RESULTS OF THE JRC-SCAR BIOECONOMY SURVEY

Including national report for Belgium (Flanders)

January 2015

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1. INTRODUCTION

Unprecedented and unsustainable exploitation of natural resources, potentially irreversible changes in the global climate and the lack of ability to stop the loss of biodiversity form a serious threat to the biological basis of the European society. Over the next decades, the global population is expected to increase to exceed 9 billion in 2050. These complex and inter-connected challenges will need to be addressed by an integrated and effective policy combined by an extended programme for scientific research and innovation in order to facilitate sustained changes in lifestyle and resource use across all levels of the economy.

In order to be able to cope with increasing global population, (over)exploitation of natural resources, increasing environmental pressure and climate change, Europe has to change the way it is organising the production, consumption, processing and recovering of its biological feedstocks. The bioeconomy has been proposed as a key element of a smart and green development path. Advancements in bioeconomy research and innovation uptake will facilitate the improved management of biological resources and the opening and development of diverse food and bio-based markets.

Bioeconomy has been defined in the European Commission's COM(2012)60 as:

> ''The bioeconomy encompasses the production of renewable biological resources and their conversion into food, feed, bio-based products and bioenergy. It includes agriculture, forestry, fisheries, food and pulp and paper production, as well as parts of chemical, biotechnological and energy industries. Its sectors have a strong innovation potential due to their use of a wide range of sciences (life sciences, agronomy, ecology, food science and social sciences), enabling and industrial technologies (biotechnology, nanotechnology, information and communication technologies (ICT), and engineering), and local and tacit knowledge''[1]

There are many possible reasons for a country to engage in the Bioeconomy. Driving forces for Bioeconomy policy may be merely political – to realise policy existing or newly defined objectives, economic – to stimulate existing economic performance, and/or to generate new market power, as well as oriented towards realisation of environmental objectives – for example, to reduce waste, or Greenhouse Gas emissions, and help improve environmental quality.

Bioeconomy is the field where all types of biomass uses are coming together and links to all biomass uses may be found (Figure 1.1). The actual link between different sectors in practice is, however, relatively small. In the connecting field, competition may occur between biomass generating sectors – which, in principle, may be mutually replacing each other – and biomass converting sectors – which may compete for available feedstocks.

[1] Source: Commission Staff Working Document of COM(2012) 60 final. Innovation for Sustainable Growth. A Bioeconomy for Europe.

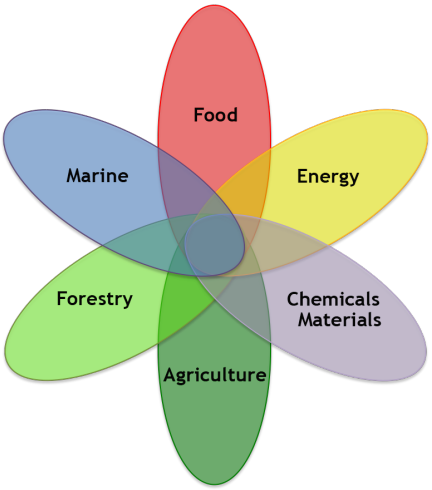

Figure 1.1. Fields covered in the Bioeconomy
Source: European Commission (2014)[2]

All Bioeconomy areas already have their own strategy, actions and innovation. Focussed action in research and policy is needed to use them to address major basic challenges that are prevalent in the current research and policy agenda's. By using a cross-sectoral approach, bioeconomy areas can be linked in an effective way to develop new, innovative research areas, and enhance policy coherence. The development of a good connectivity between individual areas is a prerequisite for effective bioeconomy development.

Establishing a bioeconomy can boost economic growth and jobs in rural, coastal and industrial areas, reduce fossil fuel dependence and improve the economic and environmental sustainability of primary production and processing.

The Bioeconomy Strategy and Action Plan presented in a 2012 Communication on Bioeconomy aims to facilitate the development of an innovative, resource efficient, sustainable and competitive use of biological resources, reconciling their exploitation for industrial purposes with food security while providing sufficient environmental safeguards. Under Action N° 6 of the Bioeconomy Action Plan consists in establishing a Bioeconomy Observatory.

The establishment of the Observatory is part of the implementation of the EU Bioeconomy Strategy and Action Plan laid down in the European Commission Communication on Bioeconomy of February 2012 (COM(2012)60)[3]. Objective of the action plan is to emphasise the importance of the bioeconomy for Europe in addressing major societal and economic challenges and to create a more favourable environment for its realisation.

The Bioeconomy Observatory, as the Strategy does, focuses on three main pillars (Figure 1.2):

- "Research" (investments in Research, Innovation and Skills)
- "Policy" (reinforced policy interaction and stakeholder engagement)
- "Markets" (enhancement of markets and competitiveness in bioeconomy)

[2] European Commission (2014). Where next for the European Bioeconomy? Brussels, Directorate-General for Research and Innovation
http://ec.europa.eu/research/bioeconomy/pdf/where-next-for-european-bioeconomy-report-0809102014_en.pdf
[3] Commission Staff Working Document of COM(2012) 60 final. Innovation for Sustainable Growth. A Bioeconomy for Europe.

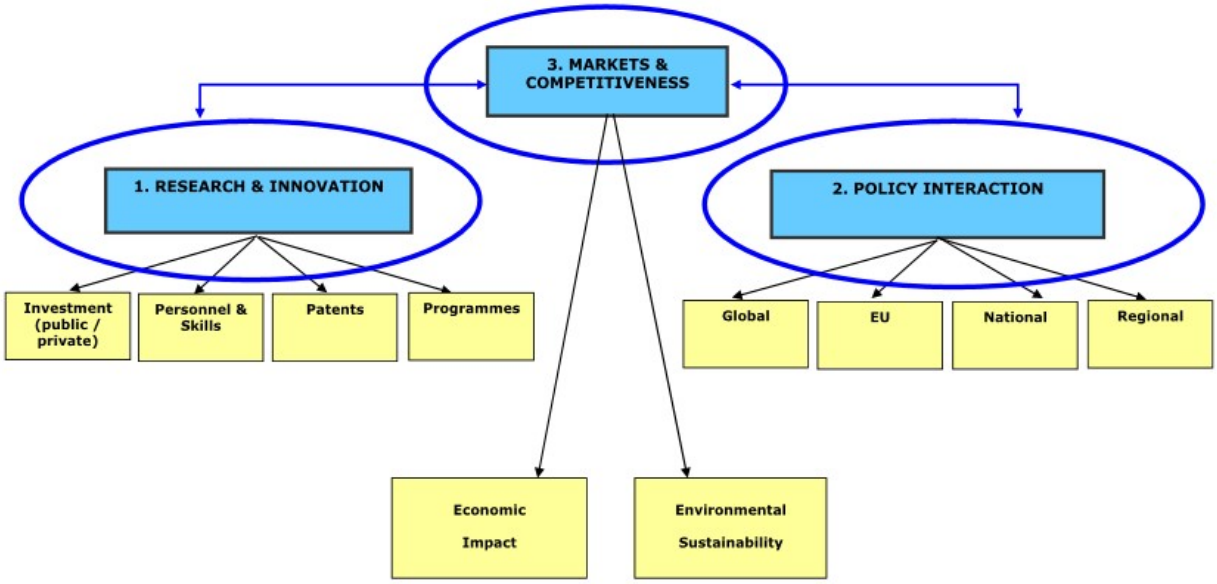

Figure 1.2 Three pillars of the Bioeconomy Information System Observatory (BISO) project[4]

The Joint Research Centre (JRC) is in charge of setting up the Bioeconomy Observatory, in close collaboration with existing information systems that allows the Commission to regularly assess the progress and impact of the bioeconomy and develop forward-looking and modelling tools. The project time line goes from the first quarter of 2013 until the first quarter of 2016; the project acronym is BISO (Bioeconomy Information System Observatory).

The establishment of the Bioeconomy Observatory is expected to support one of the major objectives of the EU Bioeconomy Strategy, which is "to contribute to achieve the full potential of the bioeconomy, by providing the knowledge base for a coherent policy framework and promoting relevant innovation activities, thereby giving specific support to markets and policies related to the bioeconomy".

Data collection and data analysis from the Bioeconomy Observatory will provide a solid basis for decision-making on the bioeconomy, in particular for policy-makers. The primary target audience for the Bioeconomy Observatory will be policy-makers (be it at EU or at national Member States level), who will be provided with comprehensive and authoritative data and information on bioeconomy.

Data and information collected about bioeconomy research, policy and markets will be available online through the BISO website. More specifically, key bioeconomy data and information collected at national level are summarised in a series of "national bioeconomy country profiles" for the EU-28 Member States which can be downloaded from the website (https://biobs.jrc.ec.europa.eu/policy).

