BioGov.net
Governance & Upskilling for a Stronger Bioeconomy

WP4: Guidelines for training and mentoring

Task 4.1: Data collection, methodology and analyses

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Consortium

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DISSEMINATION LEVEL	AUTHORS
Public	Yaprak Kurtsal (UNIBO) Rino Ghelfi (UNIBO) Paola Galletti (UNIBO) Davide Viaggi (UNIBO)

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Contributors

NAME	ORGANISATION
Mara van Eijndhoven	AVANS
Myron Koster	AVANS
Han van Osch	AVANS
George Skellaris	AVANS

Peer Reviews

NAME	ORGANISATION
Ayse Terzi	Avans

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Table of Abbreviations and Acronyms

Abbreviation	Meaning
CoP	Community of practice
EQF	European Qualification Framework
EU	European Union
ET	Education and Training
H2020	Horizon 2020
LLL	Lifelong Learning
ME	Monitoring and Evaluation
NEET	Not in Education, Employment, or Training
NGO	Non-governmental organization
VET	Vocational education and training
WP	Work Package

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Executive Summary

Bioeconomy can contribute significantly to sustainability, and is seen as a catalyst for systemic change, able to tackle the economic, social and environmental aspects of the Green Deal and create new and innovative jobs in Europe. While the importance of bioeconomy in transition to sustainability and its potential impacts throughout Europe is generally recognized, there are gaps between the demand for adequate skills and the supply of education and training (ET).

Therefore, the strategic objective of the BioGov.net project is to support the establishment of innovative governance models in bioeconomy training and skills development to achieve better-informed decision-making processes, social engagement and uptake of sustainable innovations in bioeconomy. In this direction, this document entitled "Guidelines for Governance of Education and Training in Bioeconomy" has been prepared under the BioGov.net Project Task 4.1. of "Data Collection, Methodology and Analysis" of Work Package 4 (WP4). The study presented in this report aimed to introduce the key elements that an effective governance model in bioeconomy ET is required to have; and propose guidelines towards adopting a participatory and innovative governance approach that would contribute to the improvement of the ET systems in bioeconomy and, hence, lead its sustainable transition.

In this scope, first, a conceptual framework has been prepared that can be used for the governance of training and mentoring programs that are able to support the permanent learning and re-training in bio-based economy. Then, a questionnaire was prepared, the content and the structure of which relied on the aforementioned conceptual framework. The data collection was then performed through an on-line survey. The questionnaire aimed to identify the needs, opportunities, expectations, and solutions that stakeholders encounter regarding governance of education and training in the bioeconomy. The questionnaire has been implemented in eight countries: Estonia, Slovakia, Czech Republic, Italy, Germany, Netherlands, Portugal and Greece. The target participants of the questionnaire have been members of the Communities of Practice (CoPs) established in the scope of the Project, as well as the wider networks of the project partners, or regional stakeholders, who are informed/experienced in issues related to ET of bioeconomy. The data collection has been implemented between the months of May and September 2023. A total of 188 responses have been gathered. The results obtained were grouped and analysed under each of the three components of the Conceptual framework (1 – Effectiveness of the Governance Framework, 2 – Efficiency of the Governance Framework and 3 – Collaborations and Stakeholder Engagement). The Likert-type and multiple-choice questions were analysed using descriptive statistical analysis; and the qualitative method used to analyse the open-ended questions has been a thematic analysis. The data collected via the questionnaire was used to prepare guidelines for the training governance framework.

The results revealed that among the different educational levels available in bioeconomy ET, the vocational education and training (VET) was perceived as the most important by the stakeholders, while the process of coordination and harmonization of policies in ET was seen as a fundamental step for developing VET throughout Europe. In terms of topics to be integrated into the bioeconomy courses and curricula, Sustainability (e.g. sustainable production methods, responsible use of resources, environmental/social impact assessments) and Circular Economy were regarded as the most crucial, followed by Entrepreneurial and Soft Skills. Meanwhile, the approach that was regarded as the most important by stakeholders was promoting collaboration between academia, industry and the government, thus pointing to the crucial need of collaboration and participatory governance.

Majority of respondents believe that it is essential to have a functioning Monitoring and Evaluation (ME) system in place in bioeconomy; yet a majority also find the already existing systems in their regions non-sufficient. While the need for improvement is apparent, a noteworthy number of respondents stressed the importance of improving the already existing systems in place and establishing connections between those that work, instead of creating a system from scratch. Financing opportunities, on the other hand, are also considered to be not sufficient by the respondents. While specific financing needs in each region differed, the need for financing for training the trainers and provision of new and innovation programs and modules in bioeconomy and extending their reach to make them more inclusive and attractive for the society as a whole, was common across different countries.

Partnerships and multi-stakeholder collaboration in bioeconomy ET were also considered crucial. The topic that was placed the highest importance was strengthening the collaboration between educational institutions and other organizations (e.g. industry, communities, NGOs) was placed the most importance. Besides, the need to integrate a wide variety of stakeholders in decision and curriculum-making in bioeconomy was stressed. Especially bioeconomy professionals and practitioners are seen as the most important stakeholders to be integrated. Meanwhile, in order to increase the inclusion of marginalised groups, the strategies proposed by the respondents included carefully identifying the abilities in order to obtain compatible job placements and putting in place orientation, guidance, mentorship and financing programs to target these individuals. Last but not least, the interest and willingness to learn about the possible uses of cultural and creative industries in bioeconomy was quite high among respondents. A suggestion was to enable the collaboration of students and professionals from the creative and cultural sectors to work closer with bioeconomy sectors, through co-creation of innovative spaces to establish dialogue. CoPs in this regard present a great opportunity.

In the light of a comprehensive examination of the findings, this report presents a set of guidelines to establish a dynamic and collaborative governance framework for Bioeconomy ET. The proposed measures, organized under distinct themes, address key aspects of effectiveness, efficiency, and collaboration within the bioeconomy education landscape. The following summaries encapsulate the detailed recommendations outlined in the subsequent sections:

Effectiveness in Bioeconomy Education and Training | This section promotes for measures such as skill enhancement, sustainability integration, and flexible teaching approaches to maximize the impact of bioeconomy education. The focus lies on balancing theory with practical experience and aligning the education system with the evolving needs of bioeconomy sectors.

Efficiency in Bioeconomy Education and Training Governance | Efforts to streamline governance for bioeconomy education efficiency involve policies for harmonization, transparent financial support, and the recognition of diplomas. This section also highlights the importance of creating a functional monitoring system and enhancing financial support for underrepresented groups.

Collaboration and Stakeholder Engagement in Bioeconomy Education and Training | Collaboration is at the forefront of this section, emphasizing the establishment of partnerships, inclusive decision-making mechanisms, and social inclusion. Additionally, integrating art and creative sectors into education is proposed to enhance the richness and diversity of the bioeconomy education experience.

1 Introduction

Bioeconomy can contribute significantly to sustainability, and is seen as a catalyst for systemic change, able to tackle the economic, social and environmental aspects of the Green Deal (EC, 2022). Besides, bioeconomy is expected to create new jobs and enhance competitiveness in Europe (EC, 2022). While the importance of bioeconomy in transition to sustainability and its potential impacts throughout Europe is generally recognized, there are gaps between the demand for adequate skills and the supply of education and training (ET). Hence, member states need to ensure that their ET systems are improved towards filling these gaps; and in this regard, building responsive governance systems and establishing collaborative and participatory mechanisms will play a significant role.

In our day, the importance of education and training has surged to the forefront of our collective agenda. Our era is marked by a variety of complex and "wicked" global challenges, from climate change and resource depletion to pandemics and economic inequality. Addressing these multifaceted issues demands a highly skilled and adaptable workforce, capable of responding to the ever-evolving demands of our dynamic world (UNESCO, 2021). To allow a transition towards a sustainable and an innovative bioeconomy, it is imperative not only to focus on formal education but also to provide accessible avenues for vocational education, lifelong learning and adult learning opportunities. These complementary approaches are vital for equipping both learners and practitioners in the sector with the knowledge and skills necessary for success in the bioeconomy, promoting a culture of continuous adaptation and innovation (OECD, 2019).

In the pursuit of robust education and training systems that is crucial for realizing a transition towards a sustainable bioeconomy, European member states must embrace innovative and participatory governance mechanisms (EC, 2018). Governance, in the context of education and training, refers to the strategic coordination, collaboration, regulation, and management of educational institutions, policies, and resources (OECD, 2017). It involves not only policymaking but also fostering collaboration among stakeholders, including government bodies, educational institutions, industries, research organizations, as well as other key stakeholders (European Commission, 2012). Such governance is indispensable in aligning efforts, investments, and policies to ensure that education and training meet the evolving demands of the bioeconomy, facilitating the development of the skills and expertise required to propel the transition toward sustainability.

In this direction, this study aims to introduce the key elements that an effective governance model in bioeconomy ET is required to have; and propose guidelines towards adopting a participatory and innovative approach that would contribute to the improvement of the ET systems in bioeconomy and, hence, lead its sustainable transition.

In the report, first, objectives are provided in Section 2, then a detailed explanation of the conceptual framework and the methodology of this work are presented in Section 3. The results of the study are provided in Section 4, then the results are discussed in Section 5. Then, Section 6 presents the Guidelines prepared as an output of this Study, and Section 7 provides the results and strategies proposed in the differentiation of different countries that took part in this study. Last but not least, Section 8 lays down the conclusions.

2 Objectives and key targets

2.1 Aim of WP4 – Guidelines for training and mentoring

The overall aim of WP4 ("Guidelines for Training and Mentoring"), in a nutshell, is the development of guidelines for a novel training framework in bioeconomy. The guidelines will be published as a Blueprint, applicable for other regions in the EU. Two guideline documents will be prepared in the context of this WP: Guidelines for Developing the training governance framework; and Guidelines for designing biobased training programs. Learnings from best practices from different regions will form a solid basis for elaboration of guidelines to consider different regional maturity levels and orientations (based on the findings from WP2 - Collection and assessment of good practices and case studies related to EU and regional training initiatives in bioeconomy) and provide focused instructions. The set-up based on Communities of Practice (CoPs, WP3) will support permanent learning and re-training in the area in regards the bio-based economy and provide guidance in developing connections in local/national priorities and innovative actions. This will be developed in close collaboration and input from Task 3.2. The guidelines will also consist of information regarding existing initiatives in order to provide contacts and networks for collaborative learning and co-creation.

2.2 Aim and scope of the study - Guidelines on Governance of Education and Training

The overall aim of this Report is to develop guidelines for designing an effective and innovative governance model for education and training in the bioeconomy. Towards this goal, the tasks were:

- First, **to prepare a conceptual framework** that can be used for the governance of training and mentoring programmes that are able to support the permanent learning and re-training in bio-based economy. In doing so, the focus has been on developing a governance framework that is flexible, adaptive and collaborative, which can adapt to the realities of the regional contexts and the changing educational needs and be implemented in a multi-stakeholder and participatory way.
- Second, **to prepare a questionnaire** for data collection, that is based on the aforementioned conceptual framework (the governance model for education and training in bioeconomy); and **collect data** by using the questionnaire, from the members of the **Communities of Practice (CoPs)** in addition to the wider networks and stakeholders that are informed about bioeconomy education); and to **analyse the data** to prepare Guidelines for Developing the training governance framework in the bioeconomy.

In doing so, the study particularly aimed to ensure inclusiveness and engagement of all actors, especially SMEs, civil society organisations including NGOs and broader civil society (e.g. educational institutions, museums, science- and art centres). Besides, a special focus was placed to the inclusion of innovative business models and methodologies for integration of humanities, art, design, culture, and social innovation.

3 Methodology

The methodology section is presented in three parts:

- The first part (3.1 The Conceptual Framework) lays out the conceptual framework developed in the scope of this study to guide the data collection process as well as the preparation of the Guidelines for Developing the training governance framework.
- the second part (3.2. Data Collection Strategy) sets out how data collection in the scope of this study is undertaken.
- and finally, the third part (2.3 Analysis of the data and preparation of the Guidelines) provide information on how the data was analysed and presented and how these were translated into the Guidelines for the training governance framework.

3.1 The Conceptual Framework

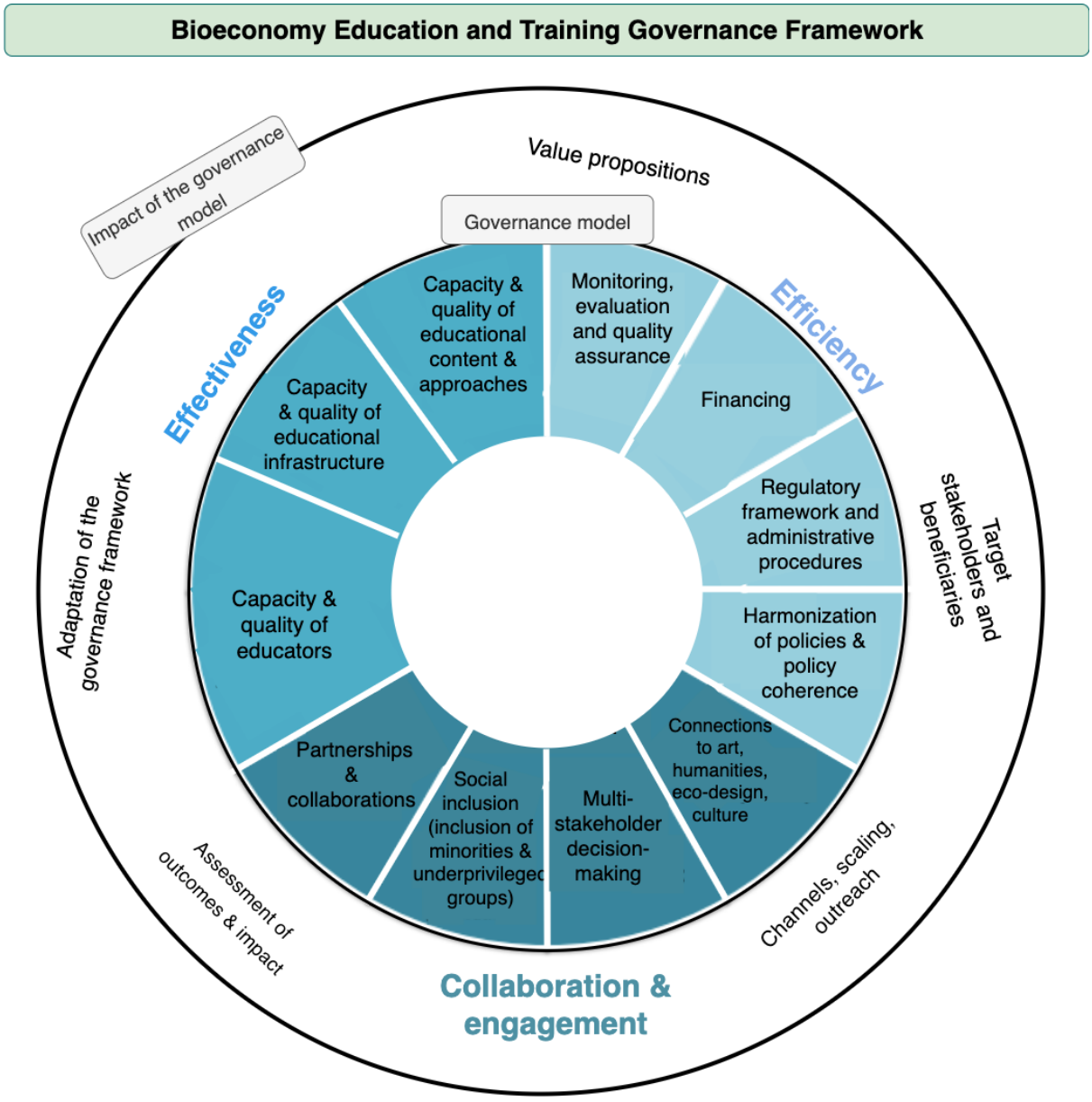
A conceptual framework ("The Bioeconomy Education and Training Governance Framework") is prepared in the scope of Task 4.1, in order to both guide the data collection process, and also to provide a clear understanding of which elements or topics need to be addressed in terms of bioeconomy education and training governance in the scope of the Project, which will then feed the other tasks in the WP (Task 4.2 and Task 4.3).

The conceptual framework pays attention to bringing together the necessary components of a governance system designed for bioeconomy education and training. It is designed to be able to facilitate the governance of training and mentoring programmes that can support the permanent learning and re-training in bio-based economy. Meanwhile, the focus is on developing a governance framework that is flexible, adaptive and collaborative, which can adapt to the realities of the regional contexts and the changing educational needs and be implemented in a multi-stakeholder and participatory way.

The framework uses important components of the Business Model Canvas (BMC) (Osterwalder and Pigneur, 2010) and the Collaborative Governance Framework (Emerson et al., 2012), as well as frameworks established as part of key strategic documents, such as the OECD principles on governance (OECD, 2015), Education Policy Outlook 2015: Making reforms happen (OECD, 2015) and Strategic Education Governance Framework (OECD, 2019), while making use of the important outputs of projects such as the BIOBec Project (https://biobec.eu/) and the NextFOOD Project (https://www.nextfood-project.eu/).

Below, Figure 1 presents the Conceptual Framework. While this figure provides an overview of the framework, a detailed explanation of each of the components of the framework and how these components work together to improve the bioeconomy education system **is detailed in the Annex 1** of this document.

Figure 1. Bioeconomy Education (and Training and Mentoring) Governance Framework



3.2 The Data Collection Strategy

Development of the questionnaire

The data collection in this study is based on an on-line questionnaire. The questionnaire aimed to identify the needs, opportunities, expectations, and solutions that stakeholders encounter regarding the governance of education and training in the bioeconomy. The data collected via the questionnaire was used to prepare guidelines for the training governance framework. The Questionnaire used in this study has been prepared by using the Conceptual Framework detailed in the previous section (Bioeconomy Education and Training Governance Framework). Hence, the questionnaire was based on the same structure of the framework. In this direction, the questionnaire consisted of four sections, namely:

A - Respondent Information,

B – Governance Model – Effectiveness (Capacity and quality of educational content and approaches,

C – Governance Model – Efficiency (Monitoring and Evaluation, Financing, Regulatory framework /administrative procedures, Harmonization of policies and policy coherence,

D – Governance model – Collaboration and stakeholder engagement (partnerships and multi-stakeholder collaborations, multi-stakeholder policy and decision-making, social inclusion, inclusion of marginalised groups, Establishing links and collaborations with art, culture, humanities and co-design options).

The questionnaire was finalised by the following steps. First, a review of the literature and similar studies conducted by the UNIBO team as well as sister projects have been carefully evaluated and integrated into the questionnaire, when necessary. The draft of the questionnaire was sent by e-mail to all partners of the Project partners to be discussed and improved. Having received suggestions and feedback by the Consortium Partners, the questionnaire was finalized.

Then, a pilot survey has been conducted by sending the questionnaire to a pilot group consisting of selected partners. After a revision, the final version of the questionnaire was sent to all partners to be translated in the local languages of the countries in which the questionnaire would be implemented, namely: Estonia, Slovakia, Czech Republic, Italy, Germany, Netherlands, Portugal and Greece. The translated versions of the questionnaire were then put into the Qualtrics survey software, which enables a survey to be conducted in multiple languages. Last but not least a survey link was formed, and the link was shared with all consortium partners to be used in the execution of the questionnaire in their own regions.

