriers for bioeconomy development in North Karelia. Respondents were asked to rank the factors from one (Not at all important) to five (Extremely important), the average value of the respondents' ranking is shown.

3.5. Assess “willingness to engage” with the bioeconomy

Respondents were asked how willing their industry sector or government department would be to developing the bioeconomy; if they had been involved in any investment projects, regulation or initiatives related to the bioeconomy; and what were the main reasons for involvement or the lack of it. Below we present the results of government and industry side by side.



Figure 11: Willingness to develop the bioeconomy. Industry and government respondents were asked to rate how willing their industry sector/government department is to develop the bioeconomy on a scale from zero (not willing) to hundred (extremely willing).

Industry

Industry respondents were asked how willing they were to develop the bioeconomy on a scale from zero (not willing) to hundred (extremely willing). The average score was 88, meaning that the industry respondents are very willing to develop the bioeconomy (Figure 11). Moreover, 71% of industry respondents said to have taken an investment project in the bioeconomy in the past.

The main reasons to have undertaken bioeconomy investment projects are *To take advantage of the existing market opportunities* (60% of industry respondents that have undertaken bioeconomy projects) and *To take advantage of government incentives* (60%). 40% also mentioned *To gain a competitive advantage in future markets*. The main reasons to NOT have undertaken bioeconomy projects are

Unprepared market: too small and growing too slow and *Lack of technical capacity* (both mentioned by the one respondent who filled in the question).

Government

Government respondents were asked how willing they were to develop the bioeconomy on a scale from zero (not willing) to hundred (extremely willing). The average score was 78, meaning that the government respondents are very willing to develop the bioeconomy but slightly less willing than the industry actors (Figure 11). Moreover, 50% of government respondents said to have undertaken a bioeconomy regulation or initiative in the past. Also this number is lower than the comparable answer from industry side.

The main reason to have undertaken a bioeconomy regulation or initiative is *To ensure sustainability or social equity* (75% of government respondents that have undertaken a bioeconomy regulation or initiative), followed by *To improve availability and access to biological resources* (50%). One of four respondents (25%) said that *To generate markets and social acceptance of bioeconomy products* was a main reason. The main reason to NOT have undertaken a bioeconomy regulation or initiative is the *Lack of technical capacity*, mentioned by two out of three respondents (67%). The third respondent specified a not predefined main reason, namely “Conflict between goals of the department and goals of the bioeconomy”.

3.6. Improve collaboration with government & industry

Respondents were asked about the division of roles and responsibilities between the government and industry regarding communicating the bioeconomy to the public, investing in research, development, and innovation, and ensuring that the bioeconomy has a positive effect on the environment and the society. We compared results between two sub-groups of respondents, namely government and industry.

Both groups emphasised that the government is more responsible in communicating and promoting the bioeconomy among the general public (Figure 12). Regarding investments in research, development, and innovation, respondents from both groups felt that both government and industry are equally responsible. The result was similar regarding ensuring positive environmental and social impacts, although the responses were slightly tilted towards government.

