BIOREGIONS

Forest bioeconomy in action

Perceptions on the Bioeconomy in Flanders

Results from a regional survey targeted at government and industry

In collaboration with:

b2be BUSINESS TO BIOECONOMY

Vlaanderen verbeelding werkt

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

The Bioregions Facility launched its Bioeconomy Perceptions Regional Survey in Flanders in the period October – December 2022 in the local language, Dutch. 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 seven key highlights of the survey in Flanders.

- Respondents generally perceived **bioeconomy as a promising economic model**, highly related to circular economy, and providing several environmental benefits. Respondents see providing renewable materials, transition to low-carbon economy and circularity as the most relevant positive impacts of the bioeconomy.
- Bioeconomy is perceived to be highly linked to **circularity, use of biomass for multiple purposes** and **sustainable land management.**
- Flanders' business and policy actors suggest that **green chemistry** is the bioeconomy sector with **highest potential for growth in Flanders**. Advanced new materials and bioplastics are in a second and third place respectively.
- **Lack of supportive & legislative environment**, **limited co-operation among different stakeholders** (policy, business, etc.) and **lack of profitability & market demand** are perceived as the most important **barriers for bioeconomy development**. **Investment in innovation**, **availability of scientific information** and **adequate regulation** are perceived the most important **supporting conditions.**
- **Industry and government** respondents indicated **high willingness to develop the bioeconomy**.
- **Government, industry and other respondents felt similar about who is responsible for different tasks in moving the bioeconomy in Flanders forward**. Respondents indicated that government and industry are more or less equally responsible for investments in research, development, and innovation. All subgroups emphasised that the government is more responsible in communicating and promoting the bioeconomy among the general public. Industry and other respondents find the government to be significantly more responsible for ensuring positive environmental and social impacts of the bioeconomy while government respondents find themselves to be only slightly more responsible.
- According to respondents, **bioeconomy has strongest goal alignment with circular economy**. Respondents also reported strong goal alignment with other policy areas, such as clean energy, technological innovation and rural development. Also, environment related policy areas with very high overlap with bioeconomy are climate change mitigation & adaptation, biodiversity conservation and nature development.

2. Regional context

Flanders is a region in northern Belgium and covers an area of 13,522 square kilometres. Flanders has a population of approximately 6.6 million people, making it the most populous region in Belgium. Flanders covers about 45% of the country's land area and is home to 60% of the population. Due to the high population density and the lack of spatial planning, the biomass availability per capita is limited. Flanders has a GDP per capita of approximately EUR 38,200 in 2021, making it one of the wealthiest regions in Europe.[1,2]

Flanders has a strong tradition of innovation in the bioeconomy, with a focus on sustainable production and value chain optimisation. For example, the region is home to world-class research institutions like VIB (the Flemish Institute for Biotechnology) and VITO (Flanders' strategic research centre for technological research)[3]. According to a study by VITO and ILVO (Institute for Agricultural, Fisheries and Food Research), the bioeconomy sector in Flanders in 2018 employs about 148,000 people and generates a turnover of around 57 billion euros. From an economic point of view, the Flemish bioeconomy did well in 2018.[4]

Our biomass production is highly land-bound. Agriculture occupies 46% of the land area in Flanders; forests occupy only 10% of the land area (approx. 140,380 ha). More than half of the agricultural land is used for fodder crops. Some 21 Mton of biomass mainstream is produced in the Flemish agricultural sector, 70% of which is of plant origin.[4]

While agriculture produces nearly 98% of biomass in Flanders, forestry produces less than 2% of the Flemish biomass. The main tree species in Flanders are Pinus sylvestris, Quercus petraea, Quercus robur and Populus sp. The volume of wood per ha has increased markedly since the beginning of measurements for the forest inventory (1997). It shows an increase from 216 m³/ha to 273 m³/ha.[5] For the entire forest area in Flanders (rounded 140,000 ha) and calculating an average growth of 9 m³/ha/year, the harvest would be 6 m³/ha/year. The ratio of logging/growth in Flanders is therefore estimated at 67%. This percentage is considered an overestimation rather than an underestimation.[6]

Flanders does not produce enough roundwood for its powerful domestic industry, and raw materials and primary processed products are imported to meet demand. Most of the roundwood is imported from neighbouring regions in France and Germany. Flanders has a fairly large wood-based panel industry that mainly produces chipboard for export and for the local furniture industry.

Fisheries and aquaculture account for only 0.1% of the producing sectors. In addition, the production of by-product streams in agriculture is about the same size as the main streams (21 Mton), but the vast

[1] Brochure Flanders in Figures, Statistics Flanders

[2] Demographics and macroeconomic trends in Flanders, FIT

[3] Brochure Flanders'bioeconomy: An unfolding story of sustainable growth

[4] MONBIO 1.0

[5] Agentschap voor Natuur en Bos – Resultaten (2022)

[6] Leen Govaere & Anja Leyman. 2020. Nieuwe cijfers over de groei van bomen in Vlaanderen. Bosrevue 90a, 1-8. ISSN 2565-6953 – Bosrevue 90a

majority of this by-product stream comes from animal production (82%), in this case manure.[4] Of the processing sectors, the food sector represents the largest consumer of biomass, overshadowing all other sectors. Within the food sector, the feed sector is a major consumer of by-products from the other food sectors. In doing so, it provides half of its raw materials; the other half are grains from agriculture. With this, it produces 6 Mton of compound feed. For bio-based sectors, i.e., the non-food/feed biomass-processing sectors, it is difficult to estimate with the available data the exact size of the bio-based part of these mostly hybrid sectors. However, it is clear by summing some large streams such as mono-valent fatty acids, fertilisers, bioethanol and biodiesel, that the chemical sector has a large share within this block.[4]

For Flanders, international trade, but especially trade with the other regions of the country and our immediate neighbours, is of great importance. This is also reflected in biomass flows. For example, the import and export of raw materials from agriculture are respectively as large as three quarters (15 Mton) and a quarter (5 Mton) of the Flemish production of main streams. This makes sense with such a highly developed food industry. Imports and exports by the Flemish food industry are also of such magnitude, at least 13 and 14 Mton respectively.[4]

In general, the Flemish bioeconomic sectors have high labour productivity compared to the EU average (€67,331/employee for industrial sectors) and our neighbouring countries (Netherlands € 116,174, France €90,126, Germany €86,977 for industrial sectors); especially the Flemish bio-based pharmaceutical industry shows itself to be very competitive in absolute terms with €450,000/employee. In relative terms, fisheries, food and beverage, bio-based textiles, clothing, wood, furniture and paper, chemicals, pharma, rubber and plastics, and bioelectrics all do significantly better than the European average and often better than our neighbouring countries. Also, in terms of agriculture, Flanders is only ahead of the Netherlands. In terms of labour productivity, the Flemish bioeconomy is doing well across the board.[4]

The Flemish government has set ambitious targets for the development of the bioeconomy in the region. By 2030, it is Flanders' ambition to be one of the most competitive bioeconomy regions in Europe, to be one of the top regions in Europe for innovation and research relating to the bioeconomy and to have created one of the most sustainable bioeconomies in Europe.[7]

Flanders is home to a number of innovative companies in the bioeconomy sector, including Biobest (a leading producer of beneficial insects for sustainable pest management), Ecover (a producer of eco-friendly cleaning products), and Greenyard (a global supplier of fresh, frozen, and prepared fruits and vegetables).

Anyhow, Flanders also experiences some challenge to further develop the bioeconomy. During the different activities of the B2BE Facilitator (thematic workshops, horizon screening, brainstorming, etc.) and the 'Platform Oogstbare Landschappen' (Platform Harvestable Landscapes), three main barriers always emerge independent of the sector. Firstly logistics, biomass or by-products are often decentralised and available in small volumes and unevenly spread during the year. This makes it difficult and costly to organise logistics. The need for central biomass hubs has arisen in every project that has been conducted (Interreg Grasgoed, B2BE Facilitator, LEADER+, LIFE Green Valleys, etc.). Secondly, regulation can slow down innovation or possible valorisation routes. Thirdly, finding the correct match between different

[7] Brochure Bioeconomy in Flanders: The vision and strategy of the Government of Flanders for a sustainable and competitive bioeconomy in 2030.

parties active in the Flemish bioeconomy and investment resources to stimulate a certain project or business idea, is not always evident.

3. Results

3.1 About the respondents

We targeted groups working within government and industry in Flanders. 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.

Due to survey dissemination methods, it is not possible to estimate accurately the number of people who received the survey. A total of 111 people responded to the survey, 62 respondents said to be from Government (or related public sector) (56%), 23 from Industry (or related private sector) (21%) and 26 respondents identified themselves as not being part of government or industry but rather of another field (23%) (Figure 1). These 26 respondents specified very varied fields in which they work, ranging from education and research to tertiary sector.

The majority of respondents were male (55%) (Annex A1). Responses were received from all age groups but only 1 response from the 18-24 age group – likely due to the survey's aim of reaching industry leaders and mid-to-high-ranking government officials. The vast majority of respondents belong to the 45-54 age group (36% of respondents) and 35-44 age group (27%). Most respondents (58%) both live and work in Flanders, but there were also those who only live in the region (39%) or only work in the region (4%). Most respondents live in rural areas (37%), in comparison with those who live in urban (32%) or semi-rural/suburban (31%) areas.