In this way, Member States authorities are provided with comprehensive and authoritative data and information on bioeconomy. They are also key partners for the Observatory in terms of "supply" of national bioeconomy data and information to the Bioeconomy Observatory. In order to access, col-

[4] Source: Plan, D. (2013). The EU Bioeconomy Observatory. First stakeholders roundtable. 26th November 2013. Brussels. https://ec.europa.eu/jrc/sites/default/files/events/20131126-biso-roundtable/20131126-biso-roundtable-plan.pdf

lect and confirm the accuracy of bioeconomy data and information gathered at national level, partnership between the Bioeconomy Observatory and the Member States remains crucial.

Partnership between the Bioeconomy Observatory and the Member States has been established through bilateral interaction with individual Member States authorities and through cooperation with the Standing Committee on Agricultural Research (SCAR) and in particular its Strategic Working Group on Sustainable use of Bio-resources for a Growing Bioeconomy (SBGB).

The Standing Committee on Agricultural Research (SCAR) of the European Union was established in 1974 by a Regulation of the Council of the EU. It is formed by representatives of Member States, and presided over by a representative of the Commission, who has a mandate to advise the Commission and the Member States on the coordination of agricultural research in Europe. It was given a renewed mandate in 2005 to play a major role in the coordination of agricultural research efforts across the European Research Area.

The Membership is composed by the 28 EU Member States, as well as representatives from Candidate and Associated Countries as observers. The SCAR members currently represent 37 countries. Since 2005, more than 20 working groups have been set up by European countries engaging voluntarily and on a variable-geometry basis in the definition, development and implementation of common research agendas based on a common vision of how to address major challenges in the field of agricultural research.[5]

In 2013, SCAR and DG-JRC decided to join forces in the development of a survey to collect essential data on national Bioeconomy policies, legal status of Bioeconomy development and national as well as regional/cluster R&D initiatives and public R&D funding. Together, DG-JRC and SCAR could provide a broad link to existing policies as well as R&D practices in the field of both classical and emerging Bioeconomy sectorial developments.

The common "Bioeconomy Member States survey" was run in 2014 aiming to collect information on the bioeconomy at individual national Member State level, with a particular focus on national research activities and policy initiatives for the bioeconomy. Biomass Research has provided support in the implementation and analysis of the survey. The general objective was to collect at individual Member State level and (on the basis of a preliminary questionnaire prepared by the JRC and SCAR) quantitative data and qualitative information on bioeconomy. In the survey, there was a particular focus on national bioeconomy research activities and national bioeconomy policy initiatives.

Biomass Research collaborated with DG JRC and SCAR, in particular with its Strategic Working Group on Sustainable use of Bio-resources for a Growing Bioeconomy (SBGB). Data and information have been collected through "national survey contact points" via questionnaires. This report presents an overview of the main results, as incorporated to national files presented on the Bioeconomy Observatory website. It contains the following elements: the questionnaire is introduced in Chapter 2; main results of the survey are presented in Chapter 3, which is followed by a discussion (Chapter 4). The annex lists details of the survey received from Belgium (Flanders). The full report, presenting results for more than 20 countries, is available online[6].

[5] http://ec.europa.eu/research/agriculture/scar/groups_en.htm
[6] See https://www.scar-swg-sbgb.eu/documents

2. METHODOLOGY AND QUESTIONNAIRE

A questionnaire was developed including six questions and several sub-questions, organised in two sections. In the first section, questions were oriented towards existence and character of national Bioeconomy policies. The second section focused on national Research and Development.

An overview of the questions is presented in Table 2.1. Many questions were open or offering plenty room for explanation and additional descriptions. Priority rankings were asked related to the main drivers to engage in the Bioeconomy (Question 2) and to the perceived benefits of research cooperation initiatives in the EU (Question 6). National policies, existing Bioeconomy regions and clusters and R&D projects could be listed. Question 4 requested annual public funding budgets for different types of Bioeconomy related research.

Table 2.1 Overview of questions of the JRC-SCAR Bioeconomy survey

Question	Subject	Type
1	Definition of Bioeconomy implemented in national policy documents. Comparison to definition used by the European Commission	Open
2	Main drivers to engage in the Bioeconomy	Priority ranking
3a	National policy strategies covering Bioeconomy	Yes/no + explanation
3b	Identification of national Bioeconomy policies	Yes/no + description, links
3c	Bioeconomy regions and clusters	Listing
4	Bioeconomy R&D programmes	Listing + explanation, public budget
5	Bioeconomy research and innovation projects	Listing + description
6	Benefit of European research cooperation	Ranking + listing existing programmes

An overview of the questionnaire is presented in Annexe 1.

The survey and a first draft of the questionnaire were presented to members of the SCAR Strategic Working group on Sustainable Bioresources for a Growing Bioeconomy, during its meeting in the Hague on June 13, 2014. Feedback on the preliminary setup was received and elaborated in the process of the finalisation of the questionnaire.

The final questionnaire was sent out to national SCAR contact points together with a personal introduction letter on June 20. The intended first deadline was August, 15. This deadline was later extended to September, 1, 2014. An overview of the contact points involved in the survey is presented in Annex 2.

Submissions were received from Belgium, Switzerland, Czech Republic, Germany, Denmark, Estonia, Spain, Finland, France, Hungary, Ireland, Israel, Italy, Latvia, the Netherlands, Norway, Sweden, Slovenia, Turkey and the United Kingdom. Belgium submitted two questionnaires, one for each major region. Italy used the framework for an old questionnaire. The questionnaire by Latvia was received late.

3. RESULTS

Survey participation

A total of 21 countries responded to the survey (Figure 3.1). Of them, 20 submitted a questionnaire, 17 Member States (Belgium, Czech Republic, Germany, Denmark, Estonia, Spain, Finland, France, Hungary, Ireland, Italy, Latvia, the Netherlands, Sweden, Slovenia, and the United Kingdom), and four non-Member States (Switzerland, Israel, Norway, and Turkey). One country (Slovak Republic) announced that submission was intended. Belgium submitted two questionnaires, one for Flanders and one for Wallonia.

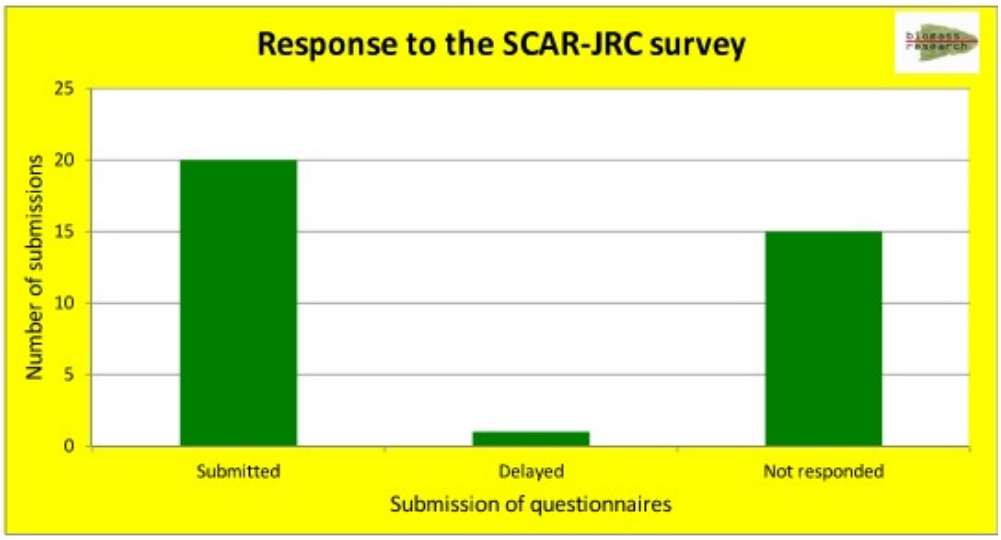

Figure 3.1 Questionnaire submission

Not all questionnaires were complete. Italy used an old format, and did not provide answers to all questions. Other countries missed questions as well (Figure 3.2).