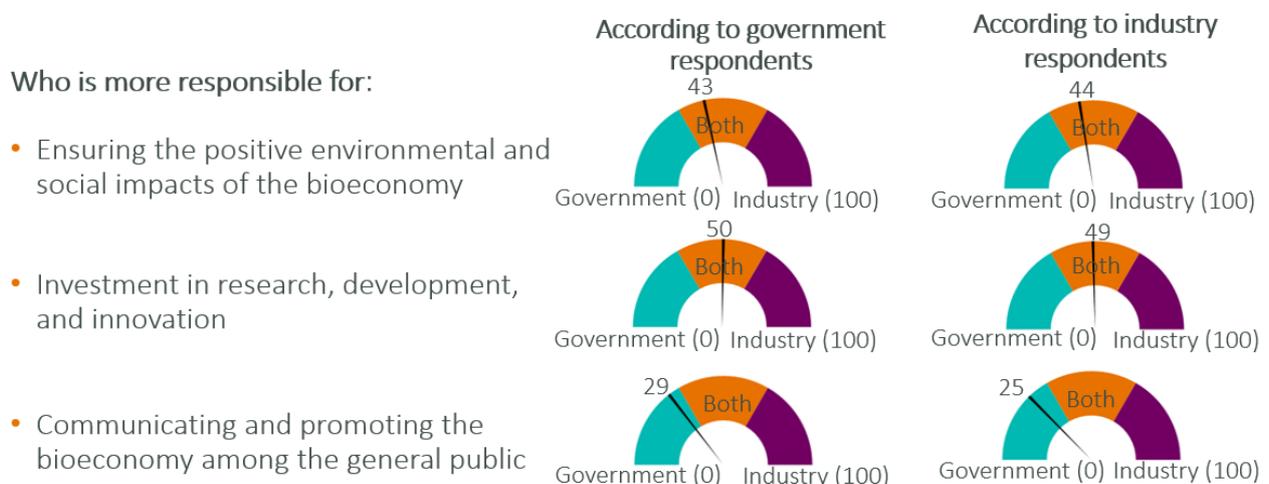


Figure 12: Division of roles and responsibilities between the government and industry regarding three different tasks in moving the bioeconomy in North Karelia forward. Industry and government respondents were asked to indicate who is more responsible for the three different tasks on a scale from zero (Only government responsible) to hundred (Only industry responsible).

Government and industry actors agree about each’s roles and responsibilities regarding to bioeconomy development. This could be the foundation for a future strengthened collaboration and co-operation among different stakeholders (e.g., policymakers, business, research) which was perceived as the most important barrier for bioeconomy development in North Karelia (see Section 3.5).

3.7. Find key leverage points for bioeconomy development by identifying overlaps with other policy areas

Respondents were asked to identify any overlaps between the bioeconomy and other policy areas that are important to business and government to help North Karelia identify key leverage points for bioeconomy development in the region. It also expands our understanding of what kinds of goals are seen as important for the bioeconomy.

All respondents chose *Climate change mitigation and adaptation* as well as *Clean energy* as having goal alignment with the bioeconomy (Figure 13). Other policy areas with very high overlap with bioeconomy are *Biodiversity conservation*, *Circular economy* and *Rural development*. Least alignment was seen with *Social inclusion*.

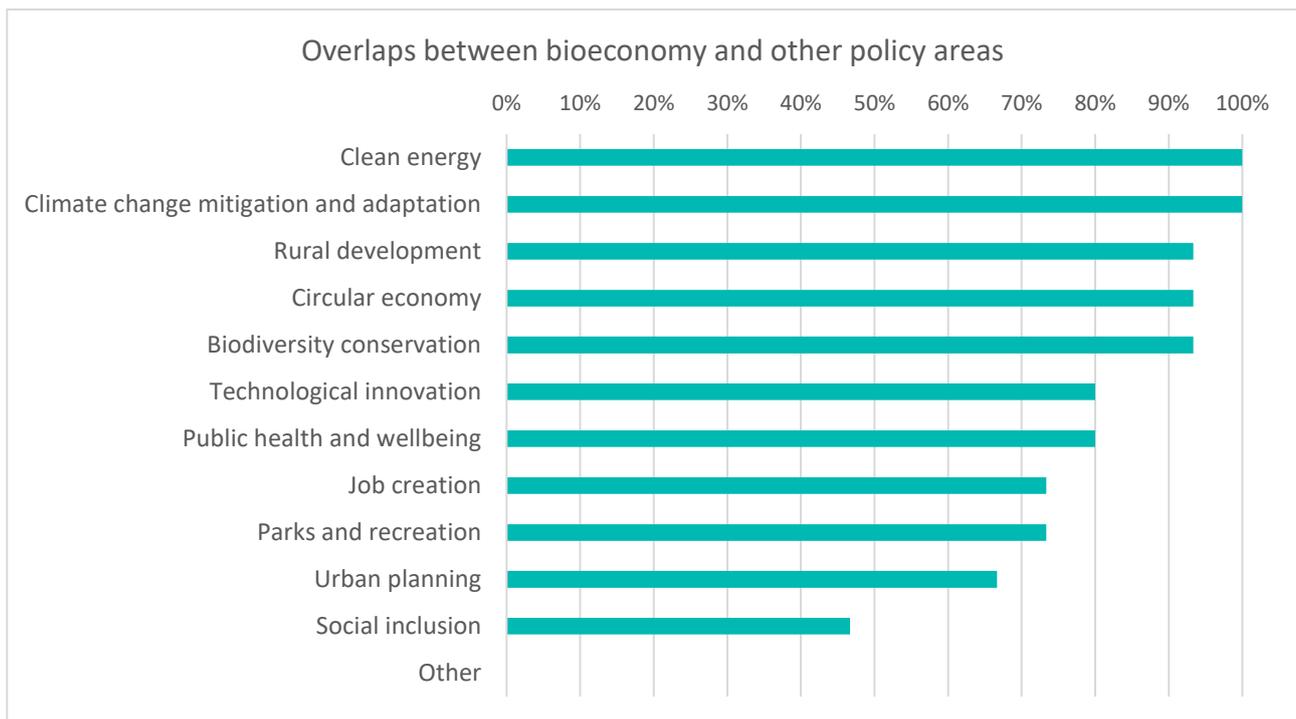


Figure 13: Proportion of respondents that understand certain policy areas to be related with the aims of the bioeconomy. Respondents were allowed to select as many policy areas as desired. Proportion expressed as percentage of respondents.