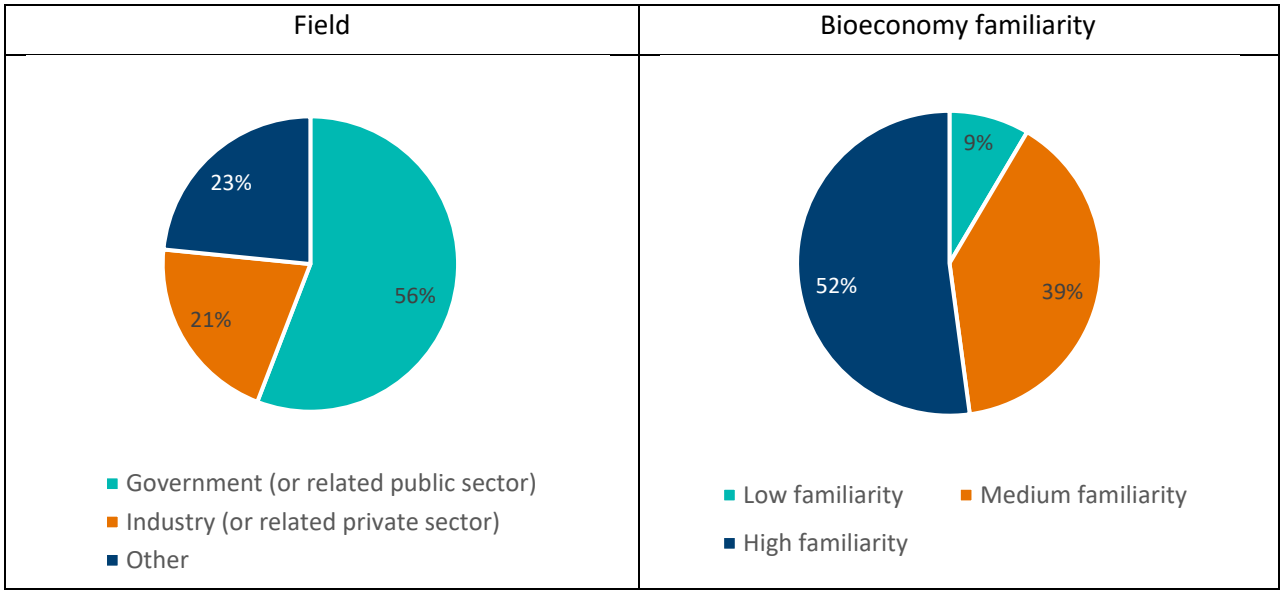

Figure 1: Characterisation of respondents according to field and bioeconomy familiarity. Additional charts related to the characterisation of the respondents can be found in Annex 1

Most respondents reported good familiarity with the bioeconomy, with 52% indicating high familiarity and 39% indicating medium familiarity with the bioeconomy (Figure 1). 9% of the respondents reported having low familiarity with the bioeconomy.

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.

Circular use of resources (by 90% of respondents) and *Use of biomass* (by 87% of respondents) were most understood to be a part of the bioeconomy (Figure 2). *Sustainable land management* (81%), *Nature-based solutions* (77%), *Carbon neutrality* (71%), *Sustainable consumption* (67%), and *Ecosystem services* (61%) were indicated by the majority of respondents to be a part of the bioeconomy. Interestingly, concepts such as *Local and traditional food movements* (48%), *Economic prosperity* (45%), *Technological advancement* (44%), *Community resilience* (30%), and *Degrowth* (26%) were less considered by respondents to be a part of the bioeconomy.

Summarising, respondents see circularity, biomass use and sustainability most linked to the bioeconomy. On the other hand, the bioeconomy is considered less relevant for economic and technological development but is neither perceived linked to degrowth.

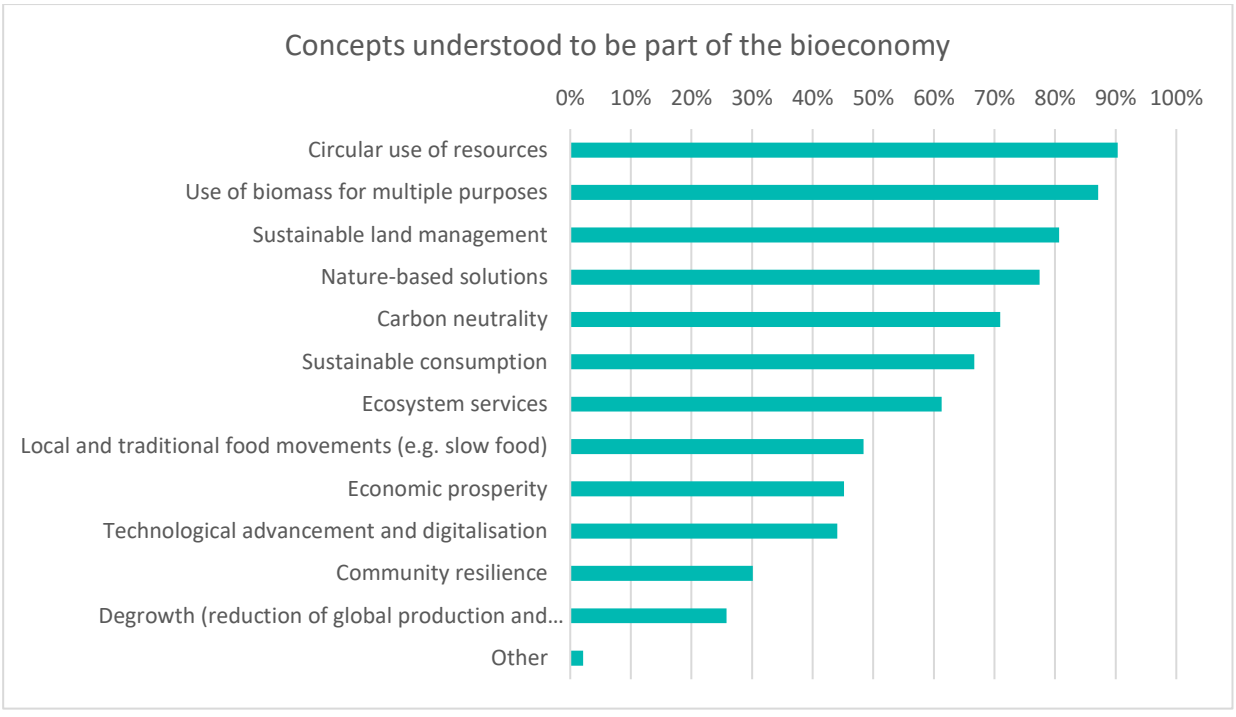

Figure 2: Proportion of survey respondents that understand certain concepts to be part of the bioeconomy. Respondents were allowed to select as many concepts as desired. Proportion is expressed as percentage of respondents.

In terms of primary production, bioeconomy is perceived to be more linked with *Agriculture* (97%) and *Forestry* (91%) than with *Fisheries and aquaculture* (83%) (Figure 3). A high proportion of respondents also consider *Waste management* (76%) and *Biotechnology and pharma* (70%) as part of the bioeconomy.

Among downstream sectors, *Energy* (85%) and *Food and gastronomy* (78%) receive most consideration. *Construction* (67%), *Chemistry* (66%) and *Textiles* (61%) are other secondary sectors perceived by about two-thirds of respondents to be part of the bioeconomy. *Machine industry* (33%), *Health and wellbeing* (31%) and *Tourism and recreation* (24%) are the sectors least considered to be a part of the bioeconomy. In addition, 8% of respondents defined *Other* sectors that they understand to be part of the bioeconomy. Some suggestions include that all the mentioned sectors can be a part of the bioeconomy.

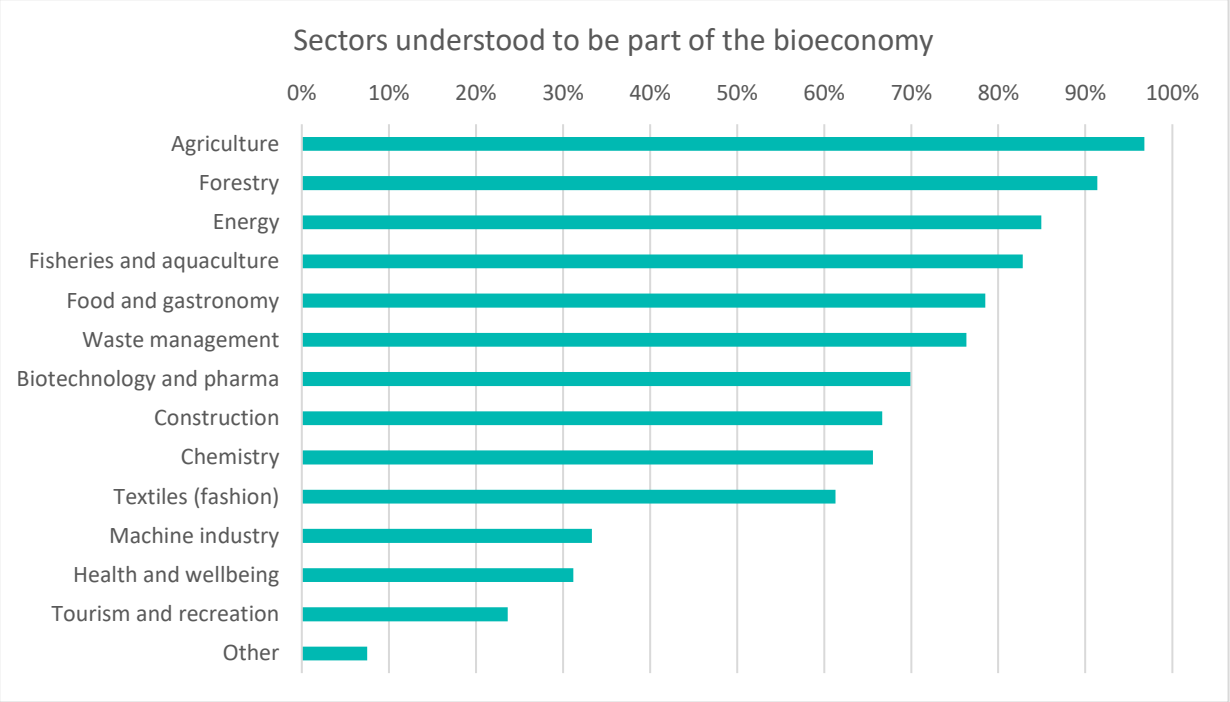

Figure 3: Proportion of survey respondents that understand certain sectors to be part of the bioeconomy. Respondents were allowed to select as many sectors as desired. Proportion is expressed as percentage of respondents.