The target audience of the questionnaire

The target participants of the questionnaire have been members of those CoPs that were already established in some of the countries in the scope of WP3 of the Project, as well as the wider networks of the project partners, or regional stakeholders, who are informed/experienced in issues related to education and training of bioeconomy in their regions. In choosing the target audience, the Quadruple Helix approach was prioritized, which is grounded on the idea that innovation is an outcome of an interactive process involving different spheres of actors (i.e. Research Organizations, Industry, Government and Civil Society), each contributing according to its institutional function in society (European Committee of Regions, 2016).

Distribution and Execution of the questionnaire

The questionnaire has been implemented in eight countries of the consortium partners in which the BioGov.net Project is being implemented: Estonia, Slovakia, Czech Republic, Italy, Germany, Netherlands, Portugal and Greece. In each of the countries, the stakeholders were contacted by the project partners that are based in those countries and the questionnaires were distributed through different modes, including distributing the questionnaire by e-mail to the CoP members and wider networks, sharing of the questionnaire via professional networks (e.g. LinkedIn) and sharing of the questionnaire on the website of the BioGov.net project. The data collection has been implemented between the months of May and September 2023. A total of 188 responses have been collected as of beginning of September 2023, when the analysis has been initiated (The number of responses collected by each country and other details related to the questionnaire can be found in the Section 4 - Results of this Report).

3.3 Analysis of the data and preparation of the guidelines

The data collected by the online survey was gathered and analysed by the UNIBO team, during the month of September 2023. The data collected consisted of three main types of answers: multiple choice, Likert type and open-ended responses. The data collected from multiple choice and Likert type questions were analysed mainly by using a descriptive statistics analysis. For all questions, descriptive statistics tables were prepared that present the distribution of responses as a whole, as well as according to the profiles of the respondents, namely, according to the stakeholder group they belong to (Research and higher educational organizations, Vocational education organizations, Business organisation, Unions, Policy makers and administrations, NGOs & marginalised groups, Active Communities, Cultural and creative sectors or Citizens & Wider Society), according to the country they are based in, their age group, whether or not they have experience in one or more of the Bioeconomy sectors and finally according to the highest level of education they completed.

These results obtained were grouped and analysed under each of the three components of the Conceptual framework (1 – Effectiveness of the Governance Framework, 2 – Efficiency of the Governance Framework and 3 – Collaborations and Stakeholder Engagement) and was reported in the associated parts of the Results Section. The results were then discussed in the Discussion Section of the Report which also formed the basis of the Guidelines to be prepared for the Governance Training Framework in Bioeconomy. Finally, the Guidelines were prepared using both the discussions of the Results as well as the answers collected by the open-ended questions. The qualitative method used to analyse the open-ended questions has been a thematic analysis. Thematic analysis is a qualitative descriptive approach that is mainly described as a method for identifying, analysing, and reporting patterns (themes) within data (Braun & Clarke, 2006). The method follows a six-step approach: (1) familiarization, (2) coding, (3) generating themes, (4) reviewing themes, (5) naming themes, and (6) writing up the results.

4 Results of the Survey on Governance of Education and Training in Bioeconomy

This section of the Report is presented in four main sections. First the sample of the survey is presented. Then the results of the survey are provided in three sections that also constitute the main parts of the Governance Training Framework, namely,

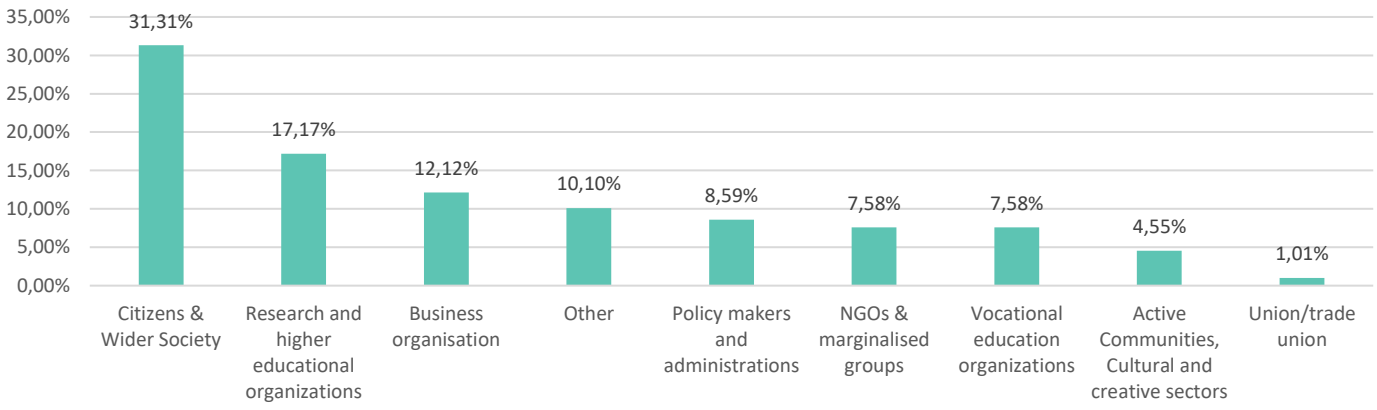
1 – The Governance Model – Effectiveness (Capacity and quality of educational content and approaches,
2 – The Governance Model – Efficiency (Monitoring and Evaluation, Financing, Regulatory framework /administrative procedures, Harmonization of policies and policy coherence, and finally,
3 – The Governance model – Collaboration and stakeholder engagement (partnerships and multi-stakeholder collaborations, multi-stakeholder policy and decision-making, social inclusion, inclusion of marginalised groups, Establishing links and collaborations with art, culture, humanities and co-design options).

While the main results have been presented under each of these sections, the detailed tables of the data collected are provided under the **Annex 3** of this Report. In the presentation of results in this section, the following approach is used. Under each heading, first, the related questions asked in the Questionnaire will be introduced, along with a table or figure to show the distribution of the answers given by the respondents for each question (percentage). The range of colours provided in some of the tables aim to distinguish higher and lower values (green denotes the highest values; red, the lowest; and yellow, those that fall in the middle). Then, a figure is provided using a Relative Importance Index, presenting the order of importance attributed to each of the topics by the respondents. The detailed methodology and the tables related to calculation of the Index can be found in the **Annex 3** of this Report.

4.1 Introducing our Sample

What type of stakeholder are our respondents?

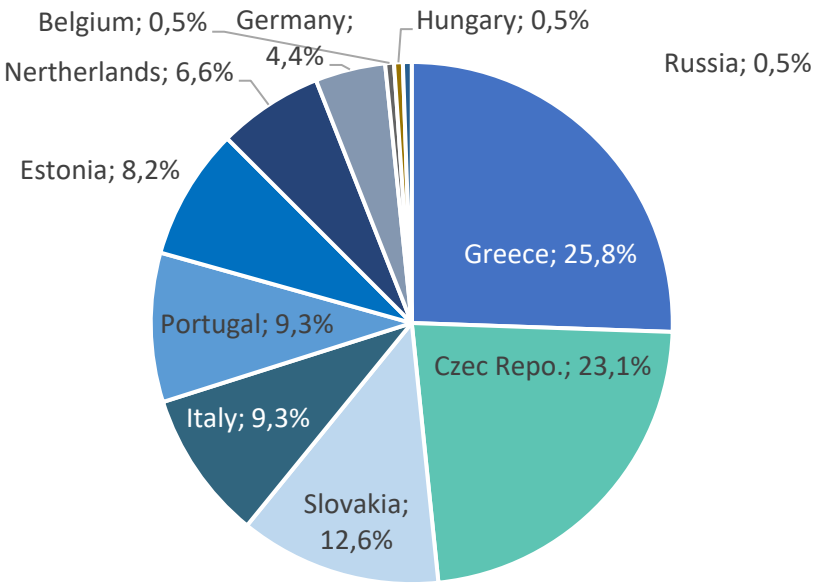
Figure 2. The distribution of respondents according to what type of stakeholder they are (percentage)



The respondents that belonged to the group of "Other" included Administrators, Business Campuses, Clusters, Consultants, Experts, Network Organizations and Municipality Representatives.

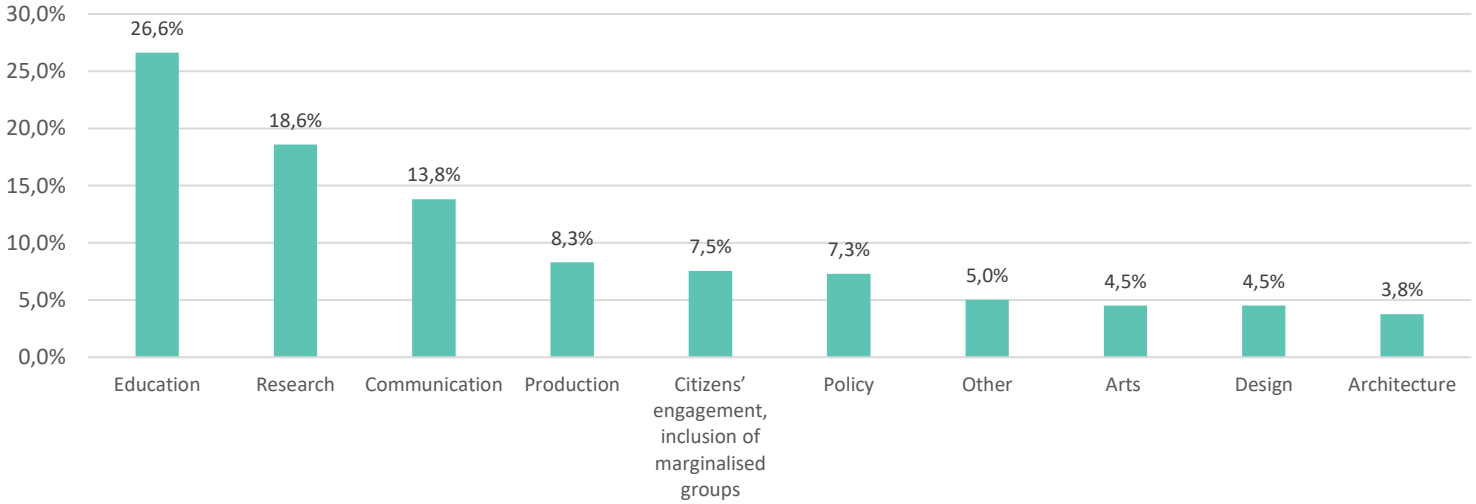
In which country are the respondents based?

Figure 3. The distribution of respondents according to which country they are based in.



In which field do our respondents have expertise in?

Figure 4. The distribution of responses collected according to which field our respondents have expertise in (percentage or responses)

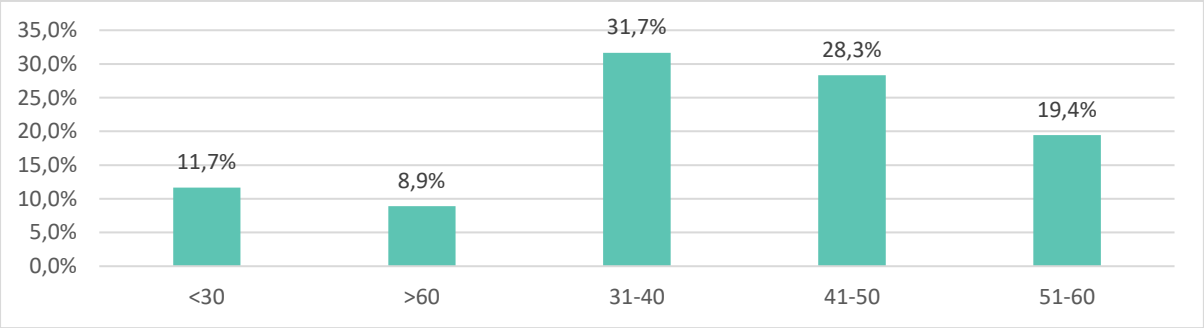


Do our respondents have experience/expertise in any of the bioeconomy sectors (e.g. agri-food, forestry, bio-based products, marine bioeconomy)?

51.7% of respondents have experience expertise in any of the bioeconomy sectors (e.g. agri-food, forestry, bio-based products, marine bioeconomy).

The age of respondents

Figure 5. The distribution of respondents according to their age group (percentage)



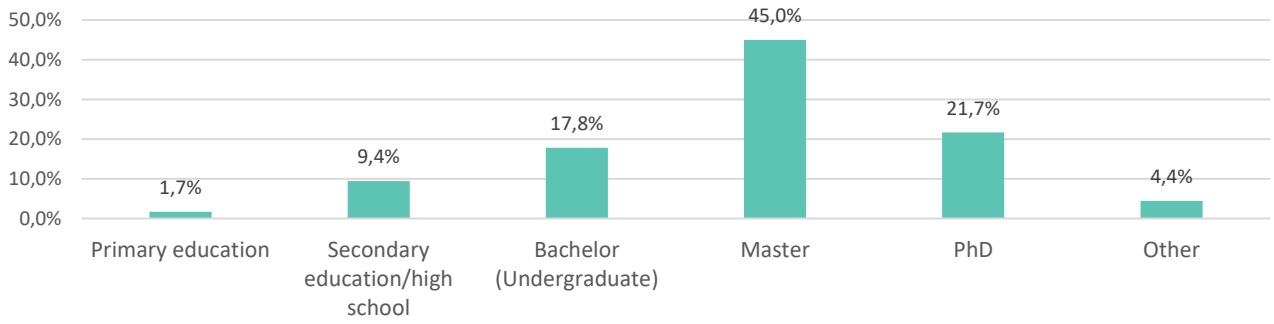
The gender of respondents

Table 1. The distribution of respondents according to their gender (frequency and percentage)

Gender	Percentage
Female	53.3%
Male	45.0%
NA	1.7%
TOTAL	

The highest level of studies the respondents have completed.

Figure 6. The distribution of respondents according to according to the highest level of studies they completed (percentage)



4.2 Effectiveness of Governance in Bioeconomy Education and Training

4.2.1 Capacity and quality of educational content and approaches

The capacity of ET content and approaches include all aspect related to designing new and up-to-date curricula, considering multidisciplinary approaches and emerging trends. Hence, it is of utmost importance to adopt innovative learning approaches, such as:

- integrating formal, informal, non-formal education – linking educational programmes to real life examples through internships, mentorship, apprenticeship, student-centered learning and modular programmes
- integration of digital skills and transversal soft skills into the curricula, and
- integrating these curriculums (and programmes) into all levels of the education and training system starting from early ages – Pre-University – to Vocational Education, University, Lifelong-learning (LLL) programmes – including mentoring programmes, and training of trainers.

In this report, the focus has been on LLL, VET and Adult learning, in line with the scope of the BioGov.net project; so, the results presented, and the Guidelines proposed will also focus on these. As, the capacity of ET content and approaches is regarded as one of the most crucial aspects of providing a quality ET in bioeconomy; we also dedicated a comprehensive section for this topic in this report. For this reason, in the Questionnaire, a noteworthy section was dedicated to exploring what are the needs in terms of ET content in bioeconomy and how it can be improved.

i. Which are the most needed/most important ET levels provided in the field of bioeconomy?

In the Questionnaire, the respondents were asked to rate the different types of ET options provided (or that need to be provided) in the field of bioeconomy in their countries/regions, namely, VET, higher education, workplace training, re-training (to change paths later in life or career), training of trainers and finally ET provided by different communities, such as through Communities of Practice (CoPs) or related associations. The Table 2 below shows the distribution of respondents (percentage) according to how they rate different ET levels as being needed or important in their region.

Table 2. Rating the different types of ET options provided, according to which ones are important/most needed in the field of bioeconomy in the region of the respondents.

	VET	Higher education	Workplace training	Re-training (to change paths)	Training of Trainers	Community education, training (through CoPs, associations)
Absolutely essential	32.30%	29.00%	30.80%	27.20%	32.00%	24.30%
Very important	34.80%	31.40%	33.70%	40.20%	32.00%	39.10%
Important	22.60%	24.30%	21.30%	18.30%	16.60%	24.90%
Moderately important	3.00%	8.90%	7.70%	10.70%	8.30%	8.90%
Slightly important	3.00%	3.00%	1.80%	1.20%	5.90%	1.80%
Not at all important	1.20%	1.80%	1.20%	0.60%	0.00%	0.60%
I don't know/No opinion	3.00%	1.80%	3.60%	1.80%	5.30%	0.60%

The results presented in Table 2 suggest that overall, all types of ET provided are mostly rated as "very important" or "absolutely essential" by the respondents, followed by those who regard them as "important".

The figure below on the other hand, presents the order of importance attributed to each of the topics using the Relative Importance Index. The Relative Importance Index calculates the value attributed to each of the topics by giving a numeric value to each of the Likert-type answers, to present the order of importance given to them. For detailed information and calculations of the index, please refer to **Annex 3** of this report.

Figure 7. The calculated relative importance according to which types of ET options are rated as most important/needed by the respondents.

According to the Figure 7, VET is seen as the most important/needed in bioeconomy ET, followed by re-training (teaching new skills to change paths later in life or career), community education and training, provided through associations, or communities such as the COPs.

These are followed by workplace training, higher education and training of trainers.

According to the stakeholder groups:

- The Stakeholder Group that mostly placed importance in VET was Research and higher education organizations and VET organizations;
- Higher education was placed the most importance by also research and higher education organizations;
- Workplace training was the most important for VET organizations and stakeholders from active communities, cultural and creative sectors;
- Re-training, to change paths and careers were seen as most important by NGOs and marginalised groups;
- Training of trainers, on the other hand was seen as the most important for VET organizations,
- And finally, policy makers were the group that placed the most importance in ET through communities, CoPs, associations etc.

In terms of countries:

- VET was seen as most important in Germany and Netherlands, while,
- Italy and Netherlands were countries which placed the most importance in higher education.
- Workplace training was placed the most importance by Italy and Portugal,
- While re-training to change paths was the most important for Germany and Portugal.
- Training of trainers gained the most points for importance by Estonia and Slovakia;
- And finally, Portugal and Slovakia were the countries where ET through communities and associations were seen as most important.

In terms of respondents having expertise/experience in any of the bioeconomy fields,

- The results were same for both of those groups that have experience, and those that do not have experience. Both groups placed the most importance in VET and ET through communities and associations.

In terms of age groups,

- Workplace training and re-training were regarded as most important for both age groups of 31-40 and below 30.
- For those over 60, VET and training of trainers were seen as most important;
- For 41-50, VET and higher education was placed the most importance.
- And for 51-60, it was training of trainers that were seen as most important.

In terms of highest education completed by the respondents,

- Community ET and training of trainers were placed more importance by PhD holders, while re-training was seen more important for master holders, and workplace training for bachelor's degree holders.

ii. Which are the most needed/most important topics in terms of designing new courses and curricula in bioeconomy ET?