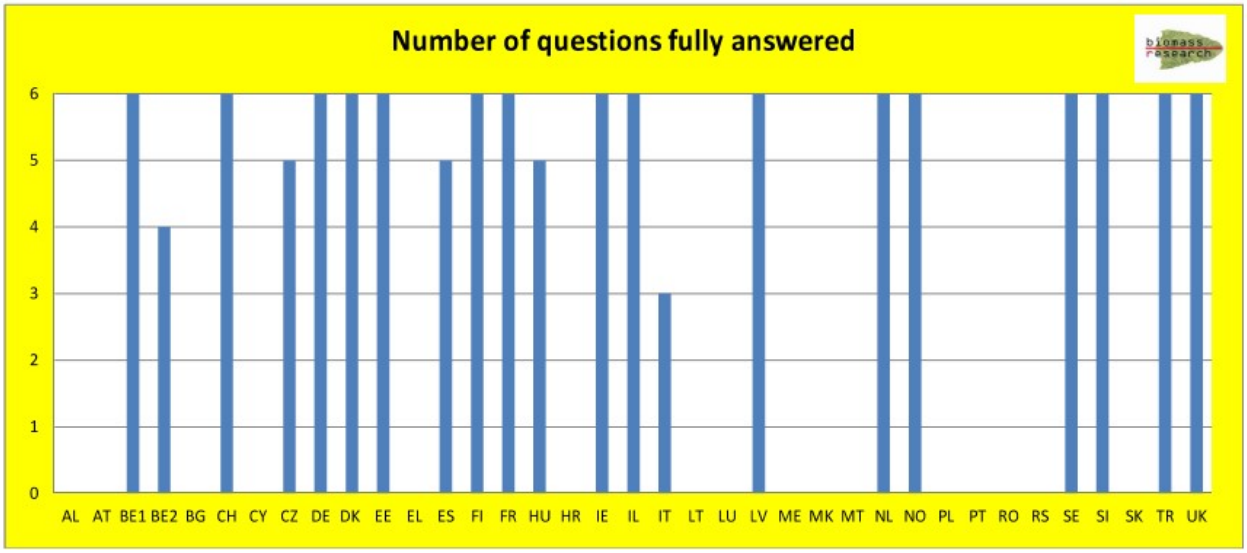

Figure 3.2 Number of questions that were fully answered

Question 1: Bioeconomy policy and definition

Twelve countries (60%) use a definition for the Bioeconomy that is more or less similar to the definition used by the European Commission (Figure 3.3). Among Member States that submitted the questionnaire, ten (63%) have a similar definition to the one used by the Commission. Most of the other countries do not use a definition.

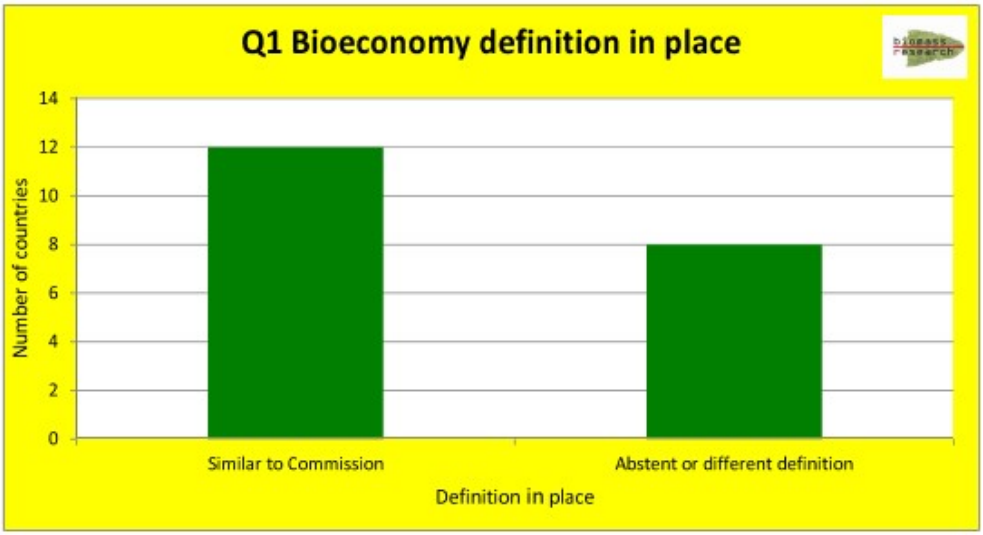

Figure 3.3 Bioeconomy definition resemblance with the Commission's definition

Question 2: Drivers to implement a Bioeconomy policy

Reasons to implement Bioeconomy policy are related to factors with a merely political, economic, or environmental character. The average ranking of 20 submissions shows priority of individual drivers ranges between 3.0 and 4.5. Economic drivers are given a higher average score (4.3) than political (average score 3.7) and environmental objectives (average 3.5). Hence, the development of a Bioeconomy policy is seen as an opportunity to enhance economic development, including both classic and new Bioeconomy sectors, while food security and the need to combat climate change are also relevant (Figure 3.4).

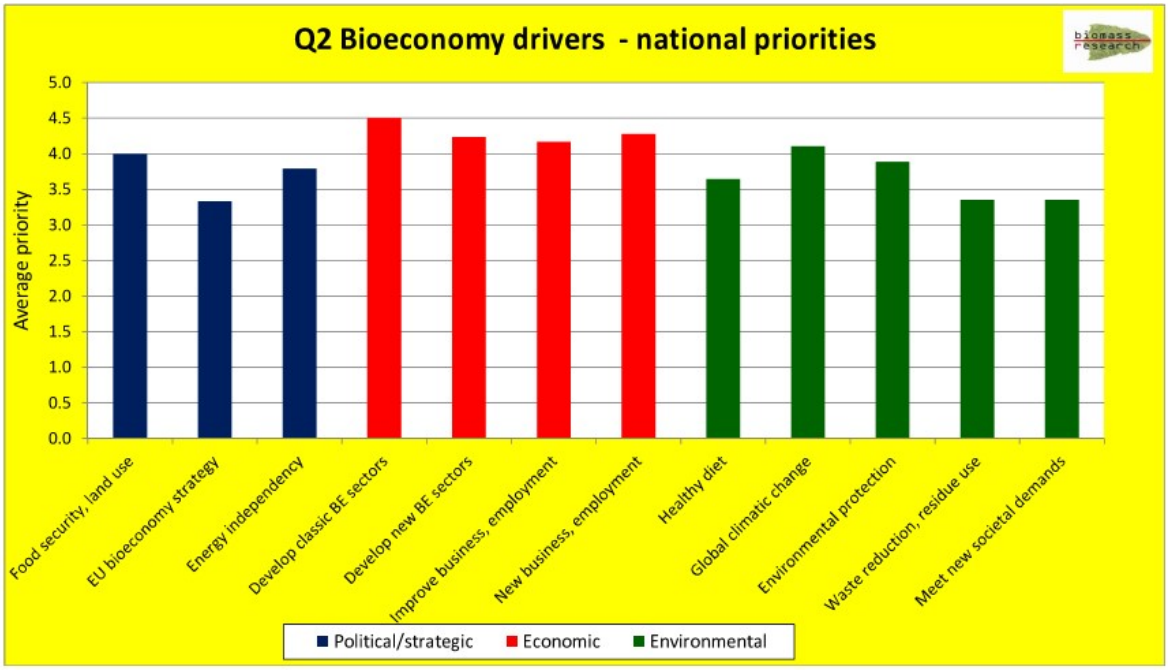

Figure 3.4 Drivers to develop a Bioeconomy strategy

Question 3: National policy strategies

Nine countries are implementing a Bioeconomy strategy (Figure 3.5). Flanders, Germany, Finland and Sweden have developed a full strategy; Switzerland, Denmark, Estonia, the Netherlands and Wallonia implement a partial strategy.

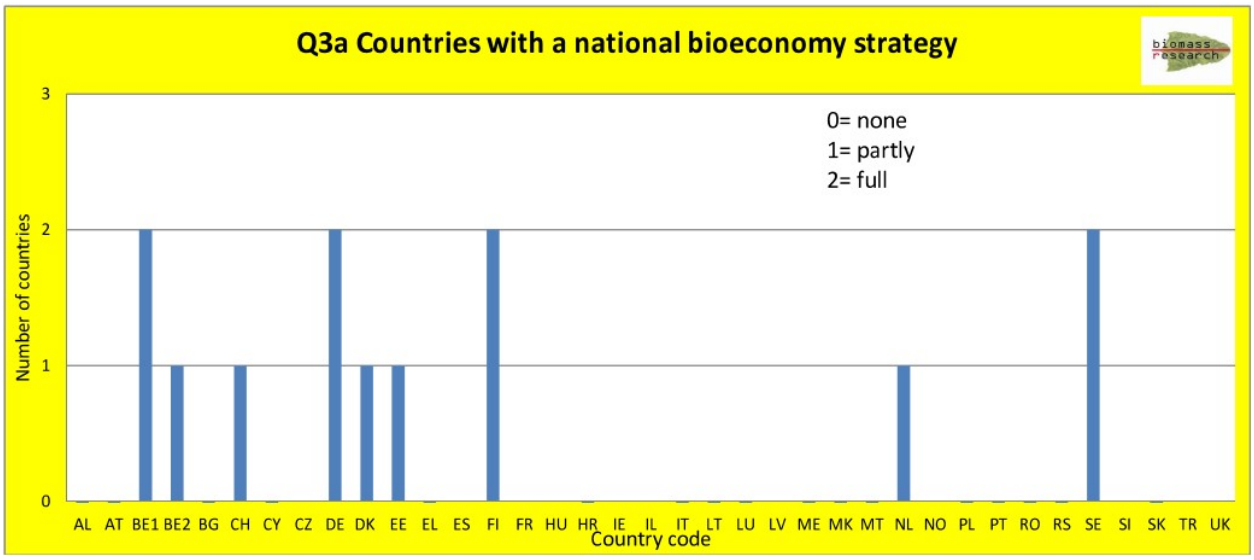

Figure 3.5 Countries with a Bioeconomy strategy

Five countries (Germany, Estonia, Finland, Hungary and the Netherlands) have installed a national Bioeconomy Agency. In most cases, two ministries are (jointly) in charge of the implementation of the Bioeconomy strategy (Figure 3.6).