As shown in Figure 4 below, based on true/false statements, the vast majority of respondents (>85%) agreed on the positive impacts of the bioeconomy, e.g., that the *bioeconomy provides business and innovation opportunities* (100% of respondents agrees), *contributes to sustainable economic growth, provides benefits to rural areas, helps mitigate climate change, creates new jobs, and reduces our dependency on fossil fuels*. Two-thirds of respondents consider that *bio-based products are easily recycled into new products and materials at their end-of-life*. On the other hand, a low proportion of respondents do perceive risks of the bioeconomy as *inducing stress on natural systems* (15%) and *contributing to deforestation* (18%). A rather high proportion of 41% of respondents consider that *there is not enough biomass to implement the bioeconomy* (41%), this might be related to the low biomass availability per capita in Flanders as it is a very populated region.

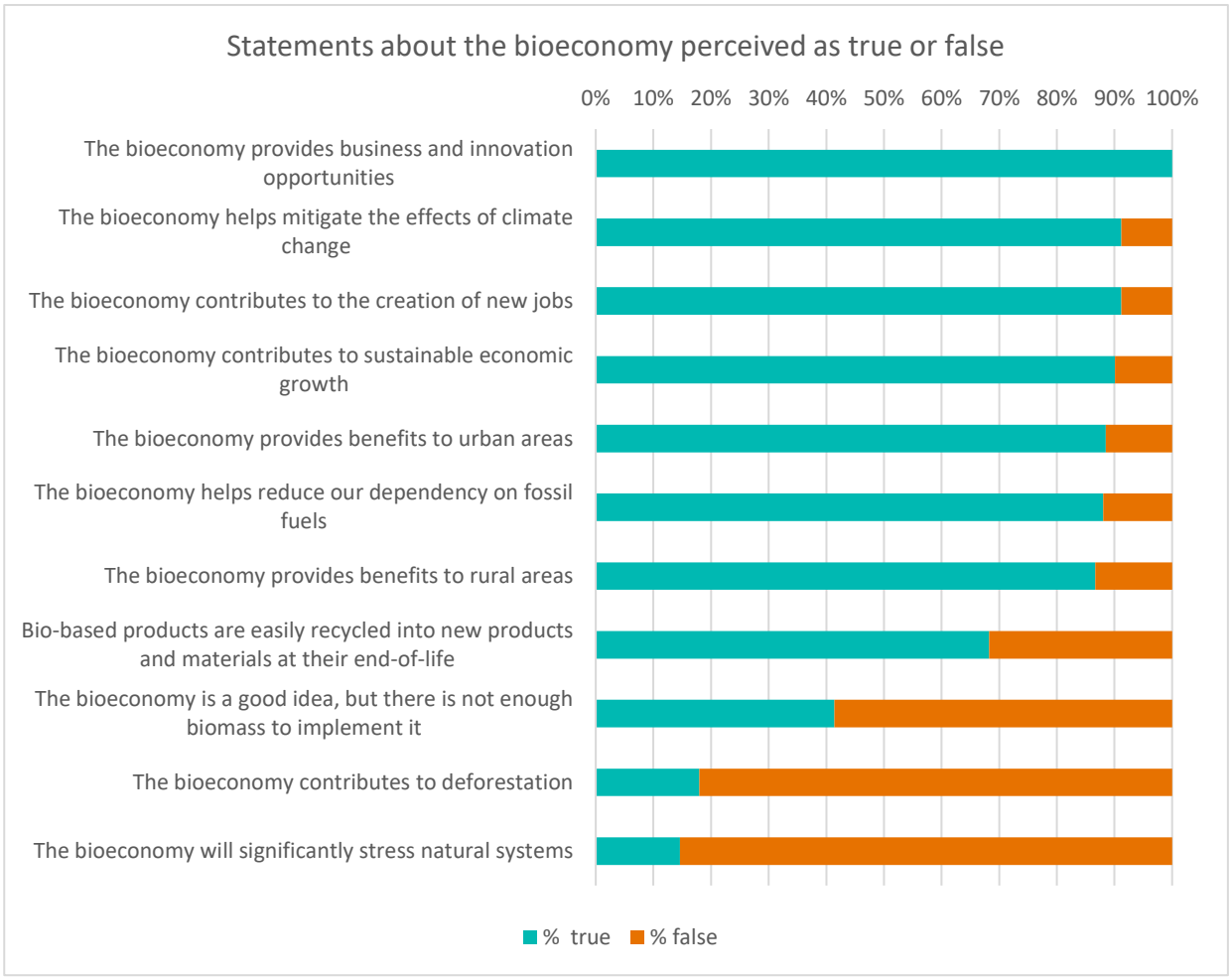

Figure 4: Proportion of survey respondents that marked bioeconomy statements as true (blue) or false (orange). Proportion is expressed as percentage of respondents.

When asked about the single most important benefit of the bioeconomy, there are three benefits most considered by respondents, namely *Providing renewable alternatives to non-renewable materials* (by 26% of respondents), *Transition to a low-carbon economy* (24%) and *Reduced material consumption and waste, increased reuse and recycling* (24%) (Figure 5). These benefits are followed by *Helping conserve biodiversity and ecosystem services* (12%) and *Renewable energy to replace fossil fuels*. The benefits *Providing wellbeing for people* (1%) and *Job creation and economic growth* (0%) were acknowledged by respectively only 1 and none of the respondents.

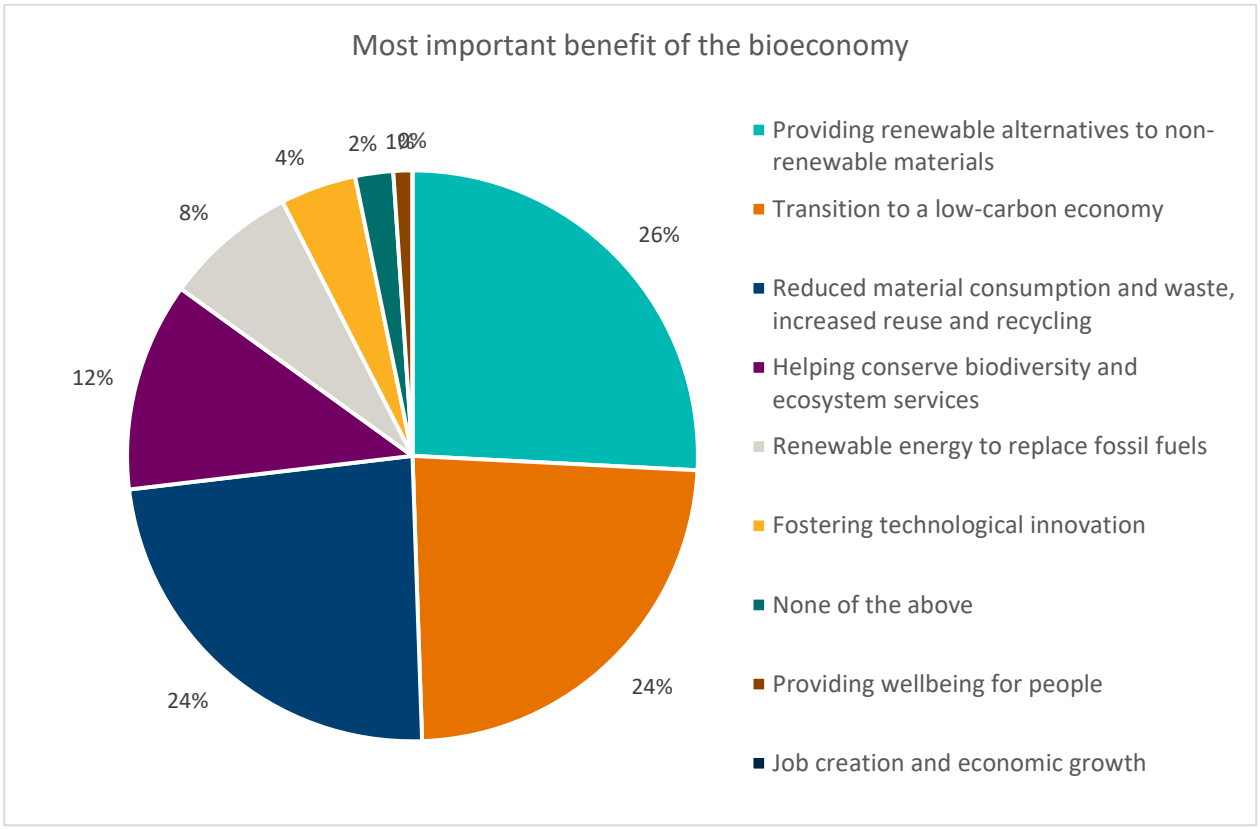

Figure 5: Proportion of respondents that perceived benefits of the bioeconomy as being the most important benefit out of eight predefined benefits. Respondents were limited to select only one benefit. Proportion is expressed as percentage of respondents.

When asked about the single most important risk of the bioeconomy, *Not enough biomass to supply the bioeconomy* emerges as the most frequent answer (26%) followed by *Impacts on ecosystem services* and *Dangerous impacts on developing countries*, both indicated by 18% of respondents (Figure 6). Otherwise, a considerable number of respondents considered *Higher cost of essential goods (14%)*. Fewer respondents considered *Increasing biomass costs* (9%) and *Impacts on poverty or food sovereignty* (4%). A tenth of respondents indicated none of the predefined risks is the most important risk of the bioeconomy.