The respondents were asked to rate the importance of integrating the below topics in terms of designing new courses and curricula in bioeconomy ET in their own region (with a special focus on VET and LLL):

- Sustainability (e.g. sustainable production methods, responsible use of resources, environmental/social impact assessments)
- Circular economy
- Inclusivity (e.g. Gender, marginalised groups)
- Soft skills (e.g. communication, networking, systems thinking, critical thinking, management)
- Digital skills and literacy
- Practical Skills and hands-on experience on bioeconomy-related tools and technologies (e.g. laboratory techniques, data analysis, problem-solving)
- Global perspective (the need to think and act in a holistic way and across borders if we'd like to create solutions for the wicked problems of our planet)
- Ethical implications of bioeconomy-related practices and technologies
- Entrepreneurial skills and promote a culture of innovation.

The results that are provided below (in Table 3) show the distribution of respondents (percentage) according to how they rate the importance and necessity to integrate some topics in the bioeconomy courses and curricula in their region.

Table 3. Rating the importance of integrating different topics in the bioeconomy ET courses and curricula, in the region of the respondents.

	Sustainability (e.g. sustainable production methods, responsible use of resources)	Circular Economy	Inclusivity (e.g. Gender)	Soft skills (e.g. communication, networking, systems thinking, critical thinking, management)	Digital skills and literacy	Practical Skills and hands-on experience on bioeconomy-related tools and technologies	Global perspective	Ethical implications of bioeconomy-related practices and technologies	Entrepreneurial skills and promote a culture of innovation
I don't know/No opinion	1.20%	3.00%	2.40%	1.20%	2.40%	2.40%	2.40%	1.80%	3.00%
Not at all important	0.60%	1.80%	4.10%	0.60%	2.40%	0.00%	0.00%	1.20%	0.00%
Slightly important	2.40%	2.40%	4.70%	4.10%	1.20%	3.00%	5.30%	4.70%	1.20%
Moderately important	3.60%	3.00%	13.60%	8.90%	4.70%	8.30%	16.60%	10.10%	8.50%
Important	12.40%	16.00%	24.90%	21.90%	27.20%	25.40%	29.60%	25.40%	20.00%
Very important	30.80%	33.70%	28.40%	29.60%	29.60%	30.20%	26.00%	36.10%	37.60%
Absolutely essential	49.10%	40.20%	21.90%	33.70%	32.50%	30.80%	20.10%	20.70%	29.70%

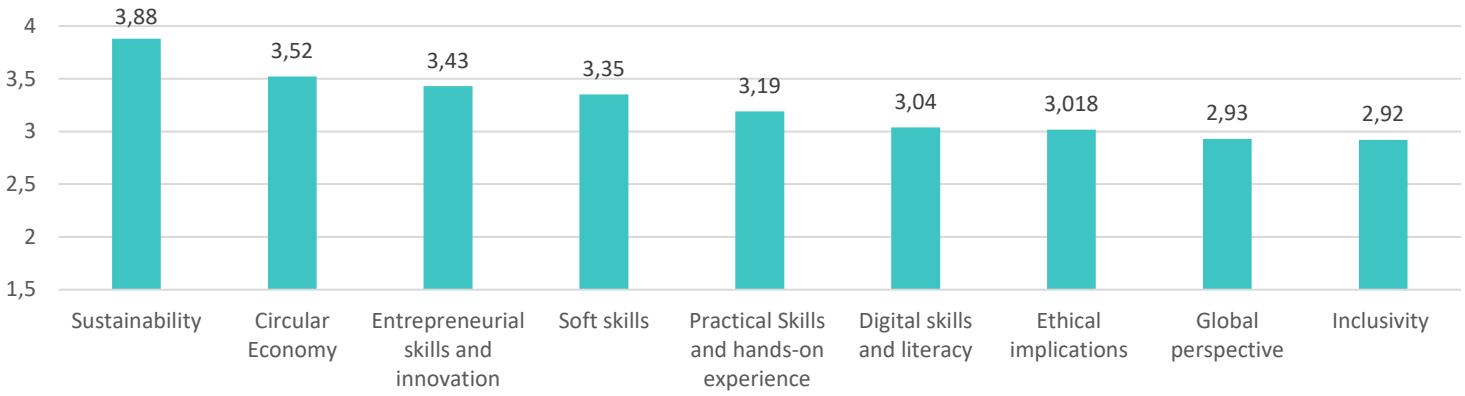
The results reveal that out of the different topics provided for the respondents to select from,

- those of "Sustainability (e.g. sustainable production methods, responsible use of resources, environmental/social impact assessments)", "Circular economy", "Soft skills (e.g. communication, networking, systems thinking, critical thinking and management) and "Digital skills and literacy" are the topics that were rated the most as "absolutely essential" by the respondents.

The figure below on the other hand, presents the order of importance attributed to each of the topics using the Relative Importance Index. The Relative Importance Index calculates the value attributed to each of the topics by giving a numeric value to each of the Likert-type

answers to present the order of importance given to them. For detailed information and calculations of the index, please refer to **Annex 3** of this report.

Figure 8. The calculated relative importance according to which topics are rated as most important/needed by the respondents.



According to the Figure 8, the topics that are regarded as the most important to be integrated into the bioeconomy courses and curricula are as follows:

- First, Sustainability (e.g. sustainable production methods, responsible use of resources, environmental/social impact assessments),
- followed by Circular Economy,
- then Entrepreneurial skills and promote a culture of innovation,
- and Soft skills (e.g. communication, networking, systems thinking, critical thinking, management).

In terms of different stakeholder groups,

- Sustainability and Circular Economy were regarded as the most important topics to integrate in the courses and curricula by all stakeholder groups, with the exception of, Citizens and Wider Society, who considered Sustainability and Digital Skills and Literacy as the most important topics.
- Active Communities, Cultural and Creative Sectors placed the most importance to Soft Skills (e.g. communication, networking, systems thinking, critical thinking, management) in addition to Sustainability and Circular Economy.
- Meanwhile, when we explore each topic separately,
    - Inclusivity and Practical Skills and hands-on experience on bioeconomy-related tools and Technologies) were seen as most important by the Policy Makers.
    - Global Perspective and Entrepreneurial Skills and Innovation were regarded as the most important topics to integrate in the curricula by stakeholders from Active Communities, Cultural and Creative Industries.
    - Finally, Ethical Implications of Bioeconomy Practices was regarded as the most important by NGOs and Marginalised Groups.

In terms of countries,

- All countries considered Sustainability (e.g. sustainable production methods, responsible use of resources) as the most important and necessary topic to integrate in the curricula and courses, while the second most important topic differed for each

country (these results can be seen in detail in Section 7 of the Report, under Country Profiles).

- When we consider each of the topics separately,
  - Inclusivity (e.g. Gender), Soft Skills (e.g. communication, networking, systems and critical thinking) and Global Perspective received the highest points (Relative Importance Index) by the respondents based in Italy,
  - While Practical Skills and hands-on experience in bioeconomy-related tools and Technologies and Entrepreneurial Skills and Innovation received the highest points in Netherlands.

In terms of having experience/expertise in any of the bioeconomy sectors,

- Sustainability was regarded as the most important topic for both type of respondents, regardless of having expertise in bioeconomy or not.
- For those that have experience/expertise in bioeconomy, Circular Economy was the second most important topic; and for those that do not have experience in bioeconomy, Digital Skills and Literacy was regarded as the second important topic, after Sustainability.

In terms of age, the highest importance placed to different topics differed for each Age Group.

- The age group of below 30 was the group the placed the highest importance to Sustainability, Inclusivity, Practical Skills, Global Perspective and Ethical implications, among all age groups,
- Circular Economy and Entrepreneurial Skills and Innovation were seen as the most important by the Age Group of 31-40
- Meanwhile, Soft skills and Digital Skills were considered as the most important by the Age Group of 60 and over.

In terms of the highest level of education completed,

- Those that have Bachelor, Master or PhD degrees placed the most importance to integrating the topic of Sustainability (e.g. sustainable production methods, responsible use of resources);
- While Digital skills and Literacy was considered as the most important for those stakeholders that completed secondary education/high school.

iii. Which are the approaches most needed/most important to be utilized in designing new courses and curricula in bioeconomy ET?

The respondents were asked to rate the importance of using different approaches (as provided below) in designing new courses and curricula in bioeconomy ET in their own region (with a special focus on VET and LLL):

- Utilising a flexible modular approach (dividing the curriculum into independent/short modules)
- Adopting learner-centered approach (Tailor-made according to the needs of the learner)
- Integrating informal learning (e.g. peer to peer learning, learning by doing)
- Making adult learning and lifelong learning programs more accessible
- Multidisciplinary approach (e.g. establishing links between different disciplines, fields, sectors), and
- Promoting collaboration between academia, industry, and government (e.g. Promoting the inclusion of practitioners as facilitators or teachers in courses)

The results that are provided in Table 4 show the distribution of respondents (percentage) according to how they rate the importance and necessity to utilize some approaches in designing bioeconomy courses and curricula in their region.

Table 4. Rating the importance of utilising different approaches in the design of courses and curricula in bioeconomy ET, in the region of the respondents

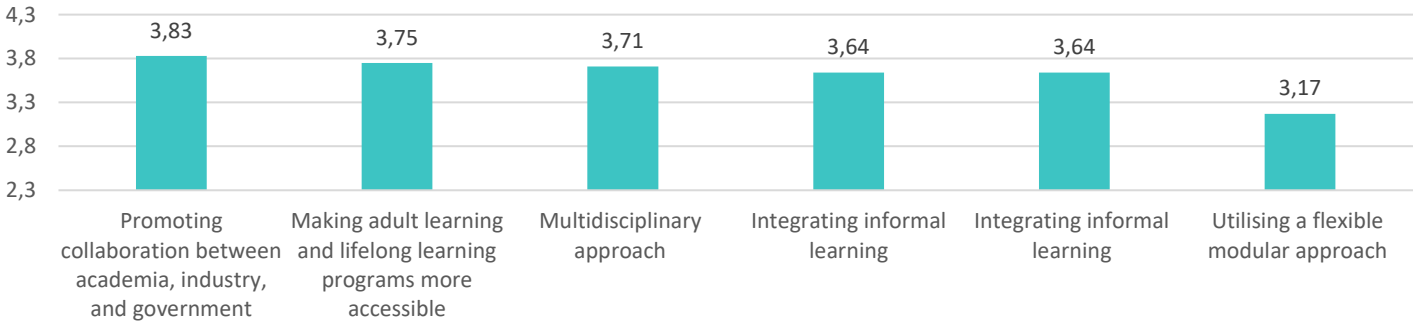
	Utilising a flexible modular approach	Adopting learner-centered approach	Integrating informal learning	Making adult learning and lifelong learning programs more accessible	Multidisciplinary approach	Promoting collaboration between academia, industry, and government
I don't know/No opinion	5.90%	5.30%	3.00%	3.00%	2.40%	3.60%
Not at all important	3.60%	3.00%	1.80%	0.60%	0.60%	1.20%
Slightly important	1.20%	1.20%	1.80%	1.20%	3.00%	4.10%
Moderately important	11.80%	8.90%	8.90%	5.90%	7.70%	5.30%
Important	30.20%	25.40%	20.10%	21.30%	20.70%	16.60%
Very important	32.00%	40.80%	36.10%	42.00%	37.30%	26.00%
Absolutely essential	15.40%	15.40%	28.40%	26.00%	28.40%	43.20%

The results reveal that out of the different approaches,

- the respondents consider "promoting collaboration between academia, industry and the government" as the most important one (with 43% of respondents rating it as "absolutely essential", and 26% as very important").

The figure below on the other hand, presents the order of importance attributed to each of the topics using the Relative Importance Index. For detailed information and calculations of the index, please refer to **Annex 3** of this report.

Figure 9. The calculated relative importance according to which approaches are rated as most important/needed by the respondents.



The results reveal that the approach that is seen as the most important (and needed) by the respondents is promoting collaboration between academia, industry and the government. This approach is followed by making adult learning and LLL programs more accessible and using multidisciplinary approaches in designing courses and curricula.

In terms of different type of stakeholders' responses, each of the approaches provided, was seen as the most important by different stakeholder groups.

- "Utilising a flexible modular approach (dividing the curriculum into independent/short modules)" was generally not rated as high, however, among the stakeholder groups, policy makers placed the most importance in using a flexible modular approach.
- Adopting learner-centered approach (Tailor-made according to the needs of the learner) was rated as the most important by the VET organisations.
- Integrating informal learning (e.g. peer to peer learning, learning by doing) was considered as placed the most importance by the NGOs and marginalised groups.
- Making adult learning and lifelong learning programs more accessible was seen as more important by Active Communities and Cultural and Creative Industries.
- While Multidisciplinary approach (e.g. establishing links between different disciplines, fields, sectors), was seen as the most important by research and higher education organizations,
- Last but not least, promoting collaboration between academia, industry, and government (e.g. Promoting the inclusion of practitioners as facilitators or teachers in courses), was rated as more important by the Business organisations.

In terms of importance of approaches by different countries,

- Utilising a flexible/modular approach and integrating informal learning in curricula were placed most importance by Italy,
- While adopting learner-centered approach and promoting collaboration between academia, industry and government, seen as most important in Portugal. Overall, this approach has been rated as very important in all countries.
- Meanwhile, making adult learning and LLL programs more accessible was considered the most important in Slovakia.
- Last but not least, adopting a multidisciplinary approach was rated the most important in Germany.

In the case of respondents' expertise in bioeconomy, those that have experience/expertise in any of the bioeconomy fields rated all approaches as more important than those respondent' that do not have any expertise.

Meanwhile, all approaches provided were rated as more important by the age group of 31-40, except from adopting a learner-centered approach, which was considered as more important by the age group of 41-50.

4.2.2 Capacity of educational institutions and infrastructure

Capacity of educational structures refer to the capacity and infrastructure of educational centers (or spaces), which are fully equipped to provide its learners with the aimed skills and competencies. These spaces can be offline or online spaces, or schools or knowledge hubs, or community centers, where learning (formal, informal or non-formal) can take place.

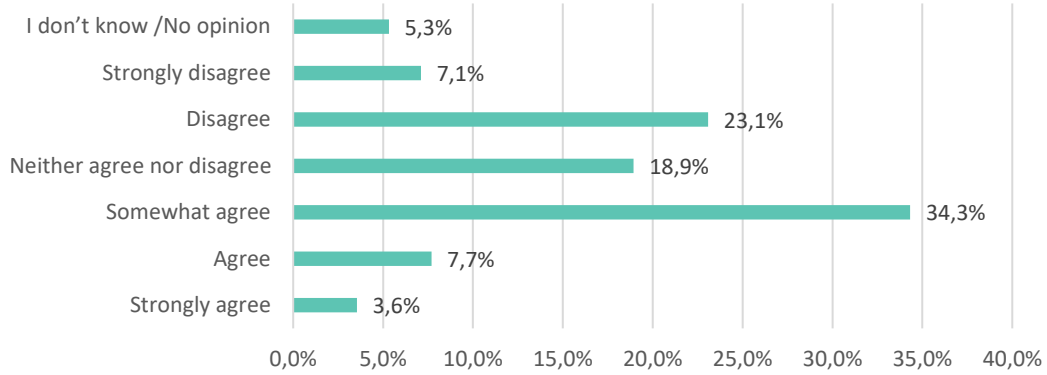
The concept of educational structures is adapted from the BIOBec Project (https://biobec.eu/). BIOBec proposes a holistic framework that merges the traditional idea of an education centre, with that of a knowledge hub, thus bridging the gaps between academic institutions, students, innovation entities and policy makers.

While integration this approach to bioeconomy ET would be crucial, the Questionnaire aimed to explore the perception of respondents on whether there is a sufficient capacity of

educational institutes/centers providing ET activities in the field of bioeconomy in the respondents' regions.

The Figure below shows the distribution of respondents' opinions as a percentage.

Figure 10. Whether there is a sufficient capacity of educational institutes/centers providing educational and training activities in the field of bioeconomy in respondents' own regions



The results reveal that the highest percentage of respondents "somewhat agree" (34.3%) that there is sufficient capacity of educational institutes/centers providing ET activities in the field of bioeconomy, while 30.2% did not agree with the statement (23.1% selected "disagree" and 7.1% strongly disagreed). The percentage of those who either "agreed" or "strongly agreed" is 10.13%. Hence, the results show a mix between different perceptions, more clustered in those that "somewhat agree", showing a need of improvement.

In order to explore better, how these answered differed and according to which criteria, we provide below some differentiations according to the type of stakeholder the respondents are, their country, whether or not they are experienced in bioeconomy, their age and highest education level completed. Below, these results are presented; for detailed calculations and associated tables, please refer to **Annex 3** of the Report.

In terms of different types of stakeholders that took part in the survey,

Those that belong to the NGOs and Marginalised Groups agreed the least with the statement, followed by Citizens and Wider Society, Business Organisations and Policy Makers.

Overall, Research Organisations tend to believe that capacity of research institutes/centers are sufficient in providing ET in the bioeconomy. This group was followed by respondents from VET institutions that agree "slightly" with the statement.

Overall, the respondents tended to agree that there is sufficient capacity of educational institutes/centers in Estonia, Netherlands, Portugal and Germany (in descending order according to the level of agreement). In Czech Republic, Italy, Greece and Slovakia (in descending order), the respondents on average believed that the capacity of educational institutes/centers are not sufficient in providing ET in the bioeconomy.

According to whether or not our respondents have experience in any of the bioeconomy sectors, their age and educational levels, in all groups regardless of their profiles believe that the capacity of institutions/centers are not sufficient (in differing levels).

4.2.3 Capacity of educators

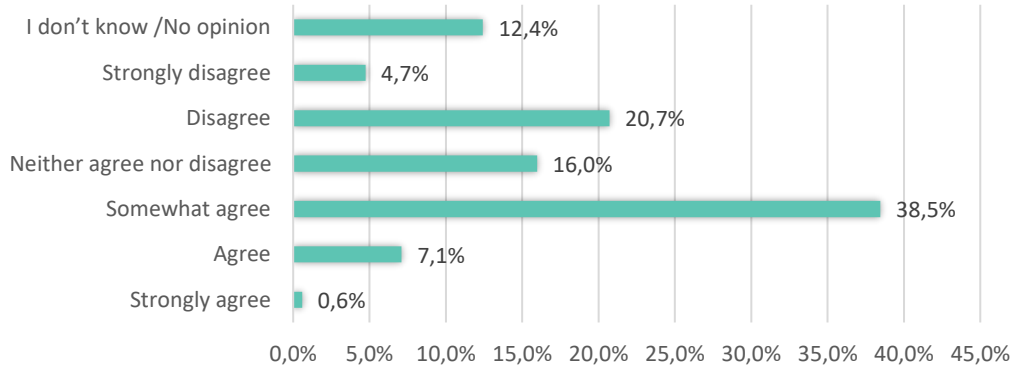
Capacity of educators refer to the capacity (and quality) of teachers, trainers, professors, and educators in the educational and training systems in bioeconomy. This section aims to identify the main issues that need to be addressed in the scope of bioeconomy education and training governance, in order to train teachers and educators that are equipped to train the future professionals of the sector.