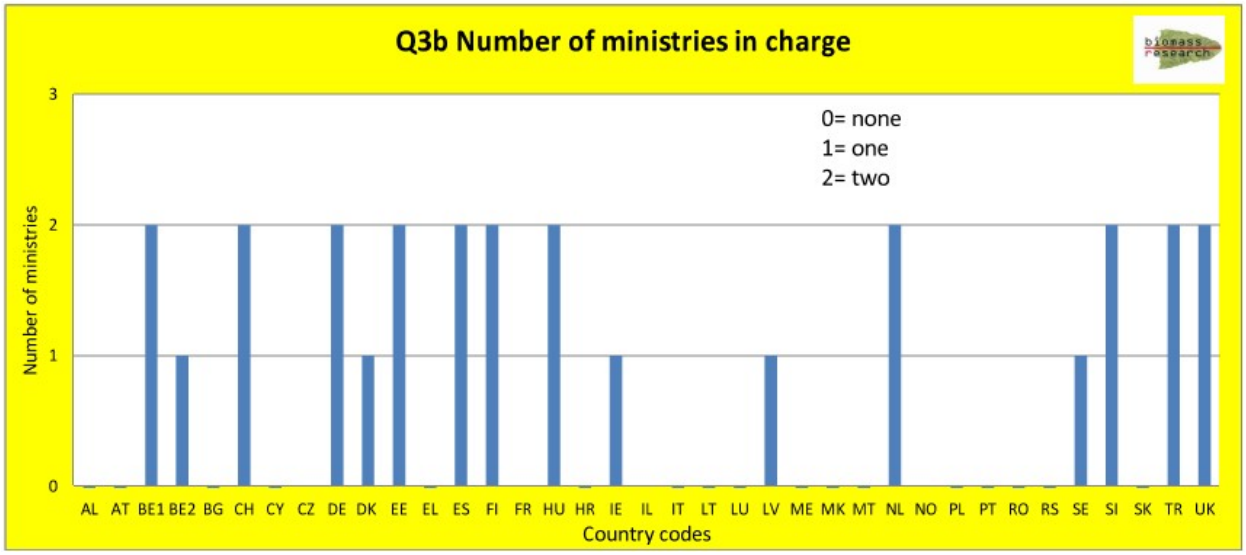

Figure 3.6 Number of ministries in charge of the Bioeconomy strategy

Question 4: Bioeconomy related R&D programmes

The budget for R & D programmes in the bioeconomy receives some 2.3 billion of public funds[7]. This amount is based on the questionnaires that were submitted and cannot be considered as fully representative for countries that did not submit any details on their information. Details of the funding of bioeconomy research & development programmes are presented in Table 3.1. Agriculture is the sector receiving most of the R & D funding. It annually receives 1.3 billion Euro which is more than half of all reported public funding. Industrial use of biomass receives 185 million Euro's (8%); while 185 million Euro is allocated to energy use; marine, fisheries and aquaculture receive 172 million Euro's (7%). A relatively small amount is designated to generic bioeconomy programs (6%).

Table 3.1 Bioeconomy related national research budgets

Sector / activity	**Budget [1]**	**Share of total budget [2]**
Generic Bioeconomy [a]	136	5.8%
Agriculture	1,344	57.5%
Forestry	10	0.4%
Marine, fisheries, aquaculture	172	7.4%
Waste as biomass sources	58	2.5%
Food and feed use of biomass (food/feed value chains)	27	1.2%
Energy use of biomass (bioenergy)	185	7.9%
Industrial uses of biomass [b]	196	8.4%
Key enabling technology (industrial biotechnology)	54	2.3%
Communication, stakeholder involvement	0	0.0%
Other (please specify)	155	6.6%
All	2,338	100.0%

[a] Covering several elements and sectors of the bioeconomy; [b] Including paper and pulp, wood and wood products, chemical production, pharmaceutical production, and other industrial uses.

[7] Only funds from research programmes, no budgets from structural or innovation funds were reported.

Question 5: Case-studies of Bioeconomy related research and innovation projects

More than 100 case-studies of successful Bioeconomy development have been reported. Nearly half of them were listed by Germany. Large numbers of case-studies were also reported by Flanders, Germany, Denmark and the UK. An overview of the number of case studies reported is given in Figure 3.7.

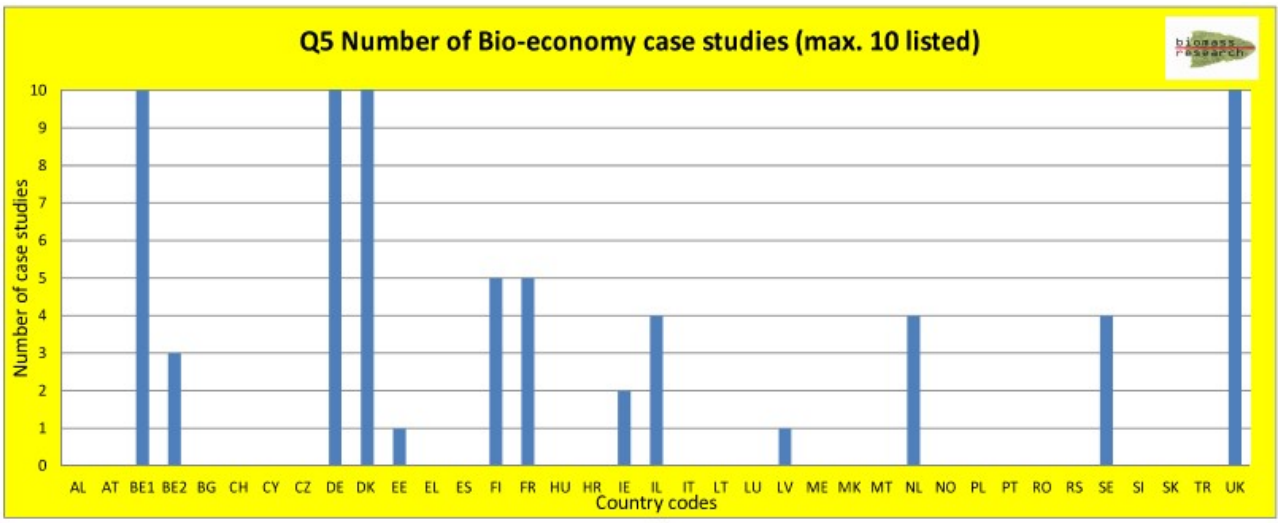

Figure 3.7 Number of case studies reported[8]

Question 6: Bioeconomy transnational R&D collaboration

The participating countries see large (potential) benefits of participation in international R&D programmes related to the Bioeconomy, although in many cases countries find it difficult to assess priority. Table 3.2 presents an overview of rankings allocated to individual elements. The lowest ranking (1) was not given. Most frequent were the highest rankings (4 and 5).

Table 3.2 Rankings reported on perceived benefits of transnational R & D collaboration

Ranking / **Sector / activity**	**1**	**2**	**3**	**4**	**5**	**All**
Food security	0	1	0	6	6	13
Policy framework	0	0	2	5	3	10
Bioenergy	0	0	5	2	4	11
Social inclusion	0	0	4	2	2	8
Economic, market framework	0	0	3	3	5	11
Knowledge, practices transfer	0	0	1	8	4	13
Resource efficiency	0	0	2	5	5	12
Biorefineries	0	1	2	4	4	10
Algae	0	1	2	2	1	11
Animal feed	0	1	4	5	0	6
Healthy food research	0	1	1	5	5	12
Sustainability criteria	0	0	1	3	9	13
Genetics	0	1	2	5	4	12
Renewable resources	0	1	3	3	4	11
Footprint methodology	0	1	1	3	3	8
All	0	8	33	63	61	4

[8] For the sake of conciseness, a maximum of ten case are presented studies per country

Average ranking scores per element were high, ranging between 3.5 and 4.6. Highest scores were given to research on the development of sustainability criteria, and to research on biorefineries, food security, resource efficiency and knowledge transfer (Figure 3.8). Average scores for political/strategic and economic elements were similar (4.1). Scores for environmental elements were slightly higher (4.2).