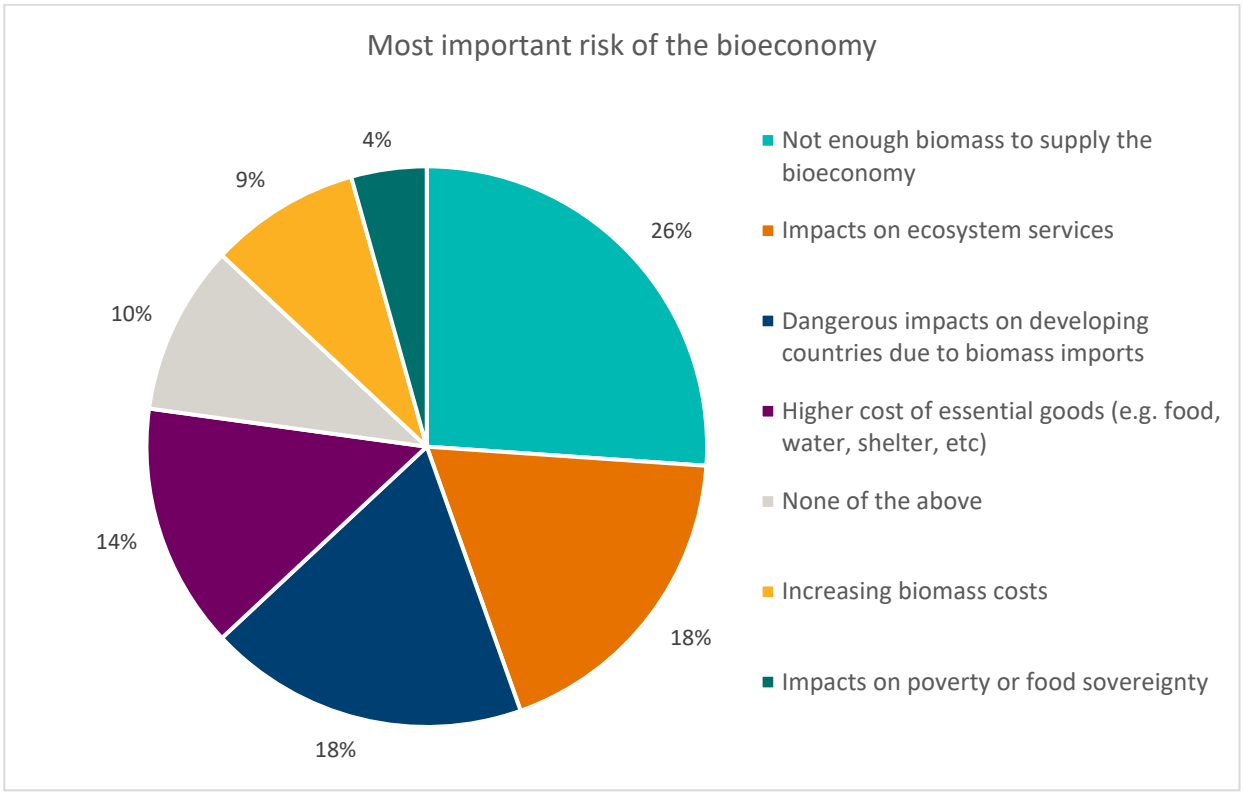

Figure 6: Proportion of respondents that perceived risks of the bioeconomy as being the most important risk out of six predefined risks. Respondents were limited to select only one risk. Proportion is expressed as percentage of respondents.

When asking about public awareness, 94% of respondents overall felt that the general public was not sufficiently informed on the bioeconomy. There was no noteworthy difference in the perception of government, industry and other respondents about the public awareness.

3.3 Revisit communication strategies and value chain priorities

Respondents were asked how prepared their region is for the transition from a conventional economy to a circular bio-based economy, to indicate which bioeconomy sectors have the highest potential for growth, and to what extend different sectors could replace their conventional materials with bio-based materials in the region by 2050. The responses allow to revisit value chain priorities and related communication efforts, compare with current bioeconomy sectors and compare with bioeconomy strategies.

When asking the respondents how they consider the readiness of Flanders for the transition from a conventional economy to a circular bio-based economy, the majority of respondents answered medium readiness (43% of respondents) and low readiness (29% of respondents) (Figure 7). 20% of respondents considered Flanders to have very low readiness but also 7% of the respondents reported a high readiness. Only 1% of the respondents considered a very high regional readiness to transition to a circular bio-based economy.

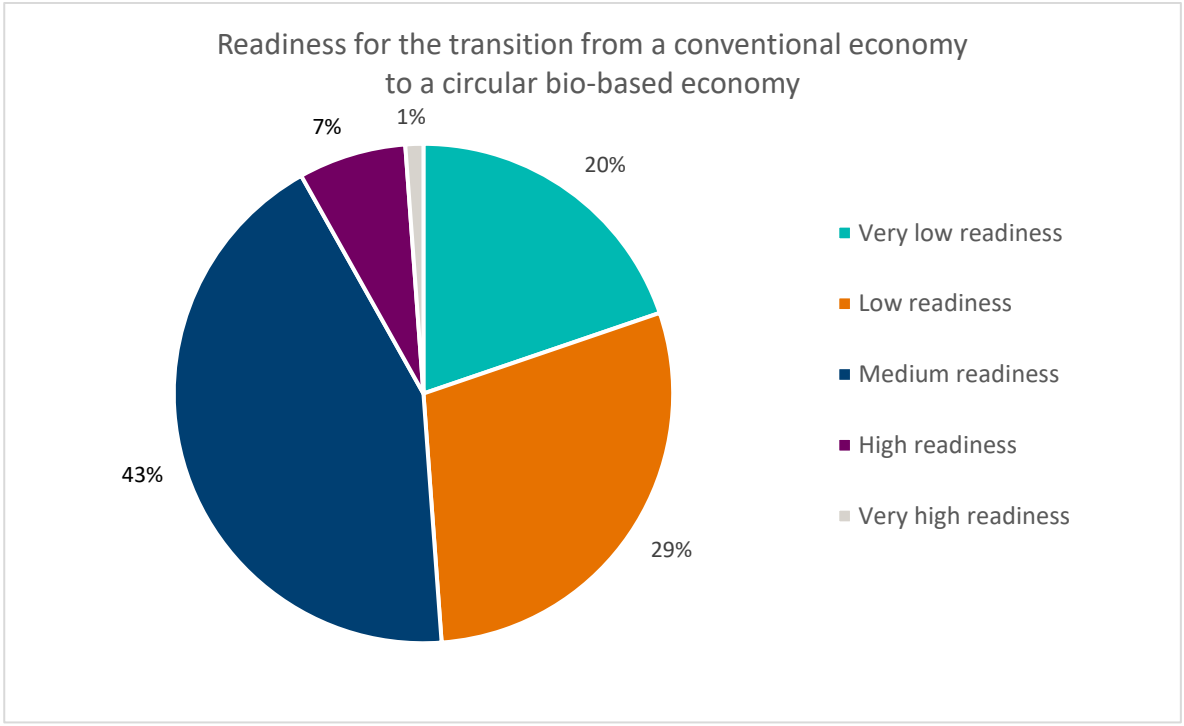

Figure 7: Proportion of respondents that consider different readiness levels of Flanders to transition from a conventional economy to a circular bio-based economy.

Respondents perceived by-far that *Green chemistry* (60%) is the bioeconomy sector with highest potential for growth in Flanders (Figure 8). Advanced new materials (45%), Bioplastics (38%) and Bioenergy (37%) were considered sectors with a high potential by more than a third of respondents. A considerable number of respondents also indicated *Food and gastronomy* (26%), *Wood construction* (20%), *Textiles & fashion* (18%) and *Wood-based materials & products* (13%). *Non-wood forest products* (8%), *Pulp & paper* (7%) and Nature-based tourism (2%) were least considered to have high potential for growth in Flanders (Figure 8).

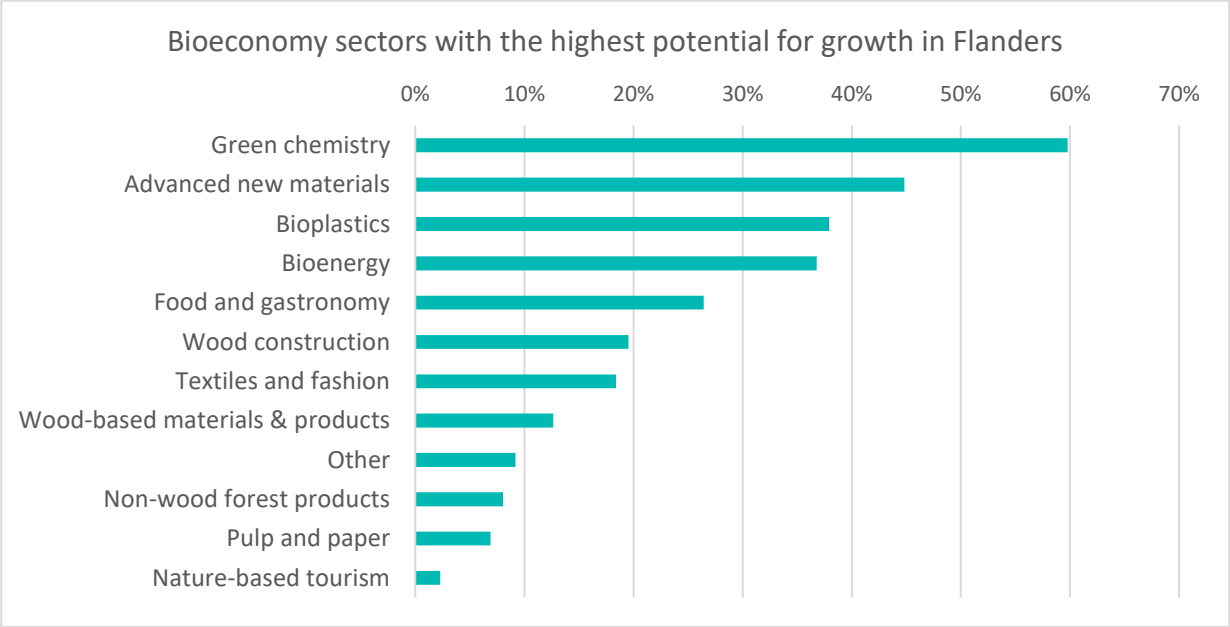

Figure 8: Proportion of respondents that selected bioeconomy sectors to have the highest potential for growth in Flanders. Respondents were allowed to choose up to three sectors. Proportion expressed as percentage of respondents.