The respondents were asked to state to which extent they agree with the statement of

- whether the educators of bioeconomy are provided with sufficient opportunities to continuously update their knowledge and competence regarding bioeconomy,
- and if there is a need to certify trainers/educators to ensure they are aligned with real needs of the bioeconomy sectors.

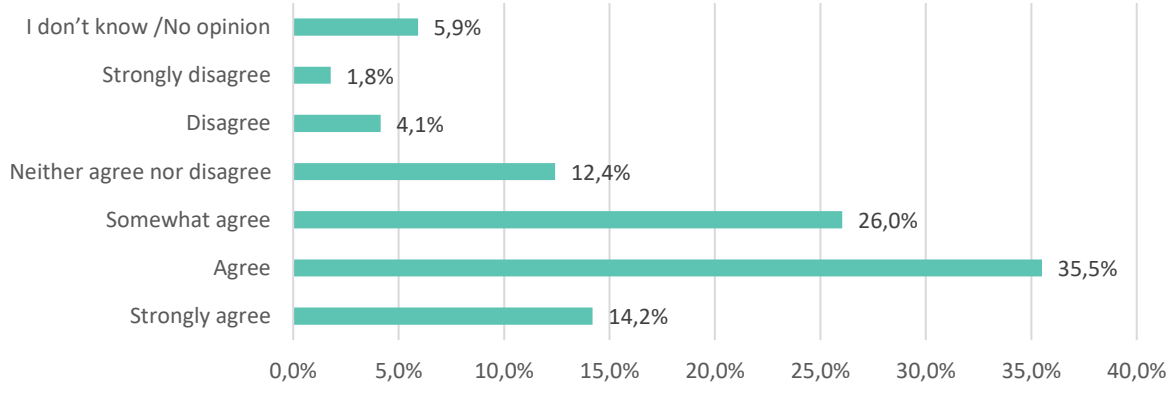
The Figures below (Figure 11 and 12) show the related results.

Figure 11. Whether the educators of bioeconomy are provided with sufficient opportunities to continuously update their knowledge and competence regarding bioeconomy (distribution of different answers as a percentage)



The results reveal that the highest share of respondents (38.5%) "somewhat agree" that the educators in bioeconomy are provided with sufficient opportunities to continuously update their knowledge and competence. This group was followed by those who either "disagreed" (20.7%) or "strongly disagreed" (4.7% with the statement). 7.1% of respondents on the other hand "agreed" with the statement.

Figure 12. Whether there is a need to certify trainers/educators to ensure they are aligned with real needs of the bioeconomy sectors.



Whether to the existence of a need to certify trainers and educators to ensure they are aligned with the real needs of the bioeconomy sectors,

- A large share of the respondents agreed to this need, while the level of agreement changed (14.2% strongly agreed, 35.5% agreed, and 26% somewhat agreed), showing an important need of taking this action (the discussion of the results is carried out in Section 4 of the Report).

In terms of the profiles of the respondents,

- Apart from Business Organisations and Research and Higher Education Organisations, all stakeholder groups believe that the educators in bioeconomy are not provided with sufficient opportunities (to continuously update their knowledge).
- In terms of countries the respondents are based in, those who on average believed that educators are provided with sufficient opportunity are Netherlands, Germany, Estonia, Portugal and Slovakia (in descending order of agreement).
- Czech Republic, Greece and Italy, meanwhile, leaned towards disagreeing with the statement.
- It is also possible to see that the answers are consistent for both the capacity of educational centers and educators across all countries.

According to whether or not respondents have experience in any of the bioeconomy sectors or not,

- both stakeholder groups on average do not believe that educators are provided with sufficient opportunities to stay updated to the real needs of the sector.

According to age group of the respondents,

- the only age groups of 31-40 and above 60 believed to some extent that there are sufficient opportunities for educators to stay updated.

In terms of educational level,

- only those with a master's degree on average agreed with the statement. All other groups were not agreeing that educators are provided with sufficient opportunities.

In terms of the needs to certify educators to ensure they are aligned with the real needs of the bioeconomy sectors,

- all respondents regardless of their age, stakeholder group, whether or not they are experienced in bioeconomy or not agreed with the need to certify trainers/educators.

4.3 Efficiency of Governance in Bioeconomy Education and Training

As suggested by the Governance and Training Framework presented in this study, the "Efficiency of Governance in Bioeconomy Education and Training" Component consists of 1 – Monitoring and evaluation and quality assurance, 2 – Financing, 3 - Regulatory framework and administrative procedures, and 4 - Harmonization of policies and policy coherence.

4.3.1 Monitoring and evaluation and quality assurance

Monitoring and evaluation (ME) are important tools for understanding whether an ET programme is on track and achieving its objectives. By tracking progress and collecting data, the responsible stakeholders can identify issues early and make necessary updates towards achieving the intended teaching and learning outcomes.

In this study, this measure is dedicated to promoting relevant institutions for monitoring and evaluation that are endowed with sufficient capacity, appropriate degree of independence and resources as well as the necessary instruments. Besides, developing reliable monitoring and reporting mechanisms to effectively guide decision-making is of utmost importance.

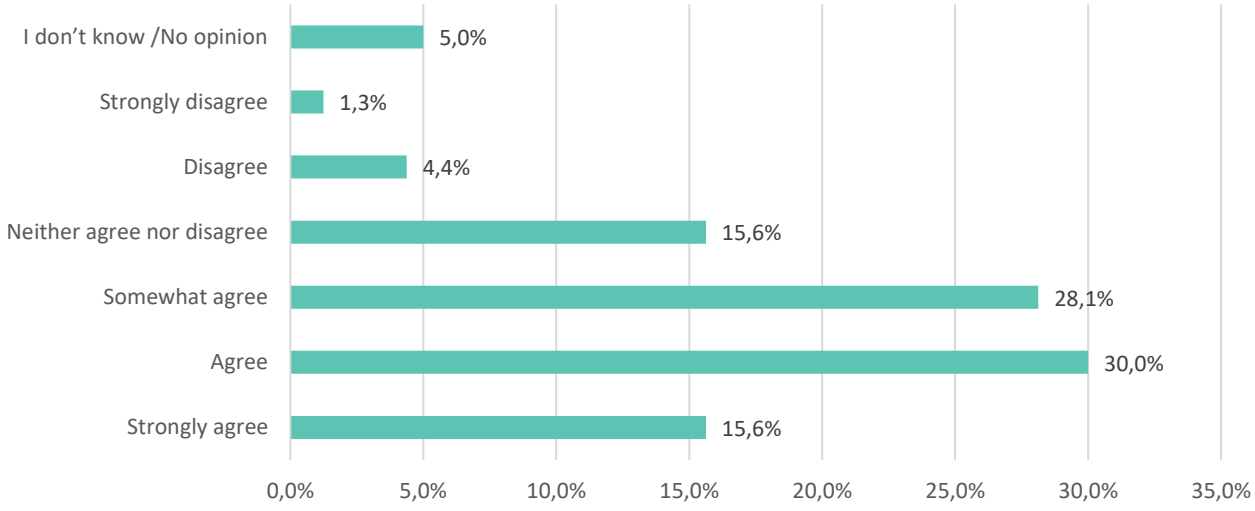
i. The necessity of having a monitoring and evaluation system in bioeconomy; and whether or not there is already an effective system in place.

In the Questionnaire, the respondents were asked to indicate to what extent they agree or disagree with the statements below:

- It is essential to have a monitoring and evaluation system of bioeconomy education and training in place,
- There is an effective monitoring and evaluation system of bioeconomy education and training in place.

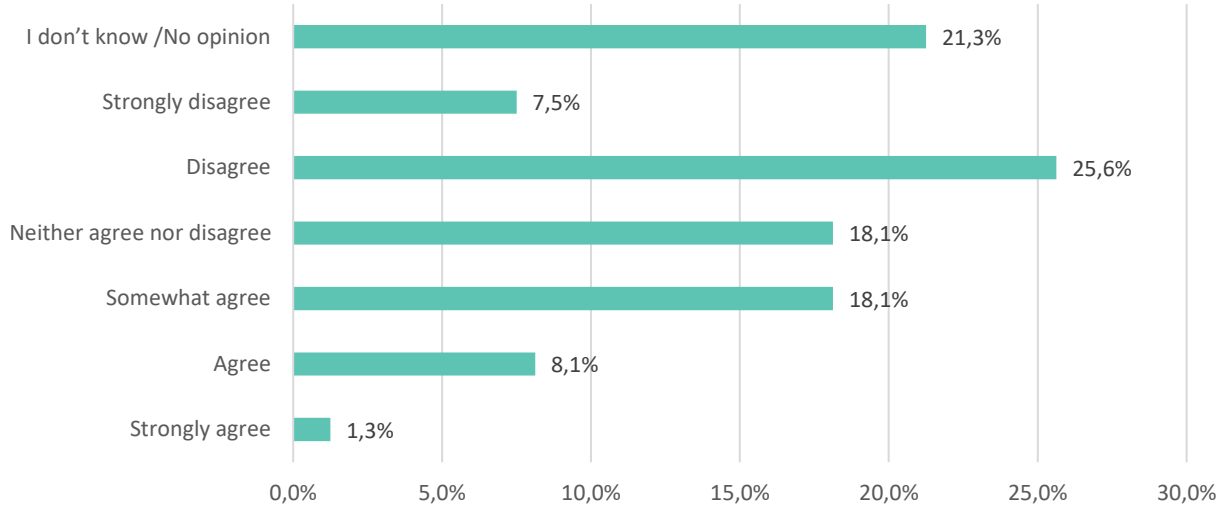
The Figures 13 and 14 below show the distribution of responses (percentage) provided by the respondents:

Figure 13. To what extent the respondents think that it is essential to have a monitoring and evaluation system of bioeconomy ET (Distribution of responses, %)



The results reveal that a major share of the respondents (45.6%) either "agree" or "strongly" agree that it is essential to have a ME system in place in bioeconomy ET, while 28.1% of respondents "somehow agreed" with the statement. Hence, only 5.7% of the respondents disagreed.

Figure 14. To what extent the respondents think that there is already an effective monitoring and evaluation system of bioeconomy ET in place (in their own regions) (Distribution of responses, %)



The results were rather mixed when it comes to the perception of respondents with regard to whether or not they believe that there is already an effective ME system is in place (in their own regions). While, a significant share of respondents did not have an opinion, the share of those that "disagreed" with the statement was noteworthy (a total of 33.1% either "disagreeing" or "strongly disagreeing"). The share of those who agreed, on the other hand, was 27.5% (including all those that "strongly agreed", "agreed" or "somewhat agreed").

Meanwhile, the perception of the respondents regarding the importance of/ and the existence of effective monitoring and evaluation systems in place, were also evaluated to explore if there were differences according to which group of stakeholders the respondents belong.

According to different stakeholder groups:

- All respondents, regardless of which stakeholder group they belong to, gave a quite high rating for both of the statements.
    - This being said, Active Communities, Cultural and Creative Sectors and NGOs and Marginalised Groups were those that found it the most essential to have a ME system of bioeconomy ET in place.
    - Meanwhile, Active Communities, Cultural and Creative Sectors and VET organizations were those that believed the most that there is already an effective ME system of bioeconomy ET in place (in their regions).

According to different countries where respondents are based,

- Respondents from Portugal and Netherlands believed the most that having a ME system is essential (these countries were followed by Italy and Greece, which also had very close and high average relative importance values).
- Meanwhile, the same countries (apart from Greece), namely, Netherlands, Portugal in addition to Italy were those that believed the most that there is an effective EM system in place, while Greece was the country that gave the lowest value to this question (meaning that it is the country that believes the least among other countries, that there is already an effective ME system in place).

In terms of being experienced or not in bioeconomy,

- Those respondents that are not experienced in bioeconomy believed more in the necessity of having a ME system in place, and also that there is already an effective ME system in place, in their regions/countries.

According to age groups,

- Respondents between the ages of 41-50 believed the most in the essentiality of a ME system,
- While those that are below 30 believed the most that there is already an effective ME system in place in their regions.

Finally,

- Those that have a bachelor's degree were the ones that believed more in the essentiality of a ME system, as well as that there is already an effective ME system in place, in their regions.

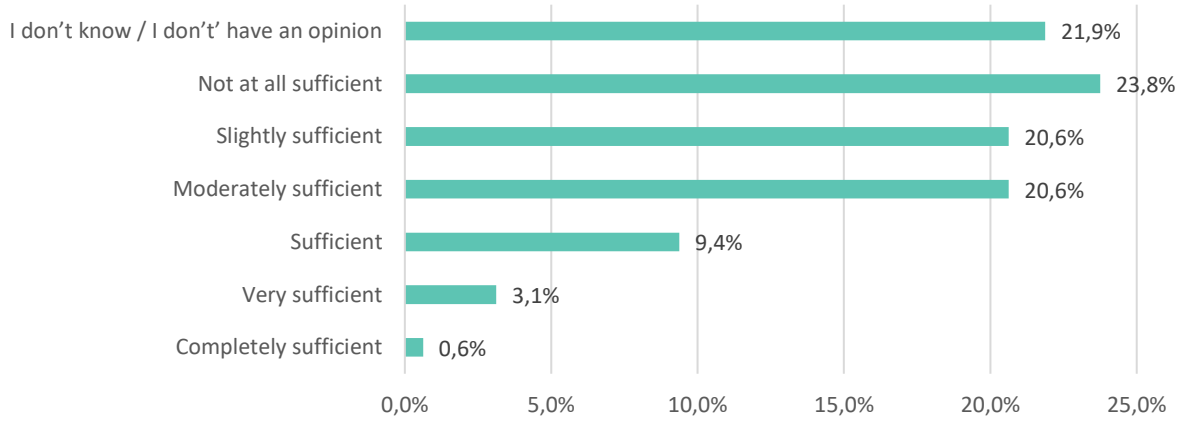
4.3.2 Financing

This component refers to ensuring that governance arrangements help mobilise financing for the bioeconomy education and training systems, and allocate financial resources in an efficient, transparent, and timely manner.

i. How sufficient are funding opportunities?

In this regard, the respondents were asked to indicate how sufficient in their opinion is funding opportunities of bioeconomy ET in their region. The below Figure shows the distribution of responses (percentage) according to how respondents rate the sufficiency of funding opportunities.

Figure 15. To what extent the respondents believe that the funding opportunities of bioeconomy ET are sufficient (Distribution of responses, %)



In terms of exploring the results according to different stakeholder groups, different countries, or other aspects,

- It is possible to say that all respondents regardless of the group they belong to had low average ratings in terms of sufficiency of funding opportunities of bioeconomy ET in their region.

- However, if we were to have a look at those groups separately, we can say that Policy Makers, those respondents from Netherlands, those that do not have expertise in bioeconomy, and those between the ages of 41-50, on average, gave the higher ratings in terms of sufficiency of funding opportunities.

4.3.3 Regulatory framework and administrative procedures

This topic refers to ensuring that sound educational regulatory frameworks are effectively implemented and enforced in a transparent and accountable way. Promoting innovative ways to co-operate, to pool resources and capacity, to build synergies across sectors and ministries, municipalities for efficient implementation of the necessary regulatory frameworks. This involves also i) simplifying the bureaucratic process to allow for a better interaction between educational institutes and experts; and ii) putting in place an accreditation system and a unified certification scheme (across Europe) to ensure the provision of qualified education and training. It also includes, balancing short-term priorities with long-term perspectives in educational policy-making – creating, sharing and consolidating a system vision, adapting to changing contexts and new knowledge.

i. Which topics are the most important/needed with regard to the regulatory framework of bioeconomy ET?

The respondents were asked to rate the importance of some selected topics regarding the regulatory framework of bioeconomy ET in their own regions. The topics that were proposed to them were as follows:

- Ensure transparency and accountability in administrative procedures,
- Simplify administrative procedures and burden,
- Improve privacy regulations,
- Balance short-term priorities with long-term perspectives in bioeconomy education and training,
- To incentivize (e.g. through tax benefits) innovative and sustainable education and training systems in bioeconomy,
- To put in place mechanisms/programs to raise awareness about the bioeconomy education and training,
- To put in place a sufficient accreditation system for bioeconomy education and training.

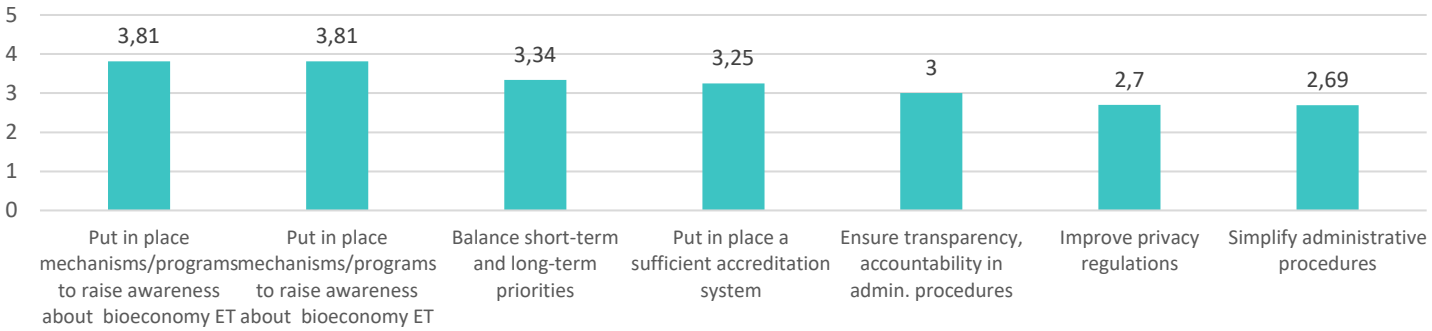
The Table 5 below shows the distribution of responses by the respondents as a percentage of answers for each of the different topics.

Table 5. How do the respondents rate the importance of some topics with regard to the regulatory framework of bioeconomy ET (Distribution of responses, %)

	Ensure transparency and accountability in administrative procedures	Simplify administrative procedures and burden	Improve privacy regulations	Balance short-term priorities with long-term perspectives in bioeconomy education and training	To incentivize (e.g. through tax benefits) innovative and sustainable education and training systems in bioeconomy	To put in place mechanisms/programs to raise awareness about the bioeconomy education and training	To put in place a sufficient accreditation system for bioeconomy education and training
I don't know/No opinion	11.90%	4.40%	7.50%	5.00%	4.40%	0.60%	4.40%
Not at all important	0.00%	0.00%	2.50%	1.30%	1.30%	0.00%	1.30%
Slightly important	5.00%	31.30%	10.00%	3.10%	2.50%	1.90%	3.80%
Moderately important	8.10%	8.80%	14.40%	8.80%	8.80%	6.30%	12.50%
Important	35.00%	28.80%	36.90%	30.60%	29.40%	26.30%	33.10%
Very important	26.30%	0.00%	20.00%	33.10%	28.80%	37.50%	26.90%
Absolutely essential	13.80%	26.90%	8.80%	18.10%	25.00%	27.50%	18.10%

The results reveal that all topics are rated high by the respondents, as it was mostly rated as "important", "very important" or "absolutely essential" by the respondents. However, in order to explore better which ones are actually placed more importance by the respondents, the responses collected were used to create a relative importance Index (for the details of the Index, please refer to **Annex 3** of this Report). The Figure below, hence, shows the Mean Index Values calculated for each of the ET types in a descending order, showing, which of these types are rated as the most important or needed by the respondents.