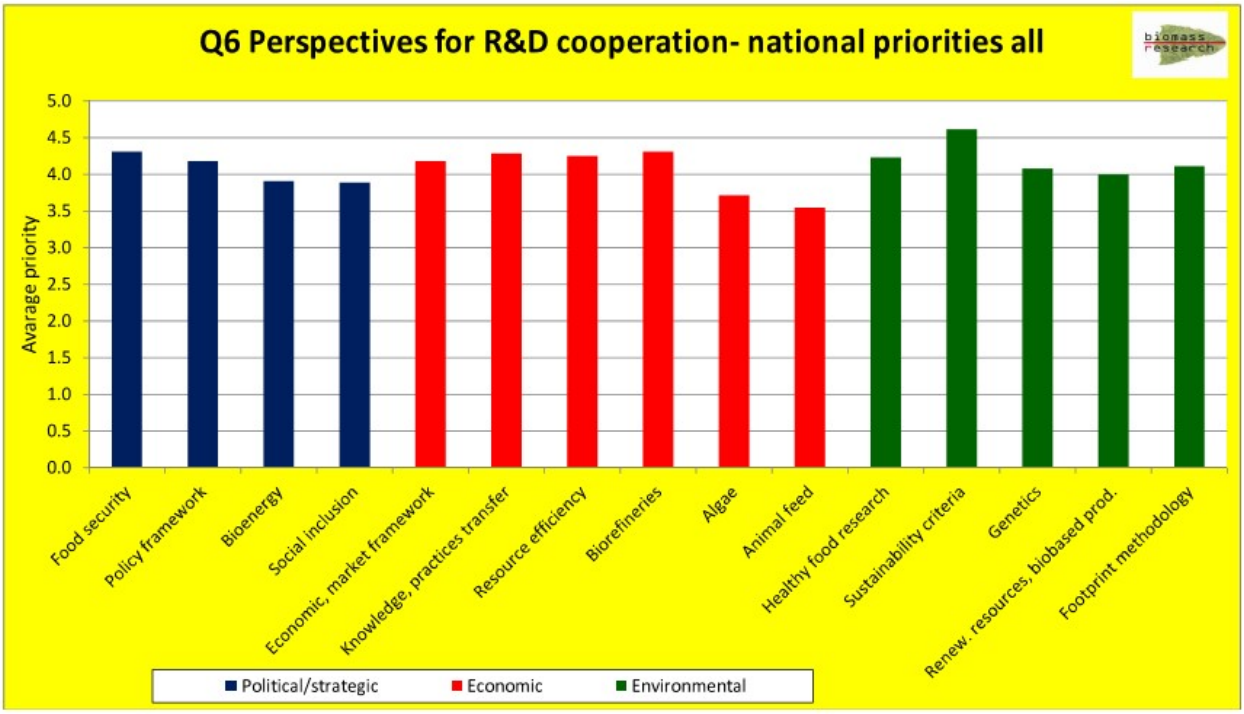

Figure 3.8 Perspective for international cooperation (all submissions)

A comparison between scores of Member States and non-Member States shows few differences. Member States generally give higher rankings, which suggests higher expectations of international cooperation. Environmental elements are given the highest ranking (Figure 3.9).

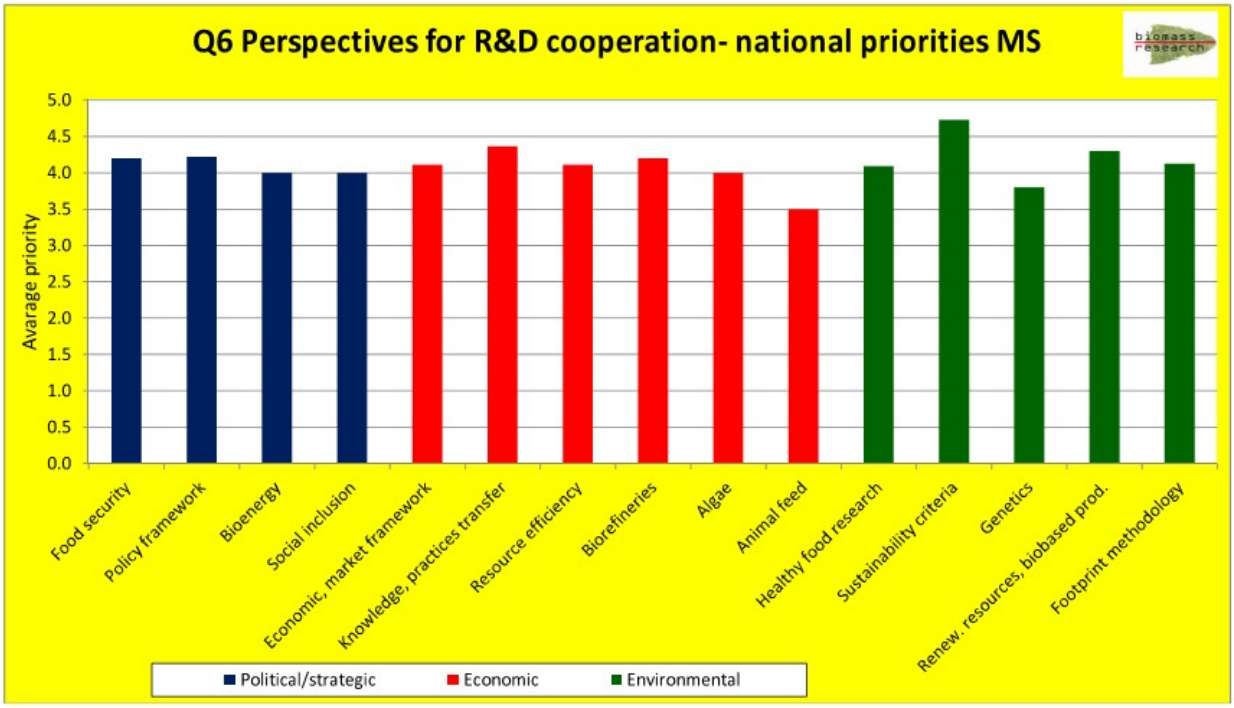

Figure 3.9 Perspective for international cooperation (Member States only)

4. DISCUSSION AND CONCLUSION

Following an active policy towards the development of a strong and effective Bioeconomy in the EU, the European Commission is working towards the establishment of a Bioeconomy Observatory. The development of the BISO project is supported by a "Bioeconomy Member States survey" to collect information on the bioeconomy at individual Member State level national, with a particular focus on national research activities and policy initiatives for the bioeconomy. A SCAR (Standing Committee on Agricultural Research) member list has been used to identify national contact points in 28 European nations including all EU Member States.

Each of the contact points was approached, requesting collaboration in the distribution and/or filling of the questionnaire in their home country. In most cases, the questionnaire was redirected to the responsible ministries as requested. Sometimes, a new contact point had to be approached. General response to the request was positive, with more than half of the countries submitting a questionnaire within the requested period which included the summer period of 2014.

The response was higher than previously was anticipated, which suggests that the right forum has been used to address issues of Bioeconomy Observatory. Twenty countries have submitted a questionnaire; Belgium submitted two (one for each major region). The quality of the submitted questionnaires was high, often providing a lot of details related to policy, R&D and regional initiatives.

This does not mean that all countries have provided similar quality of answers. As a rule, countries already active in the development of a Bioeconomy policy and research framework (e.g. Germany, Denmark, Finland, Belgium, and The Netherlands) made a larger effort in preparing the answers to the survey. While, further, the response rate has been above expectations, it is recommended to approach countries that did not (yet) submit directly as the SCAR list of contact points is not likely to be the best opportunity to obtain the missing questionnaires.

Large differences exist with respect to the implementation of a Bioeconomy policy. A limited number of countries installed such a policy, a bioeconomy advisory board or an implementation agency. In some other cases, one or two ministries have been assigned the lead in the development of a Bioeconomy policy. Generally, a small number of countries seem to implement a full package (strategy, board, agency, policies, and dedicated R&D programmes).