Highlight

The same survey was launched in eight other European regions. Flanders is the only region where Bioenergy is not the sector that is perceived to have the highest potential for growth. As not enough biomass to supply the bioeconomy is perceived as the most important risk of the bioeconomy (See section 3.2), it indeed makes sense to use biomass for other purposes than energy. Because biomass material of sufficient quality can have several other uses of high added value before being used as a bioenergy source at the end of its lifetime.

When analysing this question separately for government and industry respondents, it becomes clear that they mostly agree on the top 4 sectors, although slightly shifted in order of importance. When looking further down the list of important sectors, we notice that government respondents see significantly more potential for food and gastronomy than for wood construction, while this is the other way around for industry respondents (Table 1).

Table 1: Five sectors with highest potential for growth in Flanders for government and industry respondents respectively. The percentage reflects the proportion of respondents that selected those bioeconomy sectors. Respondents were allowed to choose up to three sectors.

Government respondents	Industry respondents
1. Green chemistry (65%)	1. Green chemistry (59%)
2. Advanced new materials (44%)	2. Bioplastics (47%)
3. Bioenergy (38%)	3. Bioenergy (41%)
4. Bioplastics (38%)	4. Advanced new materials (41%)
5. Food and gastronomy (29%)	5. Wood construction (29%)
6. Textiles and fashion (17%)	6. Textile and fashion (23%)
7. Wood construction (15%)	7. Food and gastronomy (18%)

Respondents were asked to what extend six different sectors could replace their conventional (fossil-based) materials with bio-based materials by 2050 in Flanders. Table 2 shows that the majority (more than 50%) of respondents considered that within the sectors Agri-food and Textiles & fashion, more than 50% of the conventional materials/resources (50-70%, 70-90% and 90-100%; the three green parts in the pie chart) can be replaced with bio-based materials in 2050 in Flanders. In the case of the sectors Energy, Transport & mobility, Manufacturing and Construction, half or less than half of the respondents believed that more than 50% of the conventional materials/resources (50-70%, 70-90% and 90-100%) can be replaced with bio-based materials in 2050 in Flanders.

By using the average values in the ranges of predefined proportions (e.g., assuming that respondents who selected 10-30% believe on average that about 20% of the conventional materials can be replaced), we can estimate an average proportion of the conventional materials that can be replaced with bio-based materials. This exercise gives as result that the Agri-food sector is on average estimated to be the sector with highest potential to replace conventional resources with bio-based resources in 2050 in Flanders, 59% of resources is estimated to be replaceable. The second sector with highest proportion of resources that can be replaced is the Textiles and fashion sector, with 52%. In third and fourth place, come the Energy sector, with 50% of conventional resources that are replaceable, and Construction sector, with 46%. The sectors in Flanders that are expected to have lowest proportion of resources to be replaceable by 2050 are Manufacturing (42%) and Transport and mobility (41%).

Table 2: Proportion of respondents that considers the extent to which conventional materials can be replaced with bio-based materials by 2050 in six different sectors in Flanders. Respondents were asked to estimate the proportion that can be replaced, choosing from six options: 0-10%; 10-30%; 30-50%; 50-70%; 70-90%; 90-100%.

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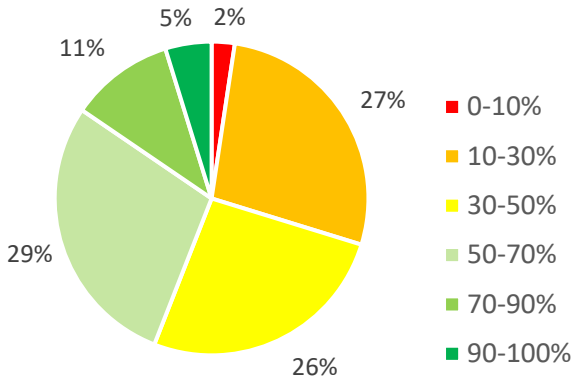
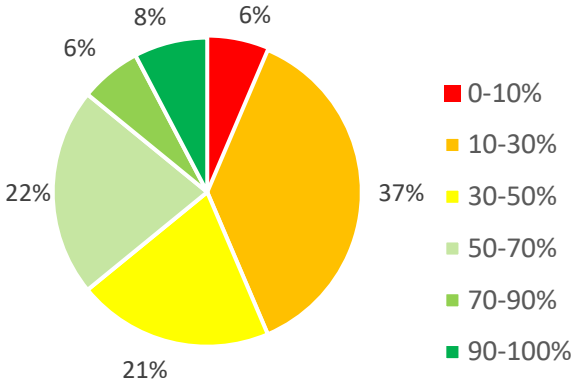
<tr><td> 
</td><td> 
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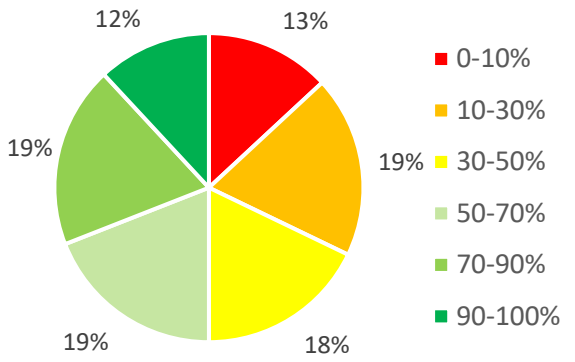
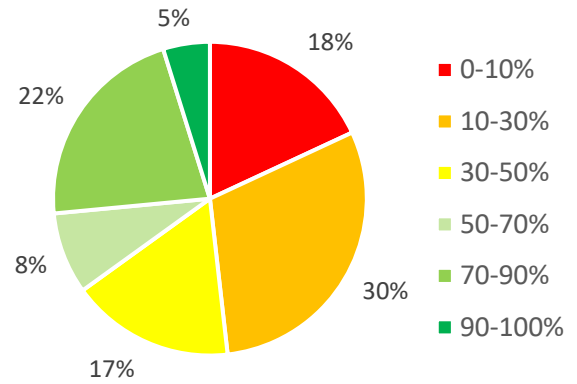
<tr><td> 
</td><td> 
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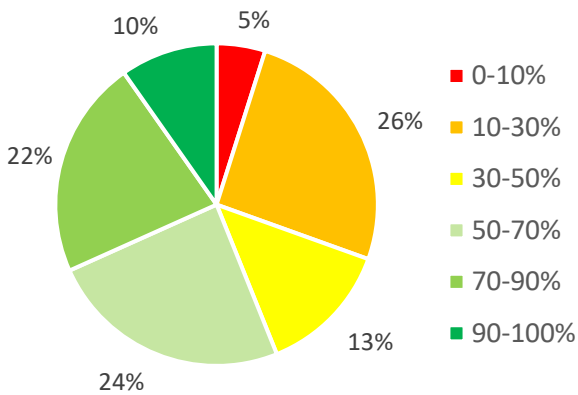
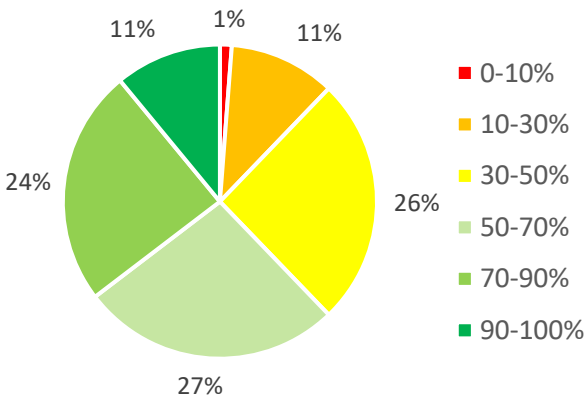
<tr><td> 
</td><td> 
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Respondents were also asked to rank biomass sources from most to least promising for the bioeconomy in Flanders. On average, this led to the ranking in Table 3. It can be noticed that agricultural biomass sources are on average ranked higher (more promising) than forestry biomass sources. Although nearly all forestry biomass sources are considered more promising than oil-rich crops. Besides, there is a clear tendency that circularity of the biomass sources is considered very promising, with *Residues from the agri-food chain* ranked as the most important biomass source, and with *Residues from local wood processing* ranked more promising than the other forestry biomass sources. Alternative biomass sources such as *Insects* and *Mycelium* are considered the least promising for bioeconomy in Flanders.

Table 3: Ranking of the importance of biomass sources from most to least promising for the bioeconomy in Flanders. The represented ranking is the average ranking of all respondents. When two types of biomass sources are in the same cell, it means that they received an equal importance.