Figure 16. The calculated relative importance according to which topics with regard to the regulatory framework of bioeconomy ET are rated as the most important/needed by the respondents.



The results reveal that the topic that was seen as the most important was to "put in place mechanisms/programs to raise awareness about bioeconomy", followed by "incentivizing

innovation and sustainable ET (through e.g. tax incentives), and "balancing short-term priorities with long-term perspectives in bioeconomy ET".

According to different stakeholder groups:

- "Ensuring transparency and accountability in administrative procedures" and "Simplifying administrative procedures" was the most important topic for Active Communities, Cultural and Creative Sectors, and Research and Higher Education Organizations,
- "Improving policy regulations" and "Balancing short- and long-term priorities" were rated the most important by also Active Communities, Cultural and Creative sectors.
- "Incentivizing (e.g. through tax benefits) innovative and sustainable ET systems" was rated as the most important by NGOs and marginalised groups.
- Finally, "putting in place mechanisms/programs to raise awareness about the bioeconomy ET" was considered as the most important by Research and higher education organizations and policy makers.

In terms of importance place by different countries,

- Italy was the country which rated all topics as the most important in comparison to other countries, except from "improving privacy regulations".
- Meanwhile, Greece and Portugal were the other two countries which rated most of these topics as the most important, compared to the other countries (for more details with regard to country specific aspects, please refer to Country Profiles in Section 7 of this report).

In terms of having expertise in any of the bioeconomy sectors,

- Those respondents that stated to have experience in bioeconomy, rated "simplifying administrative procedures" as the most important topic,
- While for those that do not have expertise in bioeconomy, "to put in place mechanisms/programs to raise awareness about bioeconomy ET" was rated as the highest.

In terms of age groups,

- "Putting in place mechanisms/programs to raise awareness about the bioeconomy ET" received the higher rating from each of the age groups, except for over 60, who instead rated "balancing short-term and long-term priorities and perspectives" as the highest.

In terms of highest level of studies completed,

- Bachelor's degree holders considered "simplifying administrative procedures and burden" as the most important, while for the PhD and master holders, "putting in place mechanisms/programs to raise awareness about bioeconomy ET" was rated as the most important.

4.3.4 Harmonization of policies and policy coherence

This measure refers to ensuring coordination and harmonization of policies/governance mechanisms across education and training in different bioeconomy sectors, across different educational levels, as well as across different regions.

i. Harmonization of policies and policy coherence in bioeconomy education and training

The respondents are asked the extent to which they think certain topics in terms of harmonization of policies and policy coherence (as listed below) was important in bioeconomy ET:

- Harmonize policies/governance mechanisms throughout all educational levels,
- Harmonize governance mechanisms across different regions (and the EU),
- Enhance coordination of policies/governance mechanisms across education and training in different bioeconomy sectors,
- Strengthen the coordination among the member states to harmonize policies in vocational education and life-long learning,
- Set up a unified certification scheme valid through EU for vocational education and life-long learning,
- Put in place a unified accreditation system across different regions (and the EU),
- Put in place a unified integrated qualification framework across different regions (and the EU).

The below Table demonstrates the distribution of answers provided by the respondents (percentage).

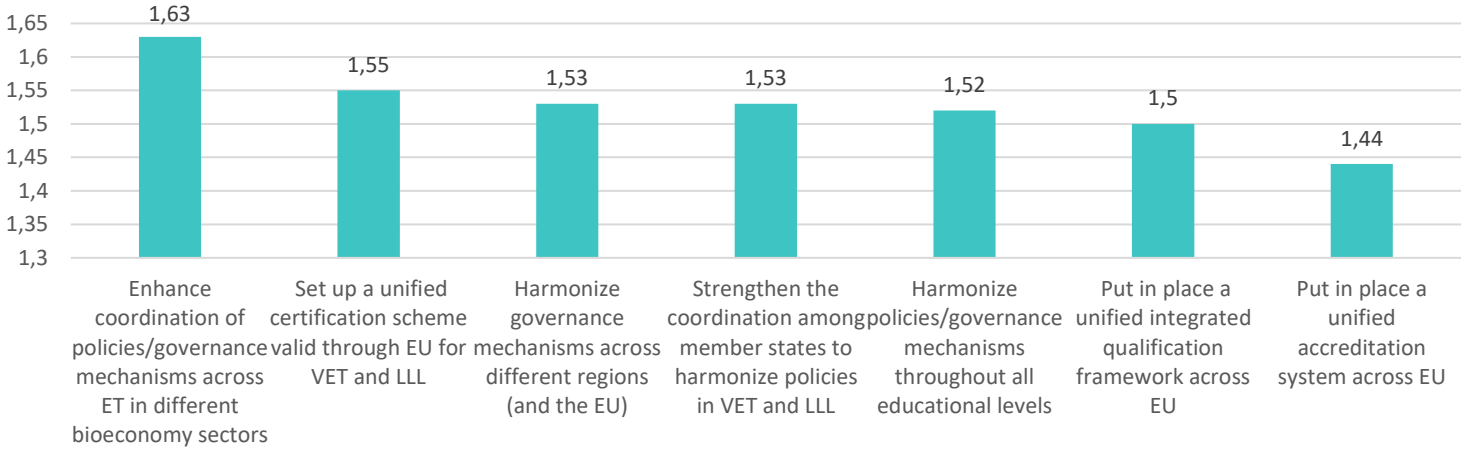
Table 6. To what extent the respondents agree or disagree with the need of taking certain actions in terms of harmonization of policies and policy coherence in bioeconomy ET (Distribution of responses, %)

	Harmonize policies/governance mechanisms throughout all educational levels	Harmonize governance mechanisms across different regions (and the EU)	Enhance coordination of policies/governance mechanisms across education and training in different bioeconomy sectors	Strengthen the coordination among the member states to harmonize policies in vocational education and life-long learning	Set up a unified certification scheme valid through EU for vocational education and life-long learning	Put in place a unified accreditation system across different regions (and the EU)	Put in place a unified integrated qualification framework across different regions (and the EU)
I don't know /No opinion	5.60%	7.50%	6.30%	4.40%	6.30%	6.90%	6.90%
Strongly disagree	1.30%	0.60%	0.00%	1.30%	0.60%	1.30%	1.90%
Disagree	3.10%	1.30%	2.50%	1.90%	3.10%	2.50%	1.90%
Neither agree nor disagree	8.80%	10.60%	6.90%	10.00%	8.10%	10.60%	7.50%
Somewhat agree	20.60%	25.00%	22.50%	24.40%	22.50%	20.00%	21.30%
Agree	40.60%	33.10%	40.60%	38.80%	37.50%	43.10%	44.40%
Strongly agree	20.00%	21.90%	21.30%	19.40%	21.90%	15.60%	16.30%

The results reveal that all topics are rated high by the respondents, as it was mostly rated as "important", "very important" or "absolutely essential" by the respondents. However, to explore better which ones are actually placed more importance by the respondents, the responses collected were used to create a relative importance Index (for the details of the Index, please refer to **Box 1** found in **Annex 3** of this report).

The Figure below on the other hand shows the results of the Relative Importance Mean Index, which also shows the average relative importance placed to each topic by the respondents (Please refer to **Annex 3** of this Report for details).

Figure 17. The calculated relative importance index to explore which actions in terms of harmonization policies and policy coherence are most important/needed in bioeconomy ET.



According to the results,

- Enhancing coordination of policies/governance mechanisms across Et in different bioeconomy sectors was rated as the most important,
- followed by setting up a unified certification scheme valid through the EU for VET and LLL,
- and harmonizing governance mechanisms across different regions.

According to different stakeholder groups:

- Harmonizing policies/governance mechanisms throughout all educational levels was rated as the highest by NGOs and marginalised groups, who also was the group that rated the highest “harmonizing governance mechanisms across different regions” and “enhancing coordination of policies in different bioeconomy sectors”.
- Meanwhile, “strengthening the coordination among member states to harmonize policies in VET and LLL” and “Putting in place a unified integrated qualification framework across EU” was considered the most important VET organizations.
- “Setting up a unified certification scheme valid throughout EU” received the highest rating by Active Communities, Cultural and Creative sectors.

In terms of different countries,

- “Harmonizing policies/governance mechanisms throughout all educational levels”, “harmonizing governance mechanisms across different regions” and “enhancing coordination of policies in different bioeconomy sectors” were those topics that were rated as the most important by Netherlands,
- Meanwhile, “strengthening the coordination among member states to harmonize policies in VET and LLL” was rated as the most important by Greece,
- While “Putting in place a unified integrated qualification framework across EU”, “Setting up a unified certification scheme valid throughout EU” and “Putting in place a unified accreditation system across different regions (and the EU)” were rated as the most important by Portugal.

According to those who are experienced in bioeconomy, enhancing coordination of policies and governance mechanisms across different regions was considered as the most important.

The age groups of 31-40, 51-60 and 60 and above regarded “enhancing coordination of policies and governance mechanisms across different bioeconomy sectors” as the most important. Those that are below 30 and between 41-50 valued “setting a unified certification scheme valid through EU” the most.

In terms of highest level of studies completed,

- Respondents with a bachelor’s degree opted for “harmonizing governance mechanisms across different regions,
- Those with a master’s degree valued the most, “putting in place a unified integrated qualification framework across different regions”,
- And those with a PhD degree considered “enhancing coordination of policies across different bioeconomy sectors” as the most important.

4.4 Collaboration and Partnership vs. in Bioeconomy Education and Training

As suggested by the Governance and Training Framework presented in this study, “Collaboration and Partnerships in Bioeconomy ET” Component consists of 1 - Partnership and multi-stakeholder collaborations, 2 – Multi-stakeholder decision and curriculum-making, 3 - Social inclusion, inclusion of marginalised groups, and 4 - Connections to art, humanities, creative industries, eco-design and culture.

4.4.1 Partnerships and Multi-stakeholder collaborations

This component refers to establishing partnerships and multi-stakeholder collaborations for governance of bioeconomy ET systems. More specifically, these partnerships and collaborations include, spreading and improving university collaborations with industry, NGOs, local communities, bio-based sector professionals; enhancing international cooperation; financing international exchanges between universities; incentivizing joint lessons of classes from different countries; and enhancing Private-Public partnerships.

- Facilitating the exchange of good practices of bioeconomy education between different regions,
- Strengthening the collaboration of educational institutions and other organisations/entities (e.g. industry, NGOs) (through joint projects or joint activities, e.g. scholarships, internships, guess lectures, thesis),
- Strengthening the collaboration between education and training providers (e.g. collaborations between University departments),
- Establishing bridges between different levels of bioeconomy education (e.g. University and life-long learning),
- Supporting educational institutions to pursue international cooperation (e.g. international exchanges between universities or joint classes of different countries),
- Enhancing public-private partnerships for bioeconomy education and training
- Promotion of public dialogues to increase the understanding of bioeconomy (and bioeconomy education),
- Putting in place necessary feedback mechanisms that allow stakeholders to voice their needs and opinions,

- Setting platforms (e.g. permanent table) with diverse stakeholders to allow multi-stakeholder discussions.

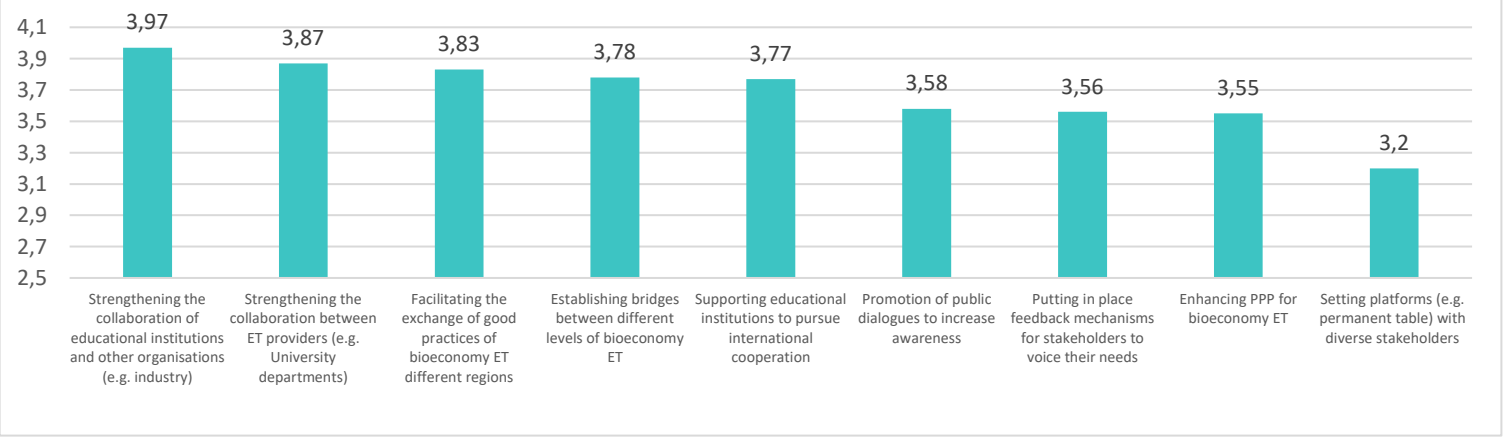
The Table 7 below shows the distribution of answers by the respondents as a percentage.

Table 7. How do the respondents rate the importance of some topics with regard to partnerships or multi-stakeholder collaborations of bioeconomy ET (Distribution of responses, %)

	Facilitating the exchange of good practices of bioeconomy ET between different regions	Strengthening the collaboration of educational institutions and other organisation	Strengthening the collaboration between ET providers	Establishing bridges between different levels of bioeconomy education	Supporting educational institutions to pursue international cooperation	Enhancing public-private partnerships	Promotion of public dialogues to increase the understanding of bioeconomy	Putting in place necessary feedback mechanisms that allow stakeholders to voice their needs and opinions	Setting platforms (e.g. permanent table) with diverse stakeholders
I don't know/No opinion	0.00%	0.00%	0.60%	1.90%	1.30%	3.90%	2.60%	4.50%	3.90%
Not at all important	0.00%	1.90%	0.60%	1.30%	0.00%	1.90%	1.90%	0.00%	3.20%
Slightly important	3.90%	0.60%	1.30%	1.90%	3.90%	3.20%	1.90%	1.90%	3.20%
Moderately important	4.50%	3.20%	6.50%	5.20%	5.80%	5.80%	7.10%	8.40%	13.60%
Important	26.00%	22.10%	21.40%	22.10%	21.40%	29.20%	27.30%	28.60%	31.20%
Very important	35.70%	35.10%	38.30%	37.00%	40.90%	25.30%	33.80%	31.20%	24.70%
Absolutely essential	29.90%	37.00%	31.20%	30.50%	26.60%	30.50%	25.30%	25.30%	20.10%

The Figure below on the other hand shows the Mean Index Values calculated for each of the ET types in a descending order, showing, which of these types are rated as the most important or needed by the respondents (For details please refer to **Annex 3** of this Report).

Figure 18. The calculated relative importance according to which topics with regard to partnerships or multi-stakeholder collaborations of bioeconomy ET



The results suggest that the topic that was considered as the most important by the respondents was,

- Strengthening the collaboration of educational institutions and organizations,
- Followed by strengthening the collaboration between ET providers and facilitating the exchange of good practices of bioeconomy ET in different regions.

According to different stakeholder groups;

All topics were rated as the most important by respondents from Active Communities, Cultural and Creative Sectors, except from “Strengthening the collaboration of education institutions and other organizations/entitles (e.g. Industry, NGOs)”, which was considered as the most important by NGOs and Marginalized groups; and “Supporting educational institutions pursue international cooperation”, which was considered as the most important by Business Organizations.

According to the country in which the respondents are based,

- Four of the topics were received the highest importance rating by Portugal, namely,
  - “Facilitating the exchange of good practices of bioeconomy education between different regions,
  - Strengthening the collaboration of educational institutions and other organisations/entities (e.g. industry, NGOs) (through joint projects or joint activities, e.g. scholarships, internships, guess lectures, thesis),
  - Establishing bridges between different levels of bioeconomy education (e.g. University and life-long learning),
  - Setting platforms (e.g. permanent table) with diverse stakeholders to allow multi-stakeholder discussions.
- Enhancing public-private partnerships for bioeconomy education and training was considered as the most important by Slovakia,
- While promotion of public dialogues to increase the understanding of bioeconomy (and bioeconomy education) was rated the most by Greece.
- Meanwhile all remaining topics were the most important for Italy, namely:
  - Strengthening the collaboration between education and training providers (e.g. collaborations between University departments),
  - Supporting educational institutions to pursue international cooperation (e.g. international exchanges between universities or joint classes of different countries),
  - Putting in place necessary feedback mechanisms that allow stakeholders to voice their needs and opinions.

Meanwhile, all topics were considered to be more important by those respondents who are experienced in any of the bioeconomy topics; and who are between the ages of 31-40.

4.4.2 Multi-stakeholder decision and curriculum-making

This measure refers to stakeholder engagement for informed and outcome-oriented contributions to educational policy design and implementation. In this regard, collaboration among actors and integrating entrepreneurs, local communities, students and bioeconomy professionals in decision-making mechanisms in the education and training system is key.

In this regard, the respondents were asked to,

1 - rate the importance of integrating below-listed stakeholders in decision-making, curriculum making in bioeconomy education and training in their region,

2 – and then to name same other stakeholders, who in their opinion should be integrated into these processes.

The Table below shows the distribution of responses.

Table 8. How do the respondents rate the importance of integrating some stakeholders into decision and curriculum-making processes (Distribution of responses, %)

	Entrepreneurs	Local communities/wider society	Vocational education and training and Life-long learners	Bioeconomy professionals/workers of bioeconomy sectors	Professionals in cultural and creative industries
I don't know/No opinion	1.30%	1.30%	1.90%	0.60%	3.20%
Not at all important	2.60%	0.00%	0.00%	0.00%	3.20%
Slightly important	3.20%	5.20%	3.20%	1.90%	6.50%
Moderately important	14.30%	13.00%	12.30%	4.50%	22.10%
Important	16.20%	27.90%	29.20%	18.80%	23.40%
Very important	32.50%	26.00%	29.90%	22.10%	23.40%
Absolutely essential	29.90%	26.60%	19.50%	51.90%	18.20%

The results reveal that the stakeholder group of "bioeconomy professional/workers of bioeconomy sectors" received the highest share of responses pointing to being "absolutely essential". However, in order to see the order of importance for all stakeholders, the responses collected were used to create a relative importance Index (for the details of the Index, please refer to Box 1 found in **Annex 3** of this Report).

The Figure below, on the other hand, shows the Mean index values in the order of importance.

Figure 19. The calculated importance index to explore how the respondents rate the importance of integrating some stakeholders into decision and curriculum-making processes.

The results reveal that the stakeholder group that is regarded as the most important to be integrated into decision and curriculum-making processes is Bioeconomy professionals and

workers of bioeconomy sectors, followed by entrepreneurs and local communities and the wider society.