There is, however, room for optimism. While Bioeconomy oriented policies and R&D infrastructure are developing, both at the national and the EU level many initiatives are taken. There is a substantial budget for Bioeconomy related research, with annual expenses exceeding 2.3 billion Euro.

A large number (108) of regional/cluster or national initiatives has been listed in the survey, and more may be expected. The recent publication of National Bioeconomy Profiles in the Bioeconomy Observatory (https://biobs.jrc.ec.europa.eu/), combining data from national and EU statistical bureau's with industrial key figures and data generated by the survey, is another milestone.

How, then, to evaluate these figures? We compare results presented above to a list of enabling factors for the development of new biotechnological innovations as presented by the Pugatch Consilium (2014)[9]. Enabling factors for innovative technological development include:

1. **Human capital** – A basic and fundamental building block is the availability of high skilled and technically trained human capital.

2. **Infrastructure for R&D** – R&D capacity is critical to fostering innovation and activity in high tech sectors including biotechnology and is reflected by country-level indicators including total R&D expenditure; patenting intensity; life science investment levels; public-private partnerships; and academic and scientific citations.

3. **Intellectual property protection** – Intellectual property rights such as patents and regulatory data protection are historically of real importance to the biotech and biopharmaceutical innovation process as they incentivise and support the research and development of new biological technologies and products.

4. **Regulatory environment** – The regulatory and clinical environment in a given country plays a significant role in shaping incentives for innovation and establishing adequate levels of quality and safety for biotech products, particularly biopharmaceuticals.

5. **Technology transfer frameworks** – Technology transfer is an important mechanism for the commercialisation and transfer of research from public and governmental bodies allowing private entities to develop commercially applicable technologies.

6. **Market and commercial incentives** – Market and commercial incentives can be realised *via* different formats including as tax incentives, support for basic research and R&D credits for investments in plant, equipment and other R&D infrastructure.

7. **Legal certainty** (including the rule of law) – The general legal environment as it relates to the rule of law including legal business context is crucial to commercialization and business activities.

Five of the enabling factors are addressed by the survey: human capital, R&D infrastructure, the regulatory environment, technology transfers, and legal certainty. Market incentives are not addressed directly, but it may be expected that emphasis on a proper legal framework and – especially – budgets for Research & Development, as well as international cooperation in R&D, help to develop an environment where economic conditions for commercial development is favourable. The survey provides a good coverage of the factors that need to be addressed in the Bioeconomy.

The recommendations presented by Pugatch with respect to technology development are in line with results of other studies. Compare, for example, to a listing by the Milken Institute (2013)[10]. According to this study, prequisites for bioeconomy development in the USA include:

- Consistent government policies
- 'Green banks'
- Public, private procurement programs

[9] Pugatch (2014). The bioeconomy. http://www.pugatch-consilium.com/reports/Building_The_Bioeconomy_PugatchConsiliumApril%202014DD.pdf . Accessed 12 June 2014

[10] Milken Institute (2013). Financial Innovations Lab Report. Unleashing the power of the Bio-Economy.

- Legel regulatory playing field
- Use agricultural, rural development programs
- CAP, Cohesian funds
- Use existing infrastructure

The list provided by Pugatch is also in line findings of other theoretical frameworks like the *Functions of Innovation Systems Theory*[11], that was developed for analysing the implementation of innovations in the Netherlands. As a rule, succesful innovations require a combination of availability of robust technology development, knowledge diffusion, enterpreneurship, availability of credit, market development and political frameworks (Langeveld 2010[12]).

Not all elements are equally well covered in the JRC-SCAR survey or – more in general – the Bioeconomy Observatory. Basically, these focus on the identification of the Bioeconomy as a strategic development area, the stimulation of national Bioeconomy strategies, the measurement and evaluation of performance including the identification of best practices, the leverage of national capabilities and enhancement of international cooperation.

[11] Hekkert, M., Negro, S., Heimeriks, G. and Harmsen, R. (2011). Technological Innovation Systems Analysis. A manual for analysts. Utrecht, Copernicus Institute for Sustainable Development and Innovation.

[12] Langeveld, J.W.A., Kalf, R. and Elbersen, H.W. (2010) Bioenergy production chain development in the Netherlands: key factors for success. Biofuels, Bioprod. Bioref. 4:484–493. DOI: 10.1002/bbb.240

ANNEXES

BE - BELGIUM: FLANDERS

Joint Survey on National Bioeconomy Strategies

Country:	**Belgium – Flemish region**
Year of data collection:	2014
Contact mail person in charge of data collection:	Flanders: eva.vanbuggenhout@lv.vlaanderen.be

This survey consist of two parts. It is aimed to collect data on:

(1) National Bioeconomy Policies and

(2) National Bioeconomy Research & Development

I POLICY

Q 1: Does your country have a national definition for Bioeconomy? If so, please provide definition here

Yes, definition: Bioeconomy encompasses the production of renewable biological resources and their conversion into food, feed, bio-based products and bio-energy. Following sectors are included: agriculture, forestry, fisheries, food, wood industry, pulp and paper industry, environment technical sector, building and infrastructure, energy and industrial sectors as textile, chemistry (also containing pharmaceutical sector) and bio-technology. Finally the end user/consumer and logistics sector (recycling and waste recovery) can be added. In short, the bioeconomy encompasses all activities linked to the production of biomass, and the different ways how this biomass and residuals are used.
The biobased economy is part of the bioeconomy. According to this definition, the biobased economy encompasses the conversion of biomass into biobased products and materials.

Please describe where your country's definition is different from the EU definition of the bioeconomy.[13]

The European definition does not make a difference between biobased economy and bioeconomy as such.

[13] EU definition: 'The bioeconomy encompasses the production of renewable biological resources and their conversion into food, feed, bio-based products and bioenergy. It includes agriculture, forestry, fisheries, food and pulp and paper production, as well as parts of chemical, biotechnological and energy industries. Its sectors have a strong innovation potential due to their use of a wide range of sciences (life sciences, agronomy, ecology, food science and social sciences), enabling and industrial technologies (biotechnology, nanotechnology, information and communication technologies (ICT), and engineering), and local and tacit knowledge' *Source:* Commission Staff Working Document of COM(2012) 60 final. Innovation for Sustainable Growth. A Bioeconomy for Europe.

I POLICY Q 2: Please list the main drivers for your country to engage in the development of the Bioeconomy		
	Please insert priority ranging from 5 (= high) to 1 (= low)	Comment/specification
Contribution/implementation of the EU strategy on Bioeconomy	3	
Food security/ land-use competition	4	
Healthy diet	1	
Independence from fossil resources/security of supply	3	
Development of classic bioeconomy sectors (agriculture, forestry, fisheries, food, paper)	4	
Development of new bioeconomy sectors (bioenergy, industrial biobased products)	4	
Maintaining business base and employment	4	
New business, increased employment	4	
Mitigation of climate change/adaptation to climate change	3	
Environmental protection/ environmental sustainability (i.e. biodiversity and ecological services)	4	
Resource efficient economy (reduction of waste, use of residues)	5	
Societal demand	2	
Other drivers – please specify	4	Enforcing the R&D potential, this follows 'maintaining business base and employment'

I POLICY Q 3: Please list National policy strategies which would also cover the Bioeconomy at least partly		
Does your country have a National Bioeconomy strategy ?	Yes ~~/ No~~	Name of the strategy: Bio-economy in Flanders: the vision and strategy of the Government of Flanders for a sustainable and competitive bio-economy in 2030 Link: http://www.vlaanderen.be/nl/publicaties/detail/bioeconomy-in-flanders
Ministry(ies) in charge of the Bioeconomy strategy ?	Yes ~~/ No~~	Name of the responsible Ministry/ Ministries: the strategy is a joined effort of the **interministerial working group**. Several entities of different policy domains are actively involved: Economy, Science and Innovation; Agriculture and Fisheries; Environment, Nature and Energy; Education and Training and Work and Social Economy. Link: http://www.linkedin.com/groups/Bioeconomie-in-Vlaanderen-Bioeconomy-in-8131126
Does your country have a Bioeconomy advisory body/panel ?	~~Yes /~~ No	Name of the body: Flanders doesn't have a bioeconomy advisory body/panel/agency as such. We do have an Interministerial Working Group Bio-economy. Link:
Does your country have a Bioeconomy agency or agencies ?	~~Yes /~~ No	Name of the agency: Link:
Does your country have a Bioeconomy observatory collecting data/info ?	~~Yes /~~ No	Name of the body: Information on biomass is collected but this done in a fragmented way (different organisations, projects, … involved) Every two years, OVAM (Public Waste Agency) publishes a biomass inventory. OVAM also developed the food waste plug-in. Link: Biomass inventory 2011-2012: http://www.ovam.be/sites/default/files/Inventaris%20Biomassa%202011-2012_0.pdf Food waste plug-in: data will be available through Eurostat in the future.
Does your country have a Bioeconomy National Contact point ?	Yes ~~/ No~~	Name: Inge Arents. A more general contact point is the chair of the Interministerial Working Group Bio-economy (Chair is rotating – currently the Department of Agriculture and Fisheries has the chair – see contact details first page of this survey) Contact: iar@iwt.be