Biomass source	Importance
Residues from the agri-food chain	Highest promising for bioeconomy in Flanders  Lowest promising for bioeconomy in Flanders
Fibre-rich crops such as nettle, hemp, flax, miscanthus, bamboo, reed, Japanese knotweed	
Protein-rich crops such as edamame, dry beans, lentils, grain sorghum, quinoa, soybeans, field peas, fodder sorghum, chickpeas	
Production of biological material based on waste streams such as CO2, greywater, waste gases	
Biomass from small landscape elements (hedges, woody roadside elements, etc.) Residues from local wood processing	
Local wood for material applications	
Short rotation forestry (coppice systems)	
Agroforestry Algae	
Local wood for biorefinery Oil-rich crops such as oil pumpkin, marigold, rubber dandelion	
Insects	
Mycelium	

Respondents were asked how well they were aware about the bioeconomy agenda of Flanders Circular (werkagenda Bio-economie van Vlaanderen Circulair) on a scale from zero (I do not know about it) to hundred (I am well aware), with a value of 50 representing that they have heard about it. If we split the respondents in three groups according to their awareness about the agenda, we notice that the biggest proportion of respondents (44%) is somehow familiar with the agenda, i.e. has heard about it (Table 4), while 31% of respondents is well aware about the agenda and 26% is not well aware.

Table 4: Awareness of respondents about the Werkagenda Bio-economie of Vlaanderen Circulair

Category (matching scores)	Proportion of responses
Not very well aware (0-33)	26%
Have heard about it (34-66)	44%
Well aware (67-100)	31%

The average score is 53 so on average the respondents have an intermediate awareness about the agenda. When we calculate the average score for all three subgroups, we find that the *Other* respondents are most aware about the agenda with an average score of 60. *Government* respondents follow in a second place with an average score of 53 and *Industry* respondents are least aware about the agenda with an average score of 43.

3.4 Identify barriers & supporting conditions

Respondents were asked to indicate the importance of supporting conditions and barriers for bioeconomy development in Flanders. 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 (4.33/5) was considered as the most important supporting condition for bioeconomy development, followed by *Availability of scientific information* (4.10/5) and *Adequate regulation* (4.07/5) (Figure 9). *Public procurement programmes* (3.81/5) and *Performance-based payments for carbon sequestration* (3.60/5) obtained scores below Important (4/5).

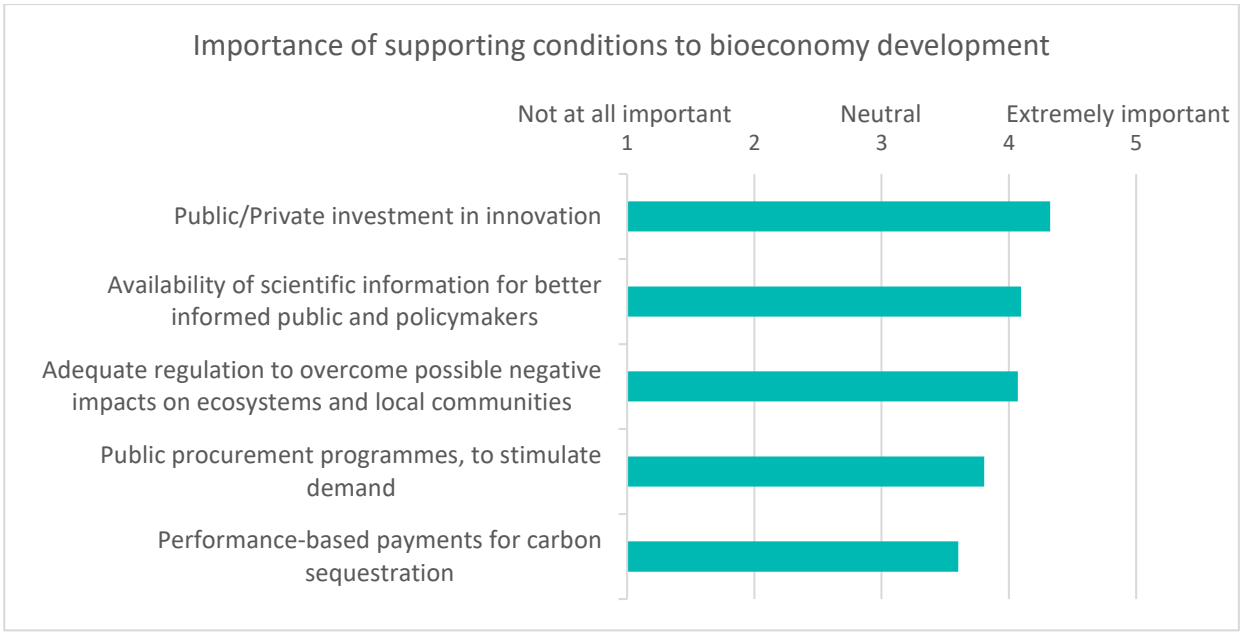


Figure 9: Importance of factors as supporting conditions for bioeconomy development in Flanders. Respondents were asked to rank the factors from one (Not at all important) to five (Extremely important), the average value of the respondents' ranking is shown.

Three of the barriers were perceived to be more important than the others, namely *Lack of supportive policy and legislative environment* (4.18/5), *Lack of co-operation among different stakeholders* (4.17/5) and *Lack of profitability and market demand* (4.13/5) (Figure 10). With their average scores above 4, they're perceived more than Important. The other three barriers are ranked in between Neutral (3) and Important (4): *Lack of technical feasibility and/or barriers to innovation* (3.66/5), *Lack of general social acceptance* (3.50/5), and *Lack of balance between different uses of forest* (3.44/5).

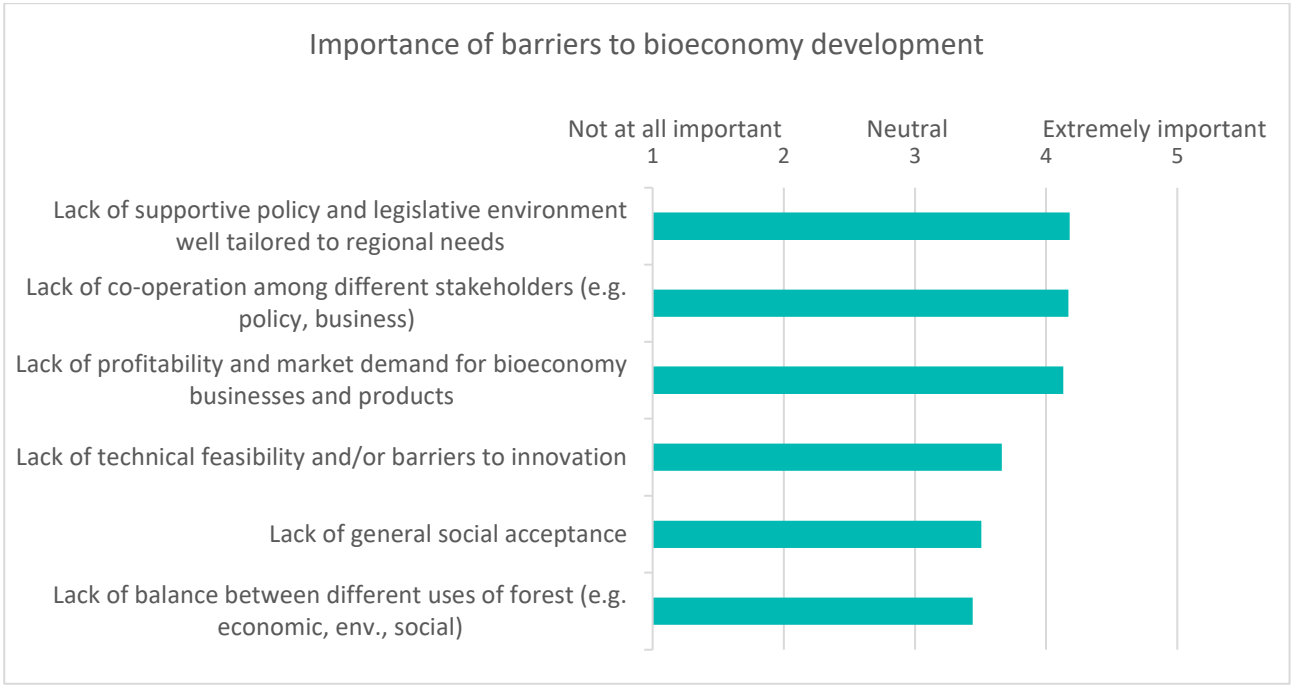


Figure 10: Importance of factors as barriers for bioeconomy development in Flanders. Respondents were asked to rank the factors from one (Not at all important) to five (Extremely important), the average value of the respondents' ranking is shown.

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, regulations 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.

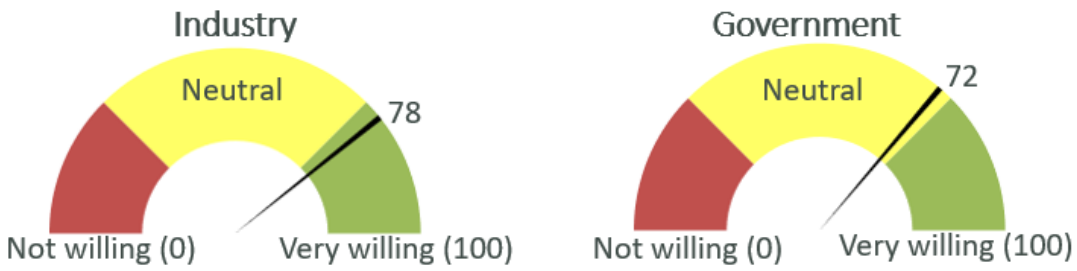


Figure 11: Willingness to develop the bioeconomy. Industry and government respondents were asked to rate how willing their industry sector/government department is to develop the bioeconomy on a scale from zero (not willing) to hundred (extremely willing).