Below the results are presented according to different profiles of the respondents:

In terms of the stakeholder group that the respondent belongs,

- "Integrating entrepreneurs into decision making and curriculum-making processes" was rated as the highest by policy makers and administrations, followed by research and higher education organizations,
- "Local communities and wider society" and "VET and Lifelong Learners" were rated as the most important group to be integrated into the decision-making processes, by the NGOs and marginalised groups.
- Business organisations, on the other hand, regarded "bioeconomy professionals and workers" as the most important stakeholder group to be integrated,
- And finally, respondents coming from active Communities and Cultural and Creative Industries rated "professionals in culture and creative industries" as the most important stakeholder group to be integrated.

In terms of different countries,

- Italy was the country that placed the highest importance to all stakeholders proposed in the questionnaire, apart from entrepreneurs, which was rated as the highest by Germany.

Meanwhile, those respondents that have expertise in any of the bioeconomy sectors rated integration of all proposed stakeholders, higher than those respondents that do not have expertise in bioeconomy.

In terms of age groups,

- Integration of local communities and the wider society was regarded as the most important by those respondents below 30,
- Integration of professional in cultural and creative industries was rated the highest by those between the ages of 41 and 50.
- While all the remaining stakeholder groups were rated the highest by those over 60.

In terms of the highest educational studies completed, those with a PhD degree gave the highest ratings to all stakeholders, apart from bioeconomy professionals of the bioeconomy sectors, which was rated the highest by those respondents with a secondary education/high school degree.

4.4.3 Social inclusion and inclusion of marginalised groups

This measure aims to make sure that minorities and underprivileged groups are included in the governance mechanisms of bioeconomy education and training. In other words, the necessary mechanisms need to be put in place to continuously evaluate and monitor the inclusion and the impact created on the targeted stakeholders (in the scope of the BioGov.net project, marginalised groups); hence, this component of the governance framework carries key importance.

In the questionnaire, the respondents were asked to rate the importance of the below statements with regard to the inclusion of marginalized groups in bioeconomy ET:

- Increasing the inclusion of marginalized groups in bioeconomy education and training and,
- Prioritising the needs and voice of marginalized groups when making strategic decisions (e.g. curriculum making, policy making).

The Figure 20 and 21 below show the distribution of responses by the respondents.

Figure 20. How do the respondents rate the importance of increasing the inclusion of marginalized groups in bioeconomy education and training (Distribution of responses, %)

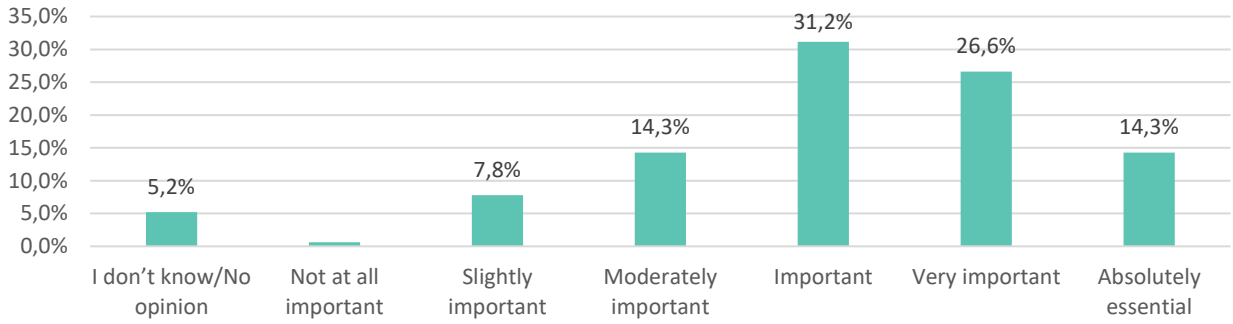
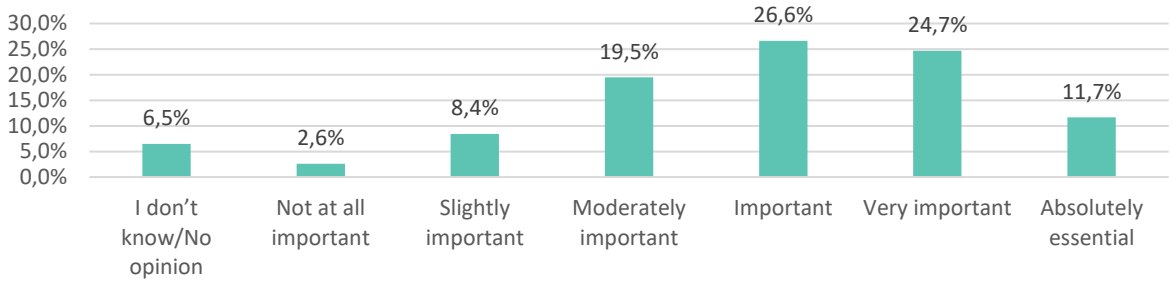


Figure 21. How do the respondents rate the importance of prioritising the needs and voice of marginalized groups when making strategic decisions (e.g. curriculum making, policy making) (Distribution of responses, %)



When we consider these results according to different profiles of the respondents, it is possible to see that:

- Increasing the inclusion of marginalized groups in bioeconomy ET was rated as the highest by respondents coming from active communities, cultural and creative sectors; by respondents from Italy; by respondents who have expertise in bioeconomy; and by those that are between the ages of 31-40.

- While, prioritising the needs and voices of marginalized groups was rated the highest by NGOs and marginalized groups; by those respondents from Italy; by those respondents experienced in bioeconomy; by those who are over the age of 60; and by those respondents who hold a bachelor's degree.

4.4.4 Connections to art, humanities, creative industries, eco-design and culture

This measure addresses the question of how arts, humanities, culture and eco-design approaches and solutions can be integrated into the bioeconomy education governance mechanisms, and which kinds of impacts can this have on the bioeconomy education (training and mentoring).

In this regard, the respondents were asked to rate several statements according to what extent they agree or disagree with them to explore their level of familiarity and interest in establishing links to, and collaborations with cultural and creative industries and the bioeconomy ET. The statements provided were as follows:

- I know of examples/cases where cultural and creative industries offer possibilities for the bioeconomy,
- In the work that I do, there are examples/cases where cultural and creative industries offer possibilities for the bioeconomy,
- I am unaware of the connection between cultural and creative industries and the bioeconomy,
- I would like to learn more about the possible uses of cultural and creative industries for bioeconomy, if it was offered as a course/teaching activity,
- my opinion, establishing links to, and collaborations with cultural and creative industries offer possibilities for the development, innovativeness and sustainability of bioeconomy.

The results with regard to the extent of which respondents agree or disagree with the statements can be seen in the table below:

Table 9. To what extent respondents agree or disagree with the statements below (Distribution of responses, %)

	I know of examples/cases where cultural and creative industries offer possibilities for the bioeconomy	In the work that I do, there are examples/cases where cultural and creative industries offer possibilities for the bioeconomy	I am unaware of the connection between cultural and creative industries and the bioeconomy	I would like to learn more about the possible uses of cultural and creative industries for bioeconomy, if it was offered as a course/teaching activity	In my opinion, establishing links to, and collaborations with cultural and creative industries offer possibilities for the development, innovativeness and sustainability of bioeconomy
I don't know /No opinion	10.40%	11.70%	3.90%	1.90%	3.20%
Strongly disagree	7.80%	9.10%	10.40%	2.60%	0.60%
Disagree	13.60%	19.50%	22.70%	5.20%	5.80%
Neither agree nor disagree	14.30%	7.80%	13.60%	10.40%	14.30%
Somewhat agree	24.00%	24.00%	19.50%	23.40%	19.50%
Agree	22.70%	19.50%	20.80%	42.90%	39.00%
Strongly agree	7.10%	8.40%	9.10%	13.60%	17.50%

The results reveal that while the respondents mainly "somewhat agree" or "agree" with the first three statements, which show the knowledge and familiarity of respondents on this topic; there is also a mix of different levels of agreement, showing that, although there are some respondents who have an idea about how can cultural and creative industries may offer possibilities for the bioeconomy and some know of examples in the work that they do, there are also respondents who do not have this knowledge.

Meanwhile the answers to the last two statements reveal that a majority of the respondents have a high willingness and interest in learning more about the possible uses of cultural and creative industries for the bioeconomy (if it was offered by a course or teaching activity); and they also largely believe in the value of establishing this link between cultural and creative industries and the bioeconomy.

In order to explore in detail which topics are actually placed more importance by the different profiles of the respondents, the responses collected were used to create a relative importance Index (for the details of the Index, please refer to **Annex 3** of the Report).

According to the results, in terms of different stakeholder groups that the respondents belong to:

- NGOs and marginalised groups were those who agree the most with each of the statements (except for being unaware of the connection between cultural and creative industries and the bioeconomy), meaning that this respondent group stated to have the highest familiarity with the topic in question and also the highest willingness to learn more about the topic.

In terms of respondents from different countries,

- Those from Netherlands agreed the most with the statement of knowing of examples offering possibilities for the bioeconomy, while it was those respondents from Italy who agreed the most with the last two statements, pointing to the highest level of interest to learn the topic and believing in the value of cultural and creative industries offering possibilities for the bioeconomy (The results according to each of the countries will be further discussed in the Section 7 – Country Profiles, of this report).

5 Discussion of Results

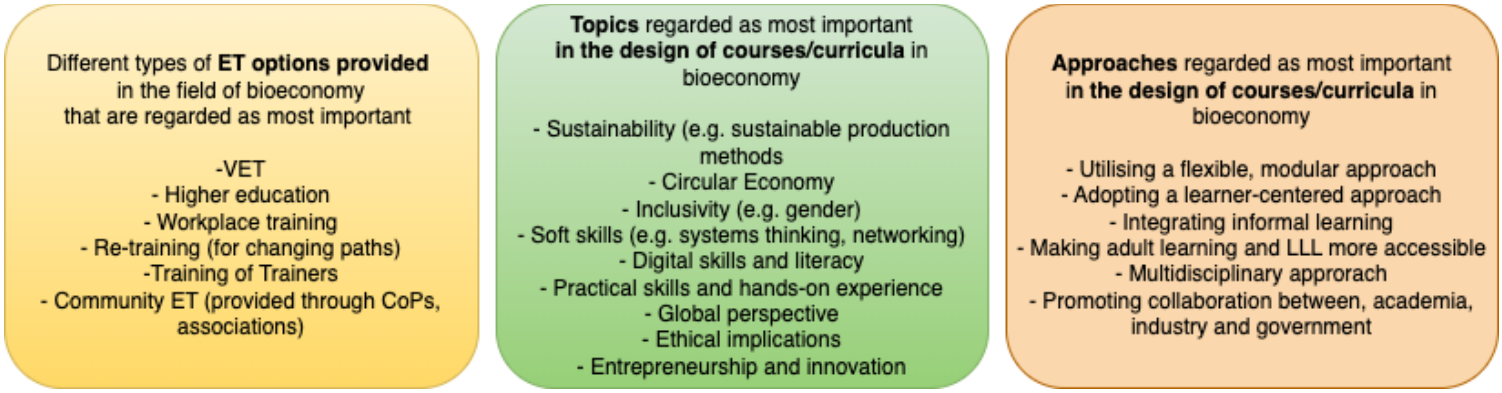
5.1 Component I: Effectiveness of Governance in Bioeconomy Education and Training

As suggested by the Governance and Training Framework presented in this study, the "Effectiveness of Governance in Bioeconomy Education and Training" was explored through 3 different headings.

- Capacity of educational content teaching/learning approach,
- Capacity of educational institutions and infrastructure, and
- Capacity of educators.

Meanwhile, each of these three headings were measured through different indicators:

- **The capacity of ET content and teaching/learning approaches** include all aspect related to designing new and up-to-date curricula, considering multidisciplinary approaches and emerging trends. Hence, it is of utmost importance to adopt innovative learning approaches. The measures through which the Capacity of educational Content was explored can be seen below:



- **Capacity of educational structures** refers to the capacity and infrastructure of educational centers (or spaces), which are fully equipped to provide its learners with the aimed skills and competencies. These spaces can be offline or online spaces, or schools or knowledge hubs, or community centers, where learning (formal, informal or non-formal) can take place.

This aspect was analysed through the measure below:

- **Capacity of educators** refer to the capacity (and quality) of teachers, trainers, professors, and educators in the educational and training systems in bioeconomy that are equipped to train the future professionals of the sector.

The capacity of educators was explored through the following aspects:

Respondents' perception on the extent of which
There are **sufficient opportunities provided to educators, in continuously updating their knowledge/approaches**

Respondents' perception on the extent of which
There is a necessity of educators to be certified, to ensure they are aligned with the needs of the bioeconomy sectors

The below section will explore each of the indicators and measures under its relevant heading, namely Capacity of Educational Content, Capacity of educational institutes/centers and Capacity of educators. First, the key results will be summarized, and then the results will be discussed.

5.1.1 Capacity of Educational Content:

i. Which are the most needed/most important ET levels provided in the field of bioeconomy?

The Results revealed that,

In terms of **different educational levels**, overall
- **VET is seen as the most important/needed** in bioeconomy ET,
- followed by re-training (teaching new skills to change paths later in life or career),
- and community education and training, provided through associations, or communities such as the COPs.

As an educational level, **VET** being perceived by the respondents as the most important and needed in the field of bioeconomy is not a surprise. In fact, VET is perceived by the EC as a **key element for "sustainable competitiveness, social fairness and resilience"** (EC, 2020). The importance of this level of education is also further confirmed by numerous official documents (European Council, 2020; Osnabrück Declaration 2020), the financial instruments (Erasmus+ programme, European Social Fund – ESF) and specific agencies (European Centre for the Development of Vocational Training – CEDEFOP, European Training Foundation – ETF) that support the Vocational Education in Europe. Indeed, the flexibility of Vocational Education is seen as the right tool to respond to the rapid changes of our society and the business environment. While it can also be solution to minimize the number of NEETs (Not in Education, Employment, or Training People) in Europe.

The importance placed to Re-Training, on the other hand points to the need of flexibility in ET and in the work life and careers in general. As our world is changing, so is the need to have more flexible careers and competencies, which can also adapt to the needs of the society in a more dynamic way.

Finally, the Community ET through CoPs and associations, being on the third place demonstrates that new and alternative approaches to ET are needed in the field of bioeconomy, where ET needs to be diversified and the experience and knowledge acquisition through networks, communities and like-minded people, through non-formal and informal learning, should be supported further. This can also be a key step in balancing theory and practice in ET in bioeconomy, which is crucial in addressing the needs of the sector.

While, these were the overall results, the importance placed to different ET levels, however, differed according to respondents with different profiles (Please refer to **Annex 3** of this Report

for details). The results reveal that different stakeholder groups have different priorities in improving the ET system in bioeconomy. In this regard, VET has been seen as the main focus (of improvement) by the Research and higher education (HE) organizations. Meanwhile, Workplace training and Training of Trainers were placed the most importance by VET organizations. This can mean that those that are working in VET organizations are in need of more ET directed to providing quality and up-to-date education, but also to focus on these levels from an effective governance point of view.

The fact that Re-training was seen as most important by NGOs and marginalised groups show the need of acquiring expertise later in life, or later in the career, and the need to change paths in an everchanging World and society.

Last but not least, it is promising to see that Policy Makers are seeing the importance of learning through Communities for bioeconomy.

In terms of different places of origin, it is not surprising for different countries to have different priorities in terms of different ET levels. The differences re-iterate the importance of providing placed-based and tailor-made solutions and focusing on these needs and priorities in different parts of Europe, while working across EU to improve all of these levels simultaneously.

ii. Which are the most needed/most important topics in terms of designing new courses and curricula in bioeconomy ET?

The results reveal that,

In terms of **topics to be integrated in the bioeconomy courses and curricula**, overall, the topics that are regarded as the most important to be integrated into the bioeconomy courses and curricula are (in the order of importance, from the most important to less important):

- **Sustainability** (e.g. sustainable production methods, responsible use of resources, environmental/social impact assessments),
- **Circular Economy,**
- **Entrepreneurial skills and promote a culture of innovation**,
- and **soft skills** (e.g. communication, networking, systems thinking, critical thinking, management).

Overall, within all of these important and necessary topics to be integrated into the curricula and courses, Sustainability and Circular Economy were seen as the most important. This result is not at all surprising as Sustainability and Circular Economy can be seen as the key topics in the area of bioeconomy, where without a sufficient knowledge in these topics, it is hard to comprehend the sector as a whole. Besides, without this crucial knowledge, teaching learners in other topics may not succeed in providing a holistic picture of the needs, challenges and opportunities of the sector. Furthermore, in order to make the Sustainability Transition that is much needed in the bioeconomy sector (and overall, in all sectors), the topic of Sustainability needs to be integrated in the ET programmes, across all ET levels, and starting with early ages. Furthermore, sustainability competencies should also be promoted as items that workplaces demand from candidates which will also drive the change and transition of skills acquired in the sector.

In terms of specific results according to the different profiles of respondents (e.g. age, country, stakeholder group), the answers with regard to Sustainability being the most important topic to integrate into the ET system, remained unchanged. Respondents of all stakeholder groups, all countries and regardless of whether they have expertise in bioeconomy or not selected Sustainability as the most important topic. However, the importance level placed to the topics differed with the age group of the respondents and the highest level of studies they completed. Sustainability was seen as the most important topic by the young respondents (Below 30) and those with Bachelor's, Master's and PhD degree holders. These results confirm the importance of Sustainability as a topic, which is demanded by the young professionals of the sector and those that acquired knowledge through different formal educational paths.

Apart from the Topic of Sustainability (and Circular Economy), it was seen that each of the other topics proposed to the respondents were rated differently across different countries (These will be discussed further in Section 7 of the Report, which is providing detailed information on country profiles).

iii. Which are the approaches most needed/most important to be utilized in designing new courses and curricula in bioeconomy ET?

The results reveal that,

The approach that is seen as the most important (and needed) by the respondents is:

- **promoting collaboration between academia, industry and the government**.

This approach is followed by:

- making adult learning and LLL programs more accessible and
- using multidisciplinary approaches in designing courses and curricula.

The results point to the critical importance of networking between academic and non-academic educational institutions, which can also lead to an ET system in bioeconomy that is not only focused on theory, but that can also deliver practical abilities and tools. This can also lead to joint efforts of academia, industry and governments in tackling issues of work placement, engage and interact with the realities of the sector and to provide a broader set of skills and competences, also with an international and global outlook. Meanwhile, the importance placed to "using multidisciplinary approaches in designing courses and curricula" are also consistent with the need to collaborate across different fields.

Moreover, the respondents also believe in the importance of making adult learning and LLL programmes more accessible. In fact, LLL is perceived as one of the most important levels of ET for facing the grand challenges of the future. This argument is in line with the fact that LLL is no longer regarded as a voluntary choice in many sectors, in contrary, it is argued that in our day, only an individual who has learnt how to learn, and who is willing to learn throughout his or her life, will be able survive in the labour market. Therefore, it is crucial to take the necessary steps to make LLL a fundamental human right, and to provide to all individuals who would like to pursue it; and provide more opportunities and options to lifelong learners, in order to make it accessible to all, and to meet the needs of the bioeconomy sectors.