4. Conclusions

Despite a limited number of responses, the survey results give an insight into how mid-to-high ranking government officials and local industry leaders perceive the bioeconomy, its benefits, and its challenges, in North Karelia. What we learn about the perceptions of these different groups can be essential to help prioritise regional bioeconomy actions and communications to maximise their impacts. Here we present six key messages from our Survey.

Bioeconomy is perceived to have a great potential to address environmental challenges, its potential to economic growth appears less prominently.

Business and policy respondents generally perceived bioeconomy as a promising economic model, highly agreeing on its positive impacts and moderately disagreeing on its potential negative impacts. Bioeconomy is perceived specifically promising to address environmental challenges, with clear emphasis on its contribution to a low-carbon economy. Although respondents do consider that the bioeconomy provides socio-economic benefits such as contributing to economic growth and the creation of new jobs, these benefits appeared less prominently. Summarising, respondents generally see the bioeconomy as strategic for generating environmental benefits, while also producing some positive economic outcomes, like sustainable economic growth and job creation.

There is a perception among government and industry that the public is not sufficiently informed on the bioeconomy.

About two-thirds of respondents think that the general public in North Karelia is not sufficiently informed on the bioeconomy. In North Karelia, the forest bioeconomy is the cornerstone of the region's business and industry sector, and it is one of the two central pillars of the region's Smart Specialisation Strategy. Accordingly, it may be surprising that a majority of respondents perceived that the general public is not sufficiently informed.

Nature-based tourism, wood construction and bioenergy are considered the most promising bioeconomy sectors for North Karelia

Respondents perceive the bioeconomy to be highly linked to agriculture and forestry sectors, somewhat less so to fisheries and aquaculture, and much less so to waste processing and industrial biotechnologies. Among downstream sectors, nature-based tourism, wood construction and bioenergy are perceived the bioeconomy sectors with highest potential for growth in North Karelia. Non-wood forest products and advanced new materials for manufacturing were considered sectors with a high potential by a moderate number of respondents. Innovative bioeconomy sectors such as *Bioplastics*, *Textiles* and *Green chemistry*, were not considered to be sectors with a high potential in North Karelia. This may be a bit surprising, as Finland is a worldwide leader in the development of cellulose-based textiles fibres. Similarly, while North Karelian Smart Specialisation Strategy highlights biorefining and new biobased products as areas of expertise for the region's forest bioeconomy, this seems not to be reflected in our results (See context; Figure 1). On the other hand, renewable energy production & wood construction, also prominent expertise areas in the region, are indeed well reflected in the Survey results. These results can help North Karelian stakeholders to revisit prioritised value chains, and design communication strategies and actions.

Investment in innovation is perceived as a key enabler of the bioeconomy; limited co-operation among different stakeholders (policy, business, etc.) is considered the most important barrier.

Several supporting conditions (enablers) for the bioeconomy development in North Karelia were rated in between extremely important and important, namely investment in innovation, followed by availability of scientific information, public procurement programmes and adequate regulation. The barriers were

generally perceived to be less important than the supporting conditions. The most important barrier for bioeconomy development in North Karelia is considered to be limited co-operation among different stakeholders (policy, business, etc.), closely followed by lack of technical feasibility and/or barriers to innovation. The GreenHub network aims to overcome the limited co-operation among different stakeholders through stimulating cooperation and information sharing in between the different actors involved in the forest bioeconomy (see context).

Clean energy and climate change mitigation are the key policy areas perceived to have the strongest goal alignment with the bioeconomy.

North Karelia business and policy actors suggest that bioeconomy has strong goal alignment with environment related policy areas, especially climate change mitigation and adaptation and clean energy. Other policy areas with very high overlap with bioeconomy are biodiversity conservation, circular economy, and rural development. Bioeconomy was considered to have least goal alignment with social inclusion policies.

Government and industry indicate willingness to engage with the bioeconomy and are well aligned in their perceptions on the responsibilities.