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 78, meaning that the industry respondents are very willing to develop the bioeconomy (Figure 11). Moreover, 88% of industry respondents said to have undertaken 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* (71% of industry respondents that have undertaken bioeconomy projects), *Other* reasons (43%) and *To gain a competitive advantage in future markets* (36%). The Other reasons mentioned include taking a leading role, company values and for being sustainable. Only 2 industry respondents that have undertaken bioeconomy projects selected the pre-defined reason *To take advantage of government incentives* (14%).

Only one predefined main reason to NOT have undertaken bioeconomy projects was selected by 1 respondent out of 2, namely *High uncertainty in bioeconomy projects* (50%). The *Unprepared market: too small and growing too slow, Low expected profitability*, and *Lack of technical capacity* were not selected. The other respondent who did not undertake a bioeconomy project mentioned an *Other* reason. The other reason mentioned is that it is a small sector full of idealism but with a lack of support.

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 72, meaning that government is also very willing to develop the bioeconomy, although slightly less than the industry respondents (Figure 11). Moreover, 67% of government respondents said to have undertaken a bioeconomy regulation or initiative in the past. This number is slightly lower than the comparable answer from industry side.

The main reasons to have undertaken a bioeconomy regulation or initiative are *To improve availability and access to biological resources* (61% of government respondents that have undertaken a bioeconomy regulation or initiative*)* and *To generate markets and social acceptance of bioeconomy products* (58%). Another predefined reason to have undertaken a bioeconomy regulation or initiative is *To ensure*

sustainability or social equity (19%). An equal number of respondents pointed towards *Other* reasons (19%), mainly referring to promoting research and innovation as well as to overcome barriers with the aim of promoting the circular economy and bioeconomy.

The main reason to NOT have undertaken a bioeconomy regulation or initiative is the *Lack of technical capacity*, mentioned by five respondents (42%). *High uncertainty of bioeconomy outcomes* and *It is not in the best interest of local strategies and policies* were selected by three respondents for each (25%). Two respondents reasoned *Public is not asking for this* (17%) whereas only 1 respondent selected *Regional development plans do not promote the bioeconomy* (8%).

Highlight

Both Government and Industry report a high willingness of their department or sector to develop the bioeconomy, this could be the foundation for a future strengthened collaboration and co-operation among different stakeholders (e.g., policymakers, business, research) which was perceived a very important barrier for bioeconomy development in Flanders (see Section 3.4).

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 three sub-groups of respondents, namely government, industry and others (respondents that identified themselves as not being part of government or industry but rather of another field).

Government and industry respondents emphasised that the government is more responsible in communicating and promoting the bioeconomy among the general public (Figure 12Figure 12), the Other respondents see a more balanced responsibility. Regarding investments in research, development, and innovation, all three subgroups perceived that Government and Industry respondents are more or less equally responsible. In relation to ensuring positive environmental and social impacts, the Government respondents perceive that they are slightly more responsible while Industry and Other respondents perceive quiet strongly that the government is more responsible.

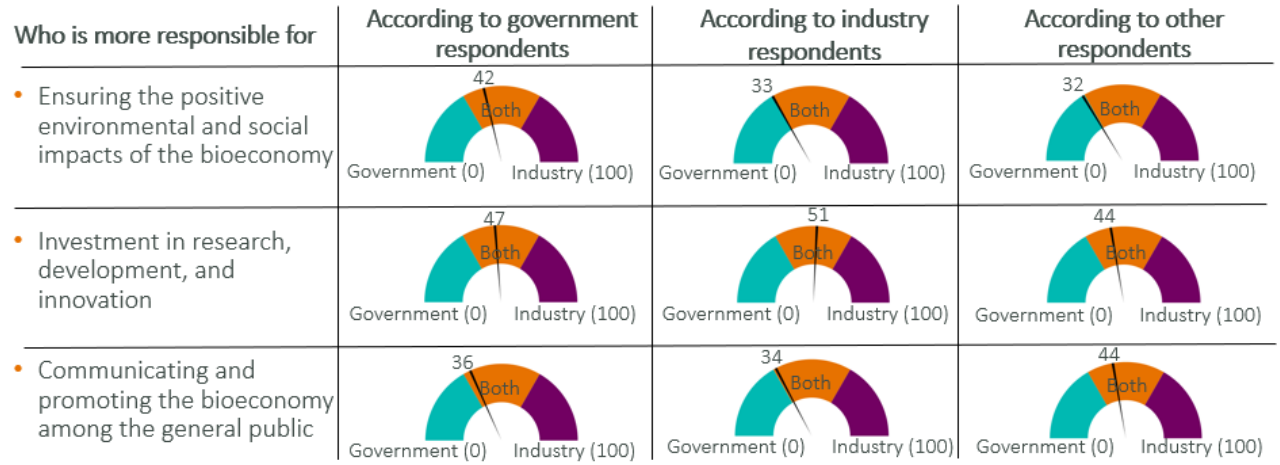


Figure 12: Division of roles and responsibilities between the government and industry regarding three different tasks in moving the bioeconomy in Flanders forward. Industry and government respondents were asked to indicate who is more responsible for the three different tasks on a scale from zero (Only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

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 industry and government to help Flanders 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.

Circular economy was selected by 98% of respondents as having goal alignment with the bioeconomy, followed by *Clean energy* (88%) and *Technological innovation* (87%) (Figure 13). Other policy areas with very high overlap with bioeconomy are *Rural development* (83%), *Climate change mitigation and adaptation* (82%), *Biodiversity conservation* (76%) and *Nature development* (75%). *Job creation* (61%) is considered by an intermediate number of respondents. *Social inclusion* (25%) is only selected by a quarter of respondents.

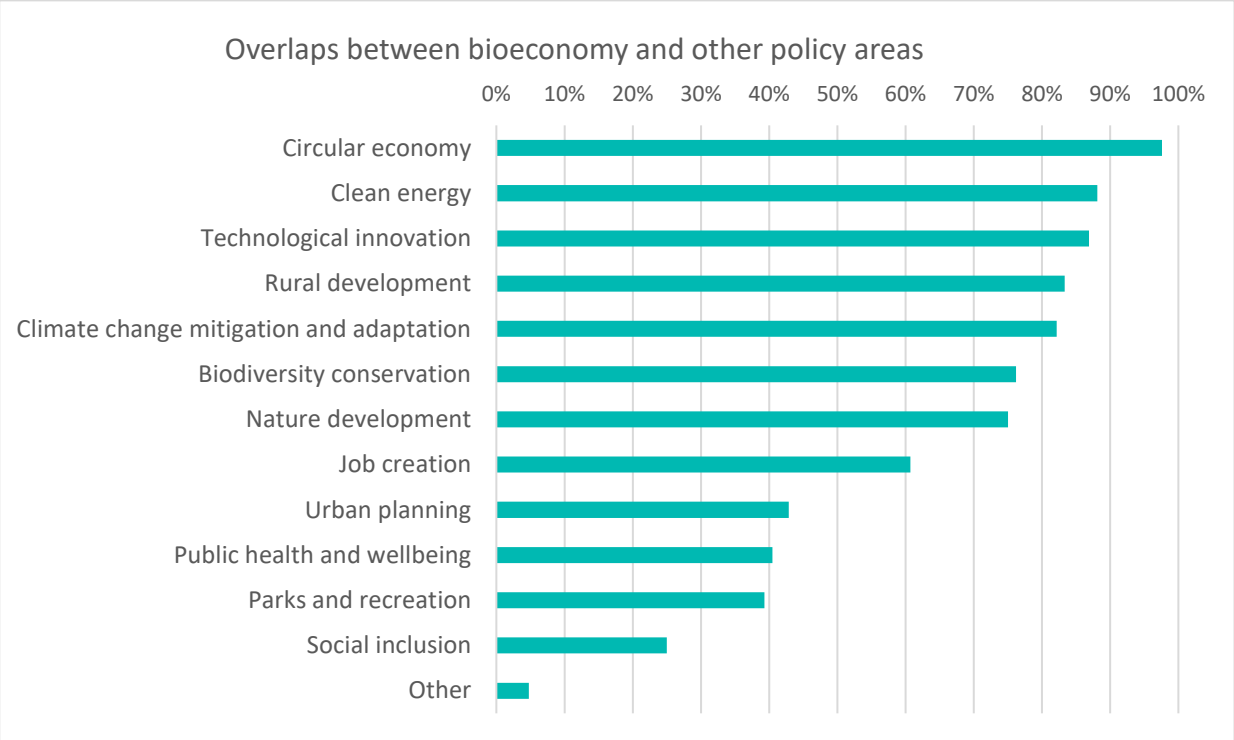


Figure 13: Proportion of respondents that understand certain policy areas to be related with the aims of the bioeconomy. Respondents were allowed to select as many policy areas as desired. Proportion expressed as percentage of respondents.

4. Conclusions for Flanders

With a total of 111 responses, of which 56% from Government (or related public sector), 21% from Industry (or related private sector) and 23% from respondents that identified themselves as not being part of government or industry but rather of another field, 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 Flanders. 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 eight key messages from the Survey.

Bioeconomy is highly linked to circularity, the use of biomass for multiple purposes, circularity and sustainable land management.

Respondents from Flanders consider circular use of resources, use of biomass for multiple purposes, sustainable land management, and nature-based solutions to be an integral part of the bioeconomy. Two-thirds of respondents understood carbon neutrality, and sustainable consumption to be part of the bioeconomy. On the other hand, economic prosperity, technological advancement, and community resilience were perceived to be part of the bioeconomy by less than half of the respondents. A quarter of respondents associated bioeconomy with degrowth.