Meanwhile, in terms of different priorities according to different profiles of the respondents, although "promoting collaboration between academia, industry and government" was placed a high level of importance by all stakeholder groups. The fact that Business Organizations

have rated it as the highest shows the willingness of the industry in taking an active part in the efforts in improving the ET system and to align it with the needs of the sector.

5.1.2 Capacity of Educational Institutes/Centers

Capacity of educational structures refer to the capacity and infrastructure of educational centers (or spaces), which are fully equipped to provide its learners with the aimed skills and competencies. These spaces can be offline or online spaces, or schools or knowledge hubs, or community centers, where learning (formal, informal or non-formal) can take place.

The Questionnaire aimed to explore the respondents' perception on whether there is a sufficient capacity of educational institutes/centers providing educational and training activities in the field of bioeconomy.

The results reveal that,

- The highest percentage of respondents "**somewhat agree**" (34.3%) **that there is sufficient capacity of educational institutes/centers** providing ET activities in the field of bioeconomy,
- while 30.2% **did not agree with the statement** (23.1% selected "disagree" and 7.1% strongly disagreed).
- The percentage of those who either **"agreed" or "strongly agreed"** is 10.13%.

Hence, the results show a mix between different perceptions, more clustered in those that "somewhat agree", showing a strong need of improvement.

While the overall results already point to the need of improvement in terms of improving the capacity of educational institutes/centers in providing ET activities in bioeconomy, the results revealed that the level of this need differed according to the stakeholder group and different countries. Those stakeholders that are actually part of the Educational Institutes and Centers (namely, Research and Higher Education Organizations and VET) tended more towards believing that there is a sufficient capacity, while those stakeholders from outside of these institutions saw a bigger need to improve.

The different perceptions and different needs of different stakeholder groups can be key to improve the ET systems, as a multi-stakeholder approach will be key to tackling the challenges of the bioeconomy sectors, which are any way consisting of a wide array of stakeholders.

5.1.3 Capacity of Educators

Capacity of educators refer to the capacity (and quality) of teachers, trainers, professors and educators in the educational and training systems in bioeconomy. The respondents were asked to state to which extent they agree with the statement of

- whether the educators of bioeconomy are provided with sufficient opportunities to continuously update their knowledge and competence regarding bioeconomy,
- and if there is a need to certify trainers/educators to ensure they are aligned with real needs of the bioeconomy sectors.

The results reveal that,

- The highest share of respondents (38.5%) **somewhat agree** that the educators in bioeconomy are provided with sufficient opportunities to continuously update their knowledge and competence.
- This group was followed by those who either **disagreed** (20.7%) or **strongly disagreed** (4.7% with the statement).
- 7.1% of respondents on the other hand **agreed with the statement**.

The results suggest that although there is a share of respondents that believe opportunities provided to educators (to keep up to date) are sufficient, a larger share (more than 25%) does not agree with this statement, while almost 40% of respondents "somewhat" agree, showing to the potential of improvement in this area.

The results are quite consistent with the results of the previous section (on quality of educational centers/institutes), as the results are very similar in these both questions. In other words, those respondents that are not satisfied with the sufficiency of institutes/centers in delivering ET activities, also saw the need of improvement for the opportunities provided to the educators/trainers.

The need of improvement revealed by the results is not surprising, as the success of an ET system is strictly linked to the quality of the teachers themselves. Educators and trainers need to be provided with courses/modules providing new and up-to-date knowledge on a mix of new topics and skills, in addition to new teaching and learning methods.

In terms of differences among stakeholder groups and countries, Business Organizations and Research and Higher Education Organizations tended more towards believing that opportunities provided to educators are sufficient, while all the rest of the stakeholder groups stated that this is not the case. Besides, consistent with the results related to the capacity of educational centers, the same countries (Czech Republic, Italy, Greece and Slovakia) demonstrated a bigger need for improvement in providing more opportunities to educators/trainers, and hence to focus more on Training of Trainers.

With regard to the **existence of a need to certify trainers and educators** to ensure they are aligned with the real needs of the bioeconomy sectors,

- A large share of the respondents agreed to this need, while the level of agreement changed (14.2% strongly agreed, 35.5% agreed, and 26% somewhat agreed), showing an important need of taking this action.

In terms of the need towards certifying trainers and educators, the responses were more unified. On overage, this need was seen across all respondent groups. These results show that while there is a mutual belief of a need to improve the capacity of educators and trainers, certification of skills/competences of educators is seen as (one of the) tools and ways to address this need.

5.2 Component II: Efficiency of Governance in Bioeconomy Education and Training

As suggested by the Governance and Training Framework presented in this study, the "Efficiency of Governance in Bioeconomy Education and Training" Component consists of four parts:

- Monitoring and evaluation and quality assurance,
- Financing,
- Regulatory framework and administrative procedures, and
- Harmonization of policies and policy coherence.

Meanwhile, each of these three headings were measured through different indicators:

- **Monitoring and Evaluation** refers to promoting relevant institutions for monitoring and evaluation that are endowed with sufficient capacity, appropriate degree of independence and resources as well as the necessary instruments. Besides, developing reliable monitoring and reporting mechanisms to effectively guide decision-making is of utmost importance.

The monitoring and evaluation in bioeconomy ET was explored through the following aspects:

How do the respondents rate the necessity of **having a ME system** in bioeconomy ET in place

To what extent respondents believe that there is already an **effective ME system in place** in their own regions

- **Financing options,** on the other hand, refers to ensuring that governance arrangements help mobilise financing for the bioeconomy education and training systems, and allocate financial resources in an efficient, transparent, and timely manner.

This aspect was analysed through the measures below:

To what extent the respondents believe that the **funding opportunities in their region are sufficient**

In which areas according to the respondents **the funding opportunities in bioeconomy ET should be increased**?

- **The capacity of the regulatory framework and administrative procedures,** referred to ensuring that sound educational regulatory frameworks are effectively implemented and enforced in a transparent and accountable way. Promoting innovative ways to co-operate, to pool resources and capacity, to build synergies across sectors and ministries, municipalities for efficient implementation of the necessary regulatory frameworks. This involves also simplifying the bureaucratic process to allow for a better interaction between educational institutes and or experts; and putting in place an accreditation system and integrated qualification framework and a unified certification scheme (across Europe) to ensure the provision of qualified education and training. It also includes, balancing short-term priorities with long-term perspectives in educational policy-making – creating,

sharing and consolidating a system vision, adapting to changing contexts and new knowledge.

This aspect was explored in this study through the following measures:

How the respondents rate the importance of some selected topics with regard to the regulator framework of bioeconomy ET:

- Ensure transparency and accountability in administrative procedures,
- Simplify administrative procedures and burden
- Improve privacy regulations
- Balance short-term priorities with long-term perspectives in bioeconomy ET
- To incentivize (e.g. through tax benefits) innovative and sustainable ET systems in bioeconomy
- To put in place mechanisms/programs to raise awareness about the bioeconomy ET
- To put in place mechanisms/programs to raise awareness about the bioeconomy ET

- Finally, **harmonization of policies and policy coherence**, referred to ensuring coordination and harmonization of policies/governance mechanisms across education and training in different bioeconomy sectors, across different educational levels, as well as across different regions.

This aspect was explored in this study through the following measure:

How do respondents rate the importance of certain topics in terms of harmonization of policies and policy coherence:

- Harmonize policies/governance mechanisms throughout all educational levels
- Harmonize governance mechanisms across different regions (and the EU)
- Enhance coordination of policies/governance mechanisms across education and training in different bioeconomy sectors
- Strengthen the coordination among the member states to harmonize policies in vocational education and life-long learning
- Set up a unified certification scheme valid through EU for vocational education and life-long learning
- Put in place a unified accreditation system across different regions (and the EU)
- Put in place a unified integrated qualification framework across different regions (and the EU)

The below section will explore each of the indicators and measures under its relevant heading. Under each heading, first, the key results will be summarized, and then the discussion of the results will be presented.

5.2.1 Monitoring and evaluation and quality assurance

i. The necessity of having a monitoring and evaluation system in bioeconomy; and whether or not there is already an effective system in place.

The Results revealed that,

A major share of the respondents (45.6%) either "agree" or "strongly" agree that **it is essential to have a ME system in place** in bioeconomy ET, while 28.1% of respondents "somehow agreed" with the statement. Hence, only 5.7% of the respondents disagreed. Meanwhile, the share of those that disagreed that **there is already an effective ME system in place** in their region was 33.1% (those that both "disagreed" or "strongly disagreed". The share of those who agreed, on the other hand, was 27.5% (including all those that "strongly agreed", "agreed" or "somewhat agreed").

While, these were the overall results, the perception of respondents with regard to the importance and the existence of a ME system in place differed according to their profiles. The results reveal that different while the biggest share of respondents believed in the importance of a ME system in bioeconomy, those that believe that there is not yet an effective ME system in their region made up the majority of the answers. These results point to the critical importance of improving these systems across different regions. Especially for those countries that gave the lowest rating to having already effective ME systems in place, namely Germany and Greece, putting in place an effective ME system in bioeconomy ET carries more importance.

Monitoring and Evaluation is a tool that allows to assess if progress is made in achieving expected results, to spot bottlenecks in implementation and to highlight whether there are any unintended effects (positive or negative) from an investment plan, programme or project/plan and its activities. Monitoring and evaluation is critical to the success or failure of any educational program, as each educational system require effective planning and implementation as well as ensuring compliance between expectations and outcomes hence monitoring and evaluation. The importance of this topic, hence, in putting in place an effective and efficient governance mechanism for bioeconomy ET is undeniable.

The stakeholder group that placed the most importance to this topic was Active Communities, Cultural and Creative sectors and NGOs and marginalised groups. This result is meaningful as these are the two stakeholder groups which carry significant importance for the BioGov.net project, in terms of its objective to especially focus on and explore the opportunities for the inclusion of marginalised groups, as well as creating synergies with cultural and creative industries towards creating solutions for the sustainable transition of the bioeconomy.

5.2.2 Financing

Financing refers to ensuring that governance arrangements help mobilise financing for the bioeconomy education and training systems, and allocate financial resources in an efficient, transparent and timely manner.

The respondents were asked how they rate the sufficiency of funding opportunities of bioeconomy ET in their region:

The results reveal that,

- The largest share of the respondents (23.8%) believed that the funding opportunities are "not at all sufficient",
- While a total of 41% find the opportunities "slightly" or "moderately sufficient",
- Only 9.4% of respondents believe that funding opportunities are "sufficient" and 3.1% "very sufficient".

While, these were the overall results, the perception of respondents with regard to how they value the current funding opportunities according to their profiles differed according to their profiles. The results suggest that although there is a share of respondents that believe that the funding opportunities in bioeconomy ET is either "slightly" or "moderately" sufficient, a noteworthy share of the respondents (23.8%) believed that they are "not at all sufficient", while only 12.5% stated that they were either "sufficient" (9.4%) or "very sufficient" (3.1%). In this regard, Netherlands was the country that rated the funding opportunities as the highest among other countries, while Estonia had the lowest ratings by the respondents.

The importance of funding opportunities is critical in the design and provision of new courses and educational programs which are endowed with new and innovative approaches of learning and governance. In addition to the quality of these courses/programs/modules, increasing the accessibility of these courses, making sure it reaches a wide array of stakeholders, including the marginalised groups, is essential. Besides, being able to extend these courses to all members of the society would also require at most times, making these free of charge. Hence, all these aspects need significant amount of funding. Moreover, making bioeconomy ET in general, and its programs, courses and modules attractive to students and learners would also require funding. In short, while all components in this governance framework are of utmost importance, funding opportunities is a component which is closely linked to all other components, as funding is required for all of the components to be operational. Hence, the need of improvement that the results suggest is not surprising, as well as the low average ratings the respondents gave.

In terms of differences among stakeholder groups, respondents that belong to the stakeholder group of NGOs and marginalised groups gave the lowest rating to the sufficiency of funding opportunities, while Policy Makers gave the highest rating. However, it is worthwhile to mention that although there were differences among stakeholder groups, all average ratings by all stakeholder groups were overall quite low, which provides a clear idea about the need to address this issue, and the possibility of tackling this issue by a collaboration of all stakeholder groups involved.

5.2.3 Regulatory framework and administrative procedures

ii. Which topics are the most important/needed with regard to the regulatory framework of bioeconomy ET?

The results reveal that,

The topic that is seen as the most important (and needed) by the respondents is:

- **Putting in place mechanisms/programs to raise awareness about bioeconomy.**

This approach is followed by:

- **Incentivizing innovation and sustainable ET** (through e.g. tax incentives), and
- **Balancing short-term priorities with long-term perspectives** in bioeconomy ET.

While, these were the overall results, the perception of respondents regarding how much they attribute importance to different topics regarding regulatory framework and administrative procedures in ET differed according to their profiles.

The results point to the critical importance of increasing the awareness in bioeconomy ET, which has been repeated many times by the respondents as part of also the open-ended questions, and also during the CoP workshops conducted as part of the WP3 of the project. As raising awareness about bioeconomy ET is one of the most critical issues in both attracting students and learners to this topic, as well as attracting skilled professionals and entrepreneurs to work on the topic, and in order to receive funding from quite a wide range of public and private institutions, putting in place necessary mechanisms to raise the awareness level is of critical importance. Meanwhile, the stakeholder group that gave the highest rating for this topic has been Research and higher education organizations. Given that research and higher education organizations are those organizations that are more likely to have the knowledge, capacity and opportunities to raise the awareness of the society through providing education and research, this can be an area where research and higher education organizations can take the lead in collaborating with all other relevant stakeholders to activate this process.

The results also suggest that overall, the stakeholder groups of Active Communities, Cultural and Creative Industries was among all stakeholder groups to give high ratings for this topic, especially being the stakeholder group that rated the highest the measures of “ensuring transparency and accountability in administrative procedures”, “simplifying these procedures” and” improving privacy regulations”, along with Research and Higher Education Organizations.

This can be a result of these organizations struggling with these procedures and/or that they would like to see improvement in these areas. In fact, slow and complex administrative procedures have been raised as an issue standing in the way of innovative solutions and an innovative transition of the ET system as a whole, by various stakeholders.

5.2.4 Harmonization of policies and policy coherence

ii. Harmonization of policies and policy coherence in bioeconomy education and training

The results reveal that,

The topic that is seen as the most important (and needed) in terms of harmonization and policy coherence in bioeconomy ET by the respondents is:

- **Enhancing coordination of policies/governance mechanisms across EU in different bioeconomy sectors**

This approach is followed by:

- **Setting up a unified certification scheme valid through the EU for VET and LLL,** and
- **Harmonizing governance mechanisms across different regions.**

While these were the overall results, the perception of respondents about how much they attribute importance to different topics regarding harmonizing policies and policy coherence in bioeconomy ET differed according to their profiles.

Harmonization of policies and policy coherence refers to ensuring coordination and harmonization of policies/governance mechanisms across education and training in different bioeconomy sectors, across different educational levels, as well as across different regions, as well as across the EU.

The process of coordination and harmonization of policies in ET is a particularly fundamental step for developing VET throughout Europe. The need is to harmonize within the Member States (e.g., national and regional laws) and among the Member States. Especially the latter is felt crucial to unlock the full potential of VET in the common market of job. In this regard, another policy objective, perceived as urgent, is to enable recognition of diplomas, which can be achieved through a unified certification scheme valid throughout the EU.

As VET has been regarded as the most important educational level by the respondents, it is of utmost importance to focus on this topic for the improvement of VET across Europe. In this regard, the aim should be the harmonization of national laws with European guidelines in terms of VET. Currently, comprehensive policies and validation strategies are lacking in some EU countries, and this leads to the failure of raising professionals that are ready to face the real context requirements in bioeconomy.

5.3 Component III: Partnerships in Bioeconomy Education and Training

As suggested by the Governance and Training Framework presented in this study, "Collaboration and Partnerships in Bioeconomy ET" Component consists of:

- Partnership and multi-stakeholder collaborations,
- Multi-stakeholder decision and curriculum-making,
- Social inclusion, inclusion of marginalised groups, and
- Connections to art, humanities, creative industries, eco-design and culture.

Meanwhile, each of these three headings were measured through different indicators:

- **Partnerships and multi-stakeholder collaborations** refers to establishing partnerships and multi-stakeholder collaborations for governance of bioeconomy education and training systems. More specifically, these partnerships and collaborations include, spreading and improving university collaborations with industry, NGOs, local communities, bio-based sector professionals; enhancing international cooperation; financing international exchanges between universities; incentivizing joint lessons of classes from different countries; and enhancing Private-Public partnerships.

This aspect was explored through the following indicator:

How do respondents rate the importance of certain topics with regard to partnerships and multi-stakeholder collaborations in bioeconomy ET

- Facilitating the exchange of good practices of bioeconomy education between different regions
- Strengthening the collaboration of educational institutions and other organisations/entities (e.g. industry, NGOs) (through joint projects or joint activities, e.g. scholarships, internships, guess lectures, thesis)
- Strengthening the collaboration between ET providers (e.g. collaborations between University departments)
- Establishing bridges between different levels of bioeconomy education (e.g. University and life-long learning)
- Supporting educational institutions to pursue international cooperation
- Enhancing PPP for bioeconomy education and training
- Promotion of public dialogues to increase the understanding of bioeconomy and bioeconomy ET)
- Putting in place necessary feedback mechanisms that allow stakeholders to voice their needs and opinions
- Setting platforms (e.g. permanent table) with diverse stakeholders to allow multi-stakeholder discussions

- **Partnerships and multi-stakeholder collaborations** refers to establishing partnerships and multi-stakeholder collaborations for governance of bioeconomy education and training systems. More specifically, these partnerships and collaborations include, spreading and improving university collaborations with industry, NGOs, local communities, bio-based sector professionals; enhancing international cooperation; financing international exchanges between universities; incentivizing joint lessons of classes from different countries; and enhancing Private-Public partnerships.

- **Multi-stakeholder decision and curriculum-making** refers to stakeholder engagement for informed and outcome-oriented contributions to educational policy design and implementation. In this regard, collaboration among actors and integrating entrepreneurs, local communities, students and bioeconomy professionals in decision-making mechanisms in the education and training system is key.

This aspect was explored through the following indicator:

How do respondents rate the importance of certain topics with regard to partnerships and multi-stakeholder collaborations in bioeconomy ET

Which other stakeholders the respondents named, who in their opinion should be integrated into these processes?

- **Social-inclusion and inclusion of marginalised groups** aims to make sure that minorities and underprivileged groups are included in the governance mechanisms of bioeconomy education and training. In other words, the necessary mechanisms need to be put in place to continuously evaluate and monitor the inclusion and the impact created on the targeted stakeholders (in the scope of the BioGov.net project, minorities and underprivileged groups); hence, this component of the governance framework carries key importance.

This aspect was explored through the following indicator:

How to respondents rate the importance of the below statements with regard to the inclusion of marginalized groups in bioeconomy ET:

- Increasing the inclusion of marginalized groups in bioeconomy education and training and,
- Prioritising the needs and voice of marginalized groups when making strategic decisions (e.g. curriculum making, policy making).