Bioeconomy related policies	Is a policy initiative for this area/sector available?	If yes, please elaborate on how the Bioeconomy is covered in this policy initiative	Link for download[14]
Agriculture	Yes / ~~No~~	Agriculture delivers most of the products on which bioeconomy is based and throughout the production and processing cycle of agricultural products many fine examples of resource efficiency and recycling can be found. There is no explicit bioeconomy related policy in Agriculture Policy, but there are a number of implicit links to be found . There are measures within the new rural development programme (2014-2020) which are implicitly dedicated to bioeconomy e.g. funding for agroforestry. The RD programme was submitted to the European Commission in April 2014 and for its execution a total of 693 million euro is reserved. Under the new direct support measures, the greening measures may implicitly contribute to the bioeconomy.	
Forestry	Yes / ~~No~~	The Forestry Decree (13.06.1990) establishes a framework for sustainable forest management focussing on a sustainable balance between the economic, social, environmental and ecologic function of the forest. The KOBE projects (see Q4) are aimed at improving the net balance between management costs for and the benefits of ecosystem services (current focus on forestry and to a lesser extend on grassland).	
Marine/Fisheries/Aquaculture	Yes / ~~No~~	As in Agriculture, Fishery and Aquaculture provide nice examples of resource efficient production and recycling: The discard ban and full landing obligation in the new Common Fishery Policy could be considered as a "bioeconomy" policy initiative. Aquaculture in closed circuit, integrated aquaculture where species live from waste of other species (mussels, seaweed, fish) , algae production for fuel, medicine, cosmetics, food supplement are examples of resource efficiency.	

[14] Please provide English link (if available)

Waste	Yes / ~~No~~	Action Plan biomass residues	
Agri-Food & Food security	Yes / ~~No~~	Cascading use of food waste that could not be prevented towards different applications. In close collaboration with the private sector (declaration of commitment).	
Food, Healthy diet	~~Yes /~~ No		
Research & Innovation	Yes / No	Innovaton Centre Flanders: innovation studies have been carried out around sutainable chemistry, green energy and eco-innovation	
Green Growth Strategy	~~Yes~~ / No[15]		
Blue Growth Strategy	~~Yes~~ / No		
Energy, including Bioenergy	Yes ~~/ No~~	The Energy agency is working on a Flemish action plan renewable energy by 2020, together with different stakeholders. One action is dedicated to guaranteeing the coherence between the action plan and the Flemish bioeconomy strategy and action plan. The Flemish action plan renewable energy will also cover the use and sustainability of the available biomass and the search for the most valuable aplliance for each energy source. The cascading principle is already in force for wood. Wood used as material is excluded from financial support for renewable energy.	
Industry, Enterprise	Yes ~~/ No~~	New Industrial Policy, Smart specialisation strategy: no particular bioeconomy strategy, but a programme 'Factory-of-the-future' with FISCH – Flanders Innovation Hub for Sustainable Chemistry	http://www.fi-sch.be/
Environment (incl. resource efficiency, sustainability, water use)	Yes / ~~No~~	The Government of Flanders has the ambition to belong to the top 5 European regions when it comes to sustainable materials management. To realise this, the Flanders' Materials Programme was launched in 2012 as part of 'Vlaanderen in Actie' (Flanders in Action). The Flanders' Materials Programme: transition project towards sustainable materials management in which government, industry, centres of expertise and civil society join	http://www.vlaamsmaterialenprogramma.be/documents/19/c3fb688b-77a1-4d9a-825d-f1aff24f5d67

[15] Although work is done on Green Growth, there is no Green Growth Strategy yet: http://www.vlaanderen.be/nl/publicaties/detail/maatschappelijk-verantwoord-ondernemen-en-groene-groei-springplanken-naar-duurzaamheid. http://www.lne.be/themas/beleid/milieueconomie/reguleringskosten

		forces.	
Eco-System Services	Yes / No	The ecosystem services concept (ESS) is included in several sectoral policies and in one way or another related to the bio-economy: The Environmental policy plan 2011-2015: “Introduction of the concept of ESS” is one of the 38 measures in this policy paper. The economy and community need a broad supply of ESS for sustainable development. Sample projects are being developed for areas offering various ESS. A network of expertise is also being developed. Flanders is developing quantity and quality tools based on this to support policy choices and/or determine and explain the confines of ecosystems.	Environmental policy plan 2011-2015 http://www.vlaanderen.be/nl/publicaties/detail/environmental-policy-plan-2011-2015-summary-1 NARA-T (http://www.nara.be/ecosysteemdienstenrapporten), only available in Dutch
Regional development and Smart Specialisation	Yes / ~~No~~	New Industrial Policy, Smart specialisation strategy:a general S3 strategy exists in Flanders but not for the bioeconomy: The trilateral programme BIG-C (Flanders, Netherlands, North-Rhine Westphalia) aims to develop the bioeconomy in the region through revitalising the chemical sector.	http://www.fi-sch.be/nl/nieuws/big-c-position-paper/
Education/Skills	Yes / ~~No~~	There is no specific policy for the bio-economy within the education field. Structural policy within the department of education may benefit the bioeconomy, as well as the execution of the STEM (Science, Technology, Engineering, Mathematics) action plan. There is also a project called Ecocampus which strives to be the catalysator for the orientation towards sustainable development within higher education. http://www.lne.be/doelgroepen/onderwijs/ecocampus	
Other areas, please specify			

Please list Bioeconomy regions and/or clusters in your country (if available)		
Name	**Description of the focus/specialisation[16]**	**Link[17]**
Ghent Bio Economy Valley/Harbour of Ghent	Ghent Bio-Economy Valley is a non-profit organisation supporting the development of biobased activities and resulting economic growth in the region of Ghent, Belgium. It is a joint initiative of Ghent University, the City of Ghent, the Port of Ghent, the Development Agency East-Flanders and a number of industrial companies related to the Ghent region that are active in the fields of generation, distribution, storage and use of biobased products and bio-energy. Ghent Bio-Economy Valley promotes the development of the biobased economy of the future through collaborative programs, joint initiatives and synergy creation between the partners in the fields of Research & Development, structural measures and policy, logistics and communication towards the general public. Ghent Bio-Economy Valley promotes the development of the biobased economy through: Technological innovation: building research and development expertise Cluster formation: building synergies between industrial partners Public awareness: improving public understanding through communication Provision of services: technological advice, partner matching, assistance with project proposal submission, … Within the Ghent Bio Economy Valley Bio Base Europe is Europe's first open innovation and education center for the biobased economy. Flanders and The Netherlands have joined forces to build state-of-the-art research and training facilities to speed up the economic growth, innovation capacity, and sustainable development of our society. Bio Base Europe consists of the Bio Base Europe Pilot Plant and the Bio Base Europe Training Cente. The Bio Base Europe Pilot Plant is a flexible and multipurpose pilot plant for biobased products and processes:	http://www.gbev.org/en

[16] 1= biomass supply; 2= food/feed use of biomass; 3= energy use of biomass/bioenergy ; 4= industrial use of biomass, biobased products
[17] Please provide English link (if available)