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 disagreeing on its potential negative impacts. Bioeconomy in Flanders is perceived specifically promising to address environmental challenges, with clear emphasis on its contribution to providing renewable alternatives to non-renewable materials, transition to a low-carbon economy and reduced material consumption and waste, increased reuse and recycling. Summarising, respondents generally see the bioeconomy as strategic for generating environmental benefits, while also producing some positive outcomes for people's wellbeing, job creation and economic growth.

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

94% of respondents think that the general public in Flanders is not sufficiently informed on the bioeconomy. This highlights a clear need for communication and awareness raising among the general public.

Green chemistry is considered the most promising bioeconomy sector in Flanders. Advanced new materials and bioplastics are also considered to be promising. Nature-based tourism is perceived to have the lowest potential.

Respondents perceive the bioeconomy to be highly linked to agriculture and forestry, and somewhat less to fisheries & aquaculture. Among downstream sectors, the top four sectors with highest potential for growth in Flanders are green chemistry, advanced new materials, bioplastics and bioenergy. Wood construction, textile and fashion and wood-based materials and products were also perceived to have some potential. Non-wood forest products, pulp and paper and nature-based tourism were considered to have least potential for growth in Flanders.

Biologisation of existing sectors is perceived to be significant by 2050 in Flanders.

Respondents believe that all six sectors, for which the information was asked, can replace significant proportions of their conventional (fossil-based) materials by bio-based materials by 2050 in the region, estimated proportions ranged from 41% to 59% of the resources, depending on the sector. The sectors with highest potential for biologisation (replacing conventional materials by bio-based materials) are Agri-food and Textiles & fashion.

Investment in innovation, availability of scientific information and adequate regulation are perceived as a key enablers of the bioeconomy. Lack of supportive policy & legislative environment, limited co-operation among different stakeholders and lack of profitability & market demand are considered the most important barriers in Flanders.

Three supporting conditions (enablers) for the bioeconomy development in Flanders were rated more important than the others, namely investment in innovation, availability of scientific information for better informed public and policymakers, and adequate regulation to overcome possible negative impacts on ecosystems and local communities. There are three barriers perceived in between important and extremely important for bioeconomy development in Flanders: Lack of supportive policy & legislative environment well-tailored to the regional needs; limited co-operation among different stakeholders (policy, business, etc.); lack of profitability and market demand for bioeconomy businesses and products.

Circular economy, clean energy and technological innovation are the key policy areas perceived to have the strongest goal alignment with the bioeconomy.

Flanders' business and policy actors suggest that bioeconomy has strongest goal alignment with circular economy. Other policy areas with strong goal alignment are: clean energy; technological innovation; rural development; climate change mitigation & adaptation; biodiversity conservation; and nature development. Job creation is perceived by a moderate number of respondents to be related with the aims of the bioeconomy. Less than half of respondents considered bioeconomy to have goal alignment with urban planning, health & wellbeing, recreation and social inclusion.

Government and industry indicate high 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. In addition, government and industry respondents felt very similar about who is responsible for different tasks in moving the bioeconomy in Flanders forward. Both groups indicated that they are more or less equally responsible for investments in research, development, and innovation and both groups agree that government is significantly more responsible for communicating and promoting the bioeconomy among the general public. There is a slight difference with regards to the perceived responsibility for ensuring positive environmental and social impacts, where government respondents perceive themselves to be slightly more responsible while the industry respondents perceive that the government is significantly more responsible.

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.
  - Government and industry respondents agreed that the government is more responsible for communicating and promoting the bioeconomy among the general public.
  - The vast majority of respondents feel that the general public in Flanders is not sufficiently informed on the bioeconomy.
  - 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 Flanders not sufficiently informed? How does the general public and specific target groups (e.g., students) perceive bioeconomy? How do they see bioeconomy-related business opportunities?

- Emphasise the economic and social dimensions of bioeconomy.
  - Environmental benefits are widely acknowledged. Potential risks are minimised or not perceived as such.
  - Contributions and policy overlaps with economic development, job creation, innovation, etc. appear less prominently.

- Communicate about the diversity of bioeconomy sectors.
  - It was more challenging to attract the private sector to respond to the survey than the government, which translated in more than double the amount of government respondents in comparison with industry respondents.
  - The industry respondents report to be very willing to develop the bioeconomy, so we don't think the issue is the willingness of industry.
  - Therefore, a potential reason can be that not all companies in the industry consider the bioeconomy as their sector. For example, they will identify themselves as a company active in e.g., the food, feed, cosmetic, construction or chemical sector but not often the bioeconomy sector.

- Circularity of the bioeconomy and cascade use of biomass are important aspects for the future of bioeconomy in Flanders.
  - Flanders is a small region with a high population density and a low availability of biomass per capita. The same is true in neighbouring regions. Therefore, it will be paramount to optimise the circularity of the bioeconomy in Flanders. Bio-based materials and products should be efficiently reused and recycled at the end of their lifetimes.
  - In comparison with other European regions where the survey was launched, bioenergy doesn't appear so prominent which is in line with the efficient use of biomass. It makes sense to use biomass for other purposes than energy because biomass material of sufficient quality can have several other uses of high added value before being used as a bioenergy source at the end of its lifetime.

- It is important to include circularity, cascade use and material efficiency aspects of different bioeconomy sectors in communication policies, as well as its synergy with material uses and existing knowledge on the actual contribution to climate change mitigation of the different technologies and climate change adaptation in relation to the production of specific types and amounts of biomass in the landscape (forest, agroforest, wood edges, hedges, etc.).

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. In 2023, the member regions are Catalonia (Spain), North Karelia (Finland), the Basque Country (Spain), 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.

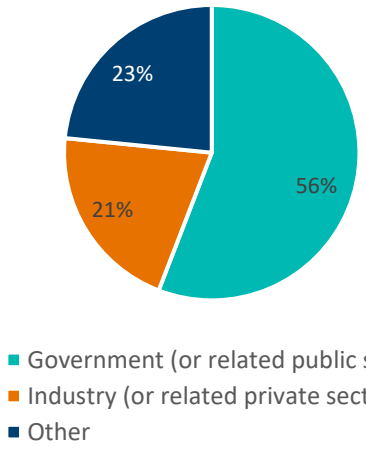
The Survey toolkit consists out of 5 items: 1) Deployment checklist and timetable; 2) Pamphlet on goals and expected outcomes; 3) Survey invitation email; 4) Survey pre-formatted in SurveyMonkey; 5) Guide for identifying and contacting survey participants. All materials reaching the potential respondents are adapted to the local language, in this case Dutch. 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 social media kit with a number 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.

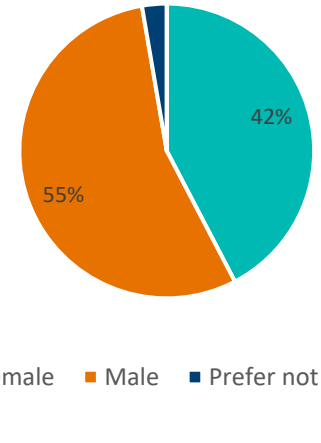
In the case of Flanders, the B2BE facilitator (business to bioeconomy) and the Platform Oogstbare Landschappen (platform on biomass from harvestable landscapes), an initiative of the Agency for Nature and Forest (Agentschap voor Natuur en Bos) and the Flemish Land Agency (Vlaamse Landmaatschappij) of the Flemish government, identified target participants from government and industry and disseminated the survey. The Bioeconomy Perceptions Regional Survey was open to answers during the period October-December 2022 and the analysis and report writing took place between January-July 2023.

A1. Characterisation of the respondents

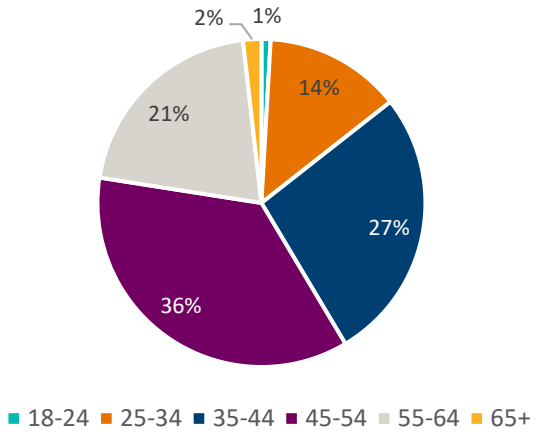
Field



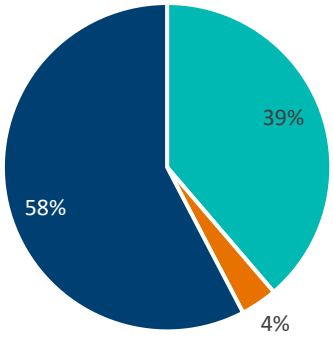
Gender



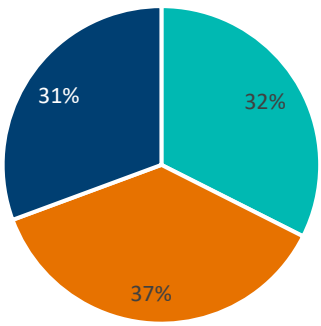
Age



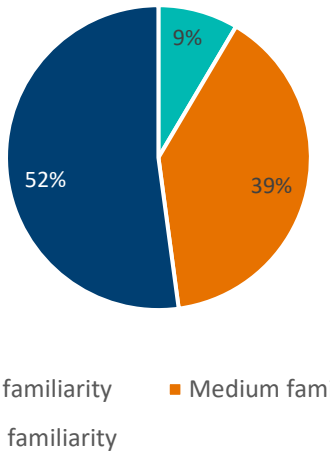
Location



Area



Bioeconomy familiarity



A2. Survey questions

Survey pre-formatted in SurveyMonkey: English translation, (REGION) is in this case always replaced with Flanders

Survey pre-formatted in SurveyMonkey: Dutch