Both government and industry respondents indicated that their sector or department is willing to develop the bioeconomy, although industry seemed to be slightly more willing. In addition, government and industry respondents felt very similar about who is responsible for different tasks in moving the bioeconomy in North Karelia forward. Both groups indicated that they are equally responsible for investments in research, development, and innovation and for ensuring positive environmental and social impacts. Significantly, both groups emphasised that the government is more responsible in communicating and promoting the bioeconomy among the general public.

5. Discussion points for improved communication on the bioeconomy

All bioeconomy stakeholders are invited to reflect upon the results of this survey and use them to design or revisit communication strategies and actions. In this respect, some issues that may be considered are proposed below.

- Improve the bioeconomy awareness of the general public
 - o Government and industry respondents agreed that the government is more responsible for communicating and promoting the bioeconomy among the general public.
 - o Two-thirds of respondents feel that the general public in North Karelia is not sufficiently informed on the bioeconomy.
 - o Further investigate concerns on social awareness of the bioeconomy as a necessary step to improve communication; Proposed research question: In which ways is the general public in North Karelia not sufficiently informed?
- Emphasise the economic and social dimensions of bioeconomy
 - o Environmental benefits are widely acknowledged.
 - o Contributions and policy overlaps with economic development, job creation, innovation, etc. appear less prominently.
- Highlight the potential of advanced biobased materials and products, such as bioplastics, textiles and green chemistry
 - o The North Karelian Smart Specialisation Strategy highlights biorefining and new products as areas of expertise for the region's bioeconomy, but related sectors were not acknowledged as having strong potential in North Karelia in the survey results.
 - o Revisit bioenergy related communication policies, in relation to circularity, cascade use and material efficiency, its synergy with material uses and existing knowledge on the actual contribution to climate change mitigation of the different technologies.
- Consider which bioeconomy sectors are strategic to communicate as part of the bioeconomy
 - o For example, North Karelia has the biggest forest machine manufacturing hub in the world, but only a limited number of respondents considered machine industry as part of the bioeconomy.
 - o Potentially interesting sectors to promote in North Karelia include non-wood forest products, nature-based tourism and new products and materials.

6. About the Bioregions Facility and the survey

The Bioregions Facility, launched in 2020, is a transregional cooperation network that supports innovation, networking, and policy learning related to the development of a sustainable forest bioeconomy. Consisting of forward-thinking regions across Europe, it aims to unlock regional potential through international exchange on forest circular bioeconomy issues. Three founding members are the Basque Country (Spain), North Karelia (Finland) and North Rhine-Westphalia (Germany), with the European Forest Institute holding the Secretariat for the facility.

The Bioregions Facility seeks to support regional level policymakers to take advantage of strong regional policy tools and global best practices, create mutually beneficial partnerships with the private sector, and deeply understand the unique regional challenges and supporting conditions for the bioeconomy. The bioeconomy perceptions survey is an important part of this work, and it will be replicated in all the founding regions with the aim of gathering insights from regions across Europe and beyond for a large-scale comparative study.

Target outcomes of the Bioeconomy Perceptions Regional Survey:

- Understand how business and policy actors perceive the bioeconomy
- Revisit value chain priorities and related communication efforts
- Identify barriers & supporting conditions
- Assess “willingness to engage” with the bioeconomy
- Improve collaboration with government & industry
- Find key leverage points for bioeconomy development by identifying overlaps with other policy areas