	• Biobased products and processes are developed and scaled up to production scale. • One-stop-shop: the complete bioprocesses can be performed, from biomass raw material to the pure and refined bioproduct. • Technologies include biorefining, biomass pretreatment, biocatalysis, fermentation, downstream processing and green chemistry. • Target group are companies and research institutes worldwide. • Confidentiality is guaranteed as the Bio Base Europe Pilot Plant is a fully independent facility. Focus: 1, 3 and 4	
BioVille	BioVille is a full service investor/incubator, located in Flanders, the heart of Europe with direct access to Belgium, the Netherlands, France Germany and the UK. As part of the venture capital group LRM and with the support of the Province of Limburg and Hasselt University the mission is to offer innovative life sciences companies and projects a dynamic and stimulating environment where entrepreneurs and scientists can develop and expand their ideas and technologies in order to accelerate the commercialization of medical innovations in Europe. BioVille provides state of the art office, laboratory and manufacturing facilities in combination with flexible financing modalities and supporting technical and business services to a broad spectrum of companies, ranging form start-ups, over later-stage growth companies to commercial organisation in the field of medical life sciences and biotechnology, ranging across drug development, cell therapy, diagnostics, medical devices and enabling technologies. Focus: 4	http://www.bioville.be/
FlandersBio	FlandersBio is the networking organisation for the life sciences sector in Flanders, a dynamic non-profit, fee-based organisation with currently more than 270 members. FlandersBio supports the life sciences community through networking, direct services and	http://flandersbio.be/

	advocacy to stimulate the growth of the sector and deliver long-term economic and social benefits in the region. The FlandersBio network brings together companies with innovative, R&D-driven activities in the life sciences – companies that are for example developing biopharmaceuticals, medical technologies or agricultural or industrial biotech products. The network welcomes companies with production activities based in Flanders as well as academic research institutes and providers of capital, services and technologies to the life sciences community. FlandersBio's strategic goals are: • Achieve sustainable economic growth • Stimulate knowledge transfer • Create a supportive regional environment • Ensure a sufficient talent pool • Increase public awareness Together, FlandersBio, GBEV and essenscia (chemical and life sciences sector association) have joined forces to further develop and support the industrial biotechnology with CINBIOS, “Cluster for Industrial Biotech Solutions”.This synergetic cooperation involves the whole value chain and represents the major Flemish stakeholders in the field of industrial biotechnology. Focus: 4	*www.**cinbios**.be*
FISCH	Chemistry for Sustainability: FISCH identifies, stimulates and catalyzes innovations for sustainable chemistry in Flanders by supporting companies with the initiation and set up of innovation projects. How? By supporting project set up, promoting cooperation between companies, governments and research institutions, encouraging partnerships, knowledge clustering, etc. Focus 1 and 4	http://www.fi-sch.be/en/
Flanders’ FOOD	Flanders’ FOOD is a centre of competence and network organization. Its goal is to	http://www.flandersfood.com/about-

	strengthen the competitiveness of the Flemish Food Industry by providing them with the tools and knowledge to innovate more, better and faster. How? By providing companies with a scientific-technological platform that • allows them to participate in scientific reseach to meet new challenges and opportunities in an accessible manner; • gathers scientific knowledge and communicates it to the companies through newsletters, books, seminars, training and advice; • connects companies with a proper partner (research institutes, suppliers, …) to solve specific problems. Focus 1 and 2	flanders-food

II Research & Development Q 4: Which Bioeconomy related R&D programmes exist in your country ?			
By type of activity	**Programme name (please provide links)**	**Short description and relation with the Bioeconomy**	**National PublicFunding allocated to the programme (€ / year)**
	General Remark: Flemish R&D-funding schemes are in general open to all topics. The proposals should mainly follow the scheme's logic when applying for funding. There are a number of programmes which can be linked to the bioeconomy but are not specifically designed for the development of the bioeconomy.		
Agriculture	Landbouw LA-trajecten	Applied research programme. The aim is to develop innovations that can benefit the farm sector or certain subsectors. It is an open programme, link with bioeconomy possible, but not mandatory.	10,3 million/year
Forestry	KOBE (ANB)	The KOBE projects, initiated by ANB and Inverde, are aimed at improving the net balance between management costs for and the benefits of ecosystem services. It combines a range of smaller projects aimed at optimizing the economic return on investments in woodland (to a lesser extend grassland and heathland) without diminishing the whole of the natural capital. Reports on wood and biomass production can be found on http://www.inverde.be/kennis-houtige-biomassa	About 300.000/year
Marine/Fisheries/Aquaculture			
Waste as Biomass source			

Food/feed use of biomass (food/feed value chains)	Flanders' FOOD	http://www.flandersfood.com/about-flanders-food	
Energy use of biomass (bioenergy)	GBEV, SET-plan		
Industrial uses of biomass – **Paper and pulp production** – **Wood and products** – **Chemical production** – **Pharmaceutical production** – **Other industrial uses**	FISCH Bio Base Europe	Chemistry for Sustainability: FISCH identifies, stimulates and catalyzes innovations for sustainable chemistry in Flanders by supporting companies with the initiation and set up of innovation projects. How? By supporting project set up, promoting cooperation between companies, governments and research institutions, encouraging partnerships, knowledge clustering, etc. http://www.fi-sch.be/en/ The activity domains/innovation themes are closely related to the bioeconomy: Alternatives for fossils: • Production of new Bio-mass • Bio-mass conversion • Valorization of side streams Process intensification: • Separation technology • Green solvents • Micro process technology • Catalysis, alternative energy Sustainable chemical products • Multifactoral improvement • Sustainable chemical products	
Key Enabling Technology (Industrial Biotechnology)	I-Cleantech CINBIOS	I-Cleantech Vlaanderen vzw is a network organisation in Flanders, the Northern part of Belgium. Together with companies, research institutions, public bodies and civil society actors, i-Cleantech Flanders is a catalyst for innovation in a multitude of clean technologies and assists their subsequent implementation in society at large. More specifically, i-Cleantech Flanders' mis-	

		sion is “to identify and encourage the development of cleantech instruments that accelerate the realisation of a sustainable world”. i-Cleantech Flanders works cross-sectorally between existing organisations and focuses on four cleantech domains, being energy, water, materials and mobility. Central in i-Cleantech Flanders’ structure are the pillars transition (management), research and industry. i-Cleantech Flanders stimulates cleantech in Flanders though the following actions: • A yearly Cleantech report provides a state-of-the-art overview of the development of the Flemish cleantech cluster; • Cleantech projects and networking events stimulate cooperation between companies and other stakeholders; • The “MIP” Research and Innovation programme (E: Platform for Innovation *in* Environment and Energy) provides an earmarked budget for companies and research institutes for innovative cleantech projects that are integrated into a broader system perspective; • Transition management arenas are set up in order to stimulate the transition to, respectively, sustainable water policies, sustainable energy policies and climate neutral and resilient cities; • Communications tools provide more visibility to the Flemish cleantech cluster. • So-called cleantech antennas in the Flemish provincies, one of which (East-Flanders) covers the bio-economy	
Communication, stakeholder			

involvement			
Other areas, please specify			

II Research & Development
Q 5: Specific case-studies of Bioeconomy related research and innovation projects

Please list specific case-studies /examples (success stories) of Bioeconomy research and innovation projects in your country

FISCH: http://www.fi-sch.be/en/

VISIONS: http://www.bbeu.org/visions

ARBOR: http://arbornwe.eu/ (Interreg IVB NWE)

OPTIMISC : https://optimisc.uni-hohenheim.de/

DRIVE4EU: http://www.drive4eu.eu/

Genesys: http://www.ilvogenesys.be/

GROW2build : http://grow2build.eu/

Biobase Europe INTERREG projects: http://www.bbeu.org/; recently selected as mKPL demonstrator by the EC

Interreg project “Grenzeloze logistiek” : http://www.grenzelozelogistiek.be/projecten-met-impact/verduurzamen-bio-reststromen/logistieke-optimalisatie-van-bioreststromen

FP7 project NOSHAN: http://www.noshan.eu/
COST action TD1203 – EUBIS - http://costeubis.org/
COST action FA1403 – POSITIVe - http://www.cost.eu/domains_actions/fa/Actions/FA1403
LCA studies of primary plant production systems dedictated to the bio-economy

II Research & Development Q 6: Potential benefit of European research cooperation			
	Is there a benefit of European cooperation? Please insert priority ranging from 5 (= high) to 1 (= low)	**Are there any transnational cooperations established between your country and other EU Member States?** If yes please specifiy.	**Comment/specification**
Common sustainability criteria/ GHG emmissions	4	http://www.biomasspolicies.eu/ (VITO as Flemish project partner) http://www.biograce.net/biograce2/ (VEA as Flemish project partner)	
Resource efficiency	4	Cooperation between Flanders' Nutrient-platform, Dutch nutrient platform and German phosphorusplatform	
Renewable resources/ bio-based products	4	Flanders-Netherlands-North-rhine Westphalia (BIG-C)	
Knowledge transfer and good practice and innovation	4	Cooperation with the Netherlands ERA-IB Service point of the EIP on agricultural productivity and sustainability	
Economic/ market framework	4	Cooperation with the Netherlands	
Policy framework	4	Cooperation with the Netherlands	
Healthy food research	4	JPI HDHL	
Bioenergy	4	SET-plan	
Animal feed	4		
Development of an agreed methodology for environmental footprints	4		
Biorefineries	4	Biobase Europe pilot plant	

Food security	4	JPI FACCE	
Social inclusion	4	Programme on social innovation	
Algae	4	Algae platform	
Genetics	4	ERA-IB	
Other areas, please specify	4	ERA-SUSFOOD	