7. Survey methodology

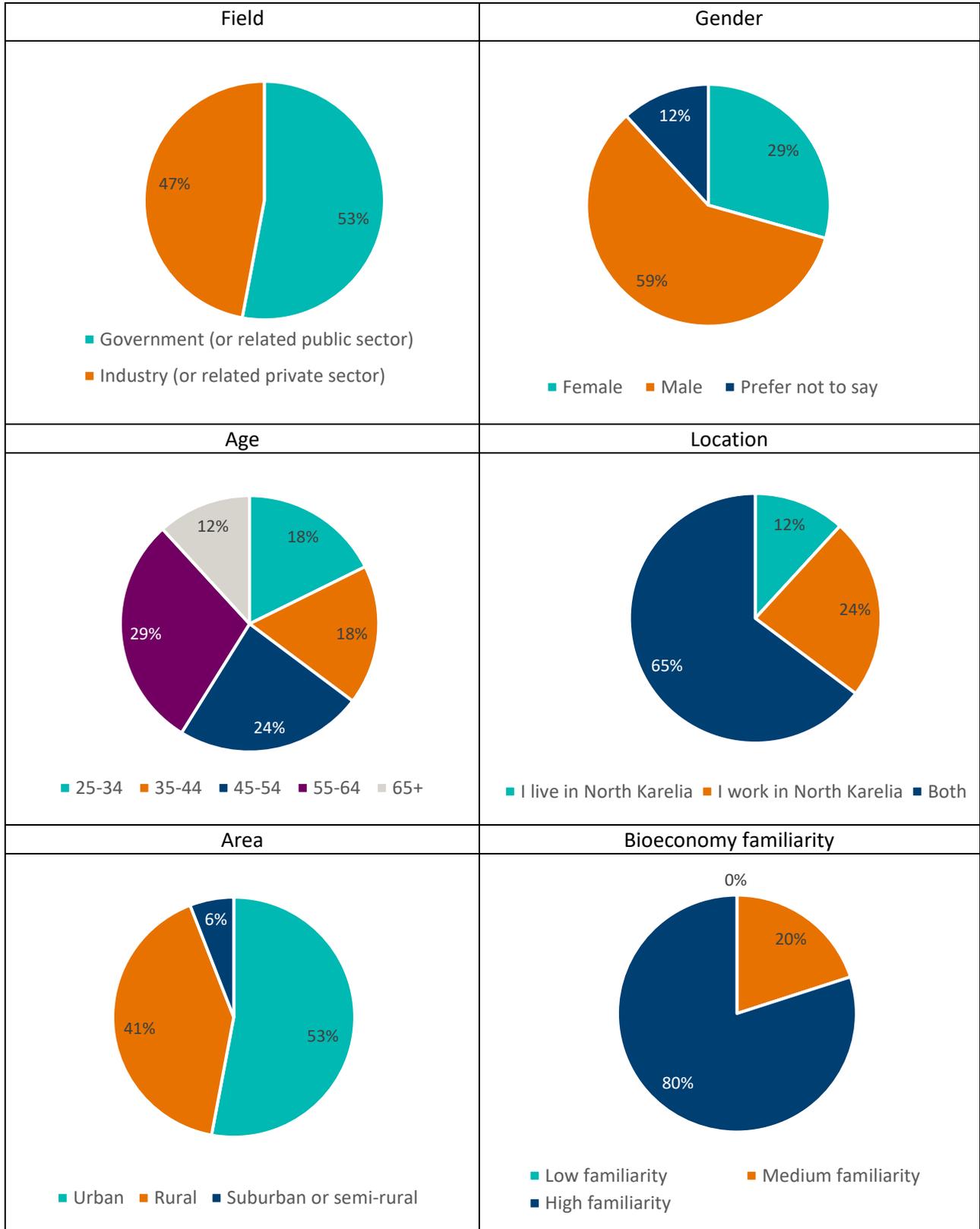
The Survey is provided in the form of a toolkit to a regional partner organisation that takes care of identifying and contacting potential respondents. The toolkit is designed and adapted to the regional context by the Bioregions Facility. Consequently, the regional partner organisation is able to launch and disseminate the Survey in the region at their own pace, with support of the Bioregions Facility Secretariat.

The Survey toolkit consists out of 5 items: 1) Deployment checklist and timetable; 2) Pamphlet on goals and expected outcomes; 3) Survey invitation email; 4) Survey pre-formatted in SurveyMonkey; 5) Guide for identifying and contacting survey participants. All materials reaching the potential respondents are adapted to the local language, in this case Finnish. The Deployment checklist and timetable document serves to keep track of responsibilities and timelines. The Guide for identifying and contacting survey participants defines in more detail how to identify survey target groups and what to consider in the survey launch and dissemination stages.

After the closure of the Survey, the Bioregions Facility Secretariat takes the lead in creating three Deliverables. These include a report on the results (this document), a PowerPoint with summarised results and a couple of social media cards. The report includes a section on the Regional context and a section with Conclusions & recommendations. The regional partner organisation is closely involved in the writing of those two sections.

In the case of North Karelia, the Regional Council of North Karelia identified target participants from government and disseminated the survey and the Bioregions Facility Secretariat supported the dissemination among potential industry respondents. The Bioeconomy Perceptions Regional Survey was open to answers during the period September - November 2021 and the analysis and report writing took place between December 2021 – February 2022.

A1. Characterisation of the respondents



A2. Survey questions

[Survey pre-formatted in SurveyMonkey: English translation](#), (REGION) is in this case always replaced with North Karelia

[Survey pre-formatted in SurveyMonkey: Finnish](#)