- **Connections to art, humanities, creative industrial, eco-design and culture** addresses the question of how arts, humanities, culture and eco-design approaches and solutions can be integrated into the bioeconomy education governance mechanisms, and which kinds of impacts can this have on the bioeconomy education (training and mentoring).

This aspect was explored through the following indicator:

To what extent respondents agree with the statements below with regard to establishing connections between bioeconomy and connections to art, humanities, creative industries, eco-design and culture?

- I know of examples where cultural and creative industries offer possibilities for the bioeconomy,
- In the work that I do, there are examples/cases where cultural and creative industries offer possibilities for the bioeconomy,
- I am unaware of the connection between cultural and creative industries and the bioeconomy
- I would like to learn more about the possible uses of cultural and creative industries for bioeconomy, if it was offered as a course/teaching activity
- In my opinion, establishing links to, and collaborations with cultural and creative industries offer possibilities for the development, innovativeness and sustainability of bioeconomy.

The below section will explore each of the indicators and measures under its relevant heading. Under each heading, first, the key results will be summarized, and then the discussion of the results will be presented.

5.3.1 Partnerships and multi-stakeholder collaborations

i. The topics are the most important/needed with regard to partnerships and multi-stakeholder collaboration.

The Results revealed that,

The topic that was considered as the most important by the respondents was:

- **Strengthening the collaboration of educational institutions and other organizations.**

This topic was followed by: **strengthening the collaboration between ET providers and facilitating the exchange of good practices of bioeconomy ET** in different regions.

While, these were the overall results, the perception of respondents regarding the importance of partnerships and multi-stakeholder collaboration differed according to their profiles.

The results reveal that according to the respondents, the most important aspect with regard to partnerships and multi-stakeholder collaborations in bioeconomy ET is strengthening the collaboration between educational institutions and other organizations (e.g. Industry, NGOs).

The results and the workshops conducted in the scope of the BioGov.net Project suggest that there is lack of practical knowledge and experiences in educational curricula, and that a theory-oriented approach is failing to deliver practical abilities and tools.

One way to tackle this problem is to establish strong ties between academic and non-academic educational organizations. Hence, collaboration should be adopted by a wide range of actors and institutions, for example between universities and market actors, between ministries and between all actors of the bioeconomy with a network mindset, but also to learn from the experience and good practices. This can be achieved in several ways: a) closer collaboration between educational bodies and industry to balance theory and practice; b) joint efforts to develop work placement and applied projects; c) engage and interact with the outside world; d) broader competence through collaboration and mixing competencies, also with an international outlook (More ideas for improvement can be found in Section 6 of this report, on the Guidelines). .

The results also revealed that the respondents that belong to the stakeholder group of Active Communities, Cultural and Creative industries were those that placed the highest importance to all proposed topics (except from one, where NGOs and marginalised groups regarded as the most important) related to partnerships and multi-stakeholder collaborations, showing the need of this approach, especially from the perspective of these stakeholders. This is an important aspect to be considered by policy makers and educator managers in designing and implementing ET strategies for improvement.

5.3.2 Multi-stakeholder decision and curriculum-making

i. The stakeholders that are regarded as the most important to be integrated into decision and curriculum-making processes.

The results reveal that,

- The stakeholder group that is considered as the most important to be included in decision and curriculum-making processes is Bioeconomy Professionals and Workers of Bioeconomy Sectors.
- This group was followed by Entrepreneurs, and Local Communities and the Wider Society.

While, these were the overall results, the perception of respondents according to their profiles differed.

Integrating the key stakeholders in decision-making processes is critical. Bioeconomy ET is no exception. In fact, development of the bioeconomy ET cannot be achieved without inclusion of the main stakeholders of the sector. Besides, integrating stakeholders in ET is an important step to know the needs of the bioeconomy sectors and be aware of the challenges and needs of professionals. In this regard, this part of the questionnaire aimed to understand which of the main stakeholders are considered as the most important to be integrated into decision-making processes by the respondents.

The results suggested that at the first place, bioeconomy professionals and workers of bioeconomy sectors were seen as the most important stakeholders to be integrated. This group was followed by entrepreneurs and local communities and the wider society. It can be argued that education should not only focus only on knowledge transfer, but also to convey realities from the ground and tailor-made solutions for local contexts. This would require a better integration of local actors and professionals in the bioeconomy sectors, including experiences from the industry and ideas of entrepreneurs to be integrated into the ET system. Hence, the results of the questionnaire are in fact in line with the needs of the sector proposed in the workshops and discussions within the Project.

In this scope, one strategy can be to set periodical meetings with selected stakeholders or creating permanent platforms for discussion, where these key actors, who are usually not fully integrated in decision or curriculum-making processes in ET, can be integrated more. This would allow to have not only a theory-based approach but to have a mix of theory and practice, which is also necessary to meet the needs of the sector.

5.3.3 Social inclusion and inclusion of marginalized groups

ii. How to respondents rate the importance of increasing the inclusion of marginalized groups in bioeconomy ET; and prioritising their needs and voice when making strategic decisions

The results reveal that,

In terms of "increasing the inclusion of marginalized groups in bioeconomy ET:
- 26.6% of respondents (the biggest share) believed that it is "important" to increase the inclusion of marginalised groups in bioeconomy ET;
- This was followed by those that found it "very important" (24.7%).
- While 27.9% believed that it is "moderately" or "slightly" important.
- While those who considered it to be "not at all important" was only 2.6%.

In terms of "prioritising the needs and voice of marginalised groups when making strategic decisions:
- 31% of respondents (the biggest share) believed that it is "important",
- This was followed by those that found it "very important" (26.6%).
- While 14.3% rated it to be "absolutely essential"
- 22.1% believed that it is "moderately" or "slightly" important.

This topic carries particular importance for this Project, as inclusion of marginalized groups is among the key objectives of this Project. It is also a topic that is rarely addressed or insufficiently addressed in the context of education and training related discourses.

In this questionnaire this topic was addressed with two questions, asking the respondents to rate the importance according to their perceptions. One was on the importance of inclusion of marginalised groups in bioeconomy ET; in other words, more related to creating those opportunities and conditions so that marginalised groups can also have access to ET in the same way as all other members of the society. The second question was in order to understand how respondents rate the importance of prioritising the needs and the voice of marginalised groups in decision-making processes.

Increasing the inclusion of marginalised groups in ET was rated the highest by Active Communities, Cultural and Creative industries, while inclusion of marginalised groups in decision-making processes was rated the highest by NGOs and marginalised groups.

In this regard, the results of the study suggested that some strategies that can be proposed are: Carefully identifying the abilities in order to obtain compatible job placements; Discussion with related public authorities and ministries responsible for social protection, social cohesion, integration and solidarity; Provision of just wages and opportunities to make sure marginalised groups are sufficiently represented in the sector; Facilitating the participation of marginalised groups by adopting a different and better approach to and for these target groups (through e.g. orientation, guidance, financing); Providing digital skills to empower marginalised groups and to decrease the divide; and emphasizing best practices and role models. Besides, it was proposed to pay attention to distribute responsibility across all decision-making levels of the ET, to avoid only a few people in managerial positions to make decisions, while those working on operational levels are more informed about the realities of the sector.

5.3.4 Establishing connections between bioeconomy ET and art, humanities, creative industries, eco-design and culture

i. Rating the familiarity of respondents to the topic; perception towards this topic offering possibilities for the development of innovativeness and sustainability of bioeconomy; and their willingness to learn more on the topic.

The results reveal that,

In terms of familiarity with examples/cases where cultural and creative industries offer possibilities for the bioeconomy:
- 46.7% of respondents "know of examples/cases where cultural and creative industries offer possibilities for the bioeconomy (in various levels: 24% somewhat agreed, 22.7% agreed, 7.1% strongly agreed).
- while 21.4% did not know of examples/cases (13.6% disagreed, 7.8% strongly disagreed),

In terms of knowing of examples/cases in the work that the respondents do:
- 51.9% of respondents are familiar with examples/cases (24% somewhat agreed, 19.5 agreed, 8.4% strongly agreed)
- 28.6% of respondents are not familiar (19.5% disagreed, 9.1% strongly disagreed)

In terms of being "unaware of the connection between cultural and creative industries and the bioeconomy"
- 49.4% of the respondents are unaware,
- and 33.1% of the respondents are not aware,

In terms of wanting to learn more on the possible uses of cultural and creative industries for bioeconomy.
- 79.9% of respondents agreed to have the willingness to learn more (23.4% somewhat agreed, 42.9% agreed, 13.6% strongly agreed)
- 7.8% of respondents did not show interest in learning more (5.2% disagreed, 2.6% strongly disagreed).

In terms of agreeing with the statement of "establishing links to cultural and creative industries offering possibilities for the development, innovativeness and sustainability of bioeconomy:
- 76% of respondents agreed (19.5% somewhat agreed, 39% agreed, 17.5% strongly agreed)
- 6.4% respondents did not agree (5.8% disagreed, 0.6% strongly disagreed).

The results reveal that although the majority of respondents are aware of the concept, and know of examples in the work that they do, and believe that cultural and creative industries can in fact offer possibilities for the bioeconomy sectors, there is still a non-negligible share of respondents that are not aware about the topic, ranging between 20 to 30 percent for each of the questions, showing the need to raise awareness about the topic and the importance of discussion this issue as part of the Project. In fact, the next statement explored in this questionnaire on the willingness to learn about the possible uses of cultural and creative industries for bioeconomy, around 80% of respondents showed willingness to learn more on the topic.

In this regard, some approaches proposed by the BioGov.net partners were: Using inspiring case studies and artistic formats to inform about the bioeconomy. This can involve integrating

opportunities offered by culture, art and eco-design to inform on bio-based products and materials of biological and renewable origin. A suggestion was to leverage the “Nespresso marketing model” to combine beauty and the "wow" effect in communicating the bioeconomy through art and to inform and educate professionals active in the creative and cultural industries to use biomaterials for their work. Besides, students and professionals for the creative and cultural sectors can work closer to and collaborate with bioeconomy sectors, through co-creation of innovative spaces to establish dialogue. Communities of Practice (CoPs) in this regard presents a great opportunity to bring together different stakeholders from cultural and creative industries and bioeconomy practitioners or learners together.

6 Guidelines

This section consists of three parts (which also constitute the three main components of the Governance and Training Framework elaborated in Section 3 of this Report): 1 – Effectiveness of Governance: Capacity and quality of educational content, quality of trainers/educators and educational centers; 2 – Efficiency of Governance: Functioning and sufficient Regulatory Frameworks, Administrative Procedures, Monitoring and Evaluation, Harmonization of Policies in Bioeconomy ET; 3 – Collaboration and Stakeholder Engagement in Bioeconomy ET: Partnerships and Multi-stakeholder approaches, Collaborative Decision and Curriculum-Making, Inclusion of marginalised groups and establishing links to creative and cultural industries. Under each part, specific guidelines are presented, which rely on data gathered by the Questionnaire that is executed in the scope of this study, insights acquired by workshops conducted so far (October 2023) in the Project in addition to relevant outputs obtained by some of the sister projects (e.g. Transition2Bio, BIOBec), in which UNIBO has been involved (as the coordinator or WP leader).

Part 1 EFFECTIVENESS of GOVERNANCE IN BIOECONOMY ET: Capacity and quality of educational content and approaches, and quality of trainers/educators and educational centers

Enhancing skills (with a particular focus on soft skills) in bioeconomy

1 The importance of skill generation across the bioeconomy sectors is emphasized largely as part of this study, hence, focusing on skill generation will be key in order to enable the ET systems to meet the needs of the bioeconomy sectors. Our study particularly reveals the importance of integrating soft skills into the ET programmes, including but not limited to project thinking, aptitude for design, methodologies for design thinking and design of participatory processes and addressing real like problems, needs and solutions.

Skill generation in the bioeconomy sectors necessitates the implementation of new and innovative learning approaches, such as and student-centered learning, flexible approaches or multi-disciplinary approaches (linking design & technology and finance & economy and social, and the skills to be able to work with different professions and sectors) to teaching and learning. In this way it would be possible to enhance higher order learning skills, through which, learners can absorb the skills to put them critically in practice. In this regard, the following skill needs were priorities by the Transition2Bio Project:[1]

- Mindsets in bioeconomy (e.g. critical thinking and problem solving, creative thinking, values and future thinking, leadership, systems thinking, entrepreneurship),
- Digital skills (e.g. digitalisation, ICT, computational thinking, virtual collaboration, big data) (which is detailed further in the next item),
- Skills for knowledge transfer and information exchange (awareness raising, communication, mentorship, teaching and learning),
- Regulatory and policy skills (e.g. policy, law, regulatory compliance, ethics, safety and health),
- interaction with people (e.g. collaboration and cooperation, teamwork, empathy, social and personal skills, networking).

Ministry of Education, depending on the Member State, has the role of modernising the ET systems on the recognition and validation of hard and soft skills and competences in formal, non-formal and informal learning settings. The educational institutions can take on a role of actively promoting and inspiring learners, by providing them with the awareness of the importance and opportunities regarding hard and soft skills and competencies.

Enhancing digital skills and literacy throughout the bioeconomy sectors.

2

The importance of digital skills was particularly underlined especially in terms of being able to carry out organizational tasks in the sector through digital platforms. Digital skills are not only important for professionals and practitioners to learn new and advanced technologies to meet the needs of the sector, but also can facilitate the use of digital learning platforms that are now an important part of our lives. In this regard, introducing and extending courses and programs to improve digital skills and digital literacy of learners of all levels is critical.

Besides, digital skills can also help close the skill gaps of those learners that are part of marginalised groups, and hence have difficulties in accessing ET options. Hence, extending the reach of these courses, making them affordable (or free) would enable more learners (also those in more disadvantaged or remote areas) to reach learning activities, and also contribute to closing the gender gap.

Integrating Sustainability and Circular Economy to all educational levels.

3

This study revealed that Sustainability and Circular Economy were regarded as the key topics in the area of bioeconomy, where without a sufficient knowledge in these topics, it is hard to comprehend the sector as a whole, and without this crucial knowledge, providing a holistic picture of the needs, challenges and opportunities of the sector would not be possible. In this regard, the respondents of the questionnaire emphasized the importance of green competencies, social sustainability (equity, justice, solidarity) and financial sustainability of methodologies, technologies and solutions developed within the bioeconomy.

Besides, to make the Sustainability Transition that is much needed in the bioeconomy sector (and overall, in all sectors), the topic of Sustainability needs to be integrated in the ET programmes, across all ET levels, and starting with early ages. Furthermore, sustainability competencies should also be promoted as items that workplaces demand from candidates which will also drive the change and transition of skills acquired in the sector.

Hence, a first step is to create a common understanding and common language that provides a similar visioning of sustainable development. In this regard, one of the most important needs for policy action lies in information and communication actions developing a common understanding of the term and what it requires across the sector. In this perspective, setting shared indicators suitable at local and European level might also help identifying not only problems, but also the progress towards solutions.

Regarding lifelong learning, all stakeholders involved in the bioeconomy be strongly recommended to have a profession-specific sustainability course or certificate to be renewed within given intervals; hence, updating the ET system and creating courses, programs and modules that will allow this will be of critical importance.

Establishing links between formal, non-formal and informal ET in the bioeconomy.

4

Integrating formal, non-formal and informal ET in the bioeconomy sectors was seen as critical by the respondents and stakeholders in this study. Besides, the importance of learning provided through NGOs, associations and communities (e.g. CoPs) was recognised largely in this study. In this regard, new and alternative approaches to ET are needed in the field of bioeconomy, where ET needs to be diversified and the experience and knowledge acquisition through networks, communities and like-minded people, through non-formal and informal learning, should be supported further. This can also be a key step in balancing theory and practice in ET in bioeconomy, which is crucial in addressing the needs of the sector.

In this context, using an innovative model based on ET through a participatory and collaborative approach was emphasized. Moreover, an important step towards allowing non-formal and informal learning to be integrated into the whole ET system can be through efficient accreditation of learning acquired through non-formal and informal ET, not only for learners but also educators and trainers. Another suggestion was to mobilize innovative hubs, spaces and incubation centres to be mobilized, where formal, non-formal and informal ET can be systematically linked.

Balancing theory and practice in Bioeconomy ET – providing practical skills and hands-on experience on bioeconomy-related tools and technologies.

5

The results point to the critical importance of networking between academic and non-academic institutions, which can also lead to an ET system in bioeconomy that is not only focused on theory, but is more concrete, operational and can also deliver practical abilities. This can also lead to joint efforts of academia, industry and governments in tackling issues of work placement, engage and interact with the realities of the sector and to provide a broader set of skills and competences, also with an international and global outlook. Meanwhile, the importance placed to "using multidisciplinary approaches in designing courses and curricula" are also consistent with the need to collaborate across different fields.

Learners appreciate direct connections with the actors in the field, and they would benefit significantly from the hands-on approach. In this way, they can get to listen to territorial actors, to see what the real problems are, and then transfer these into their skillsets. Hence, collaboration between academia and industry is key, as well as deepening the cooperation with entrepreneurs.

Moreover, establishing cooperation between universities and NGOs can lead to educational institutions to contribute to the local communities through extracurricular activities, projects and joint courses/modules. However, due to the cost of providing practical experience to learners, many institutions cannot provide these. Hence, in order to create curricula/programs/modules that is balanced between theory and practice, one important step is incentivizing the collaboration among different partners, in particular with industry and local society. This way, providing hands-on experience to learners will not be a burden for different organizations, but will also benefit both sides. Organizing more job placements occasions can motivate each of the parties to take part in these processes. Furthermore, creating a greater connection between science and practice and to share good practices are also critical, which can in turn motivate entrepreneurs to cooperate with research.

Adopting a flexible approach in teaching.

6

Adopting mode flexible forms of ET was another aspect that was stressed in this study. The traditional approaches adopted by the ET systems until now, that is static and resistant to change, make it challenging to enhance the collaboration between ET organizations and other stakeholders (e.g. industry). The static approach to ET not only renders innovation and change quite difficult for the sector, but it also makes it hard for learners of different backgrounds throughout the Lifelong Learning system to gain the necessary continuous up-date that they need in their professions/careers. Besides, strict pre-requisites (prior knowledge requirements) that dominate the ET system, also make it difficult for those professionals (or learners) to change path later in the career or life and thus, exclude many potential candidates to bioeconomy ET.

Hence, designing more flexible education routes, and also allowing people to cross disciplinary boundaries more easily would contribute to the uptake of the sector. In addition, access to shorter or modular education tracks (combined with other types of ET) could help professionals/learners to top off the competence they already acquired in certain topics/subjects. In this regard, presence or absence of basic knowledge in the topic should be taken into account.

7 Adopting a more holistic approach of learning (and teaching).

In order to develop a comprehensive understanding of the bioeconomy as a whole, studying just a small part of the problem does not allow the learners or professionals in the bioeconomy sectors to actually find solutions to the overarching wicked problems of our world, as well as driving the much-needed transition towards sustainable bioeconomy systems.

Instead, a holistic learning approach needs to be adopted, which allows interacting with others, creating new professional figures, open for changes. Besides, a holistic approach is also necessary in addressing local needs and perspectives. One important step towards acquisition of a holistic approach can be through extending teaching methods beyond specific training modules, towards integrating workshops, discussions and co-creation in different contexts that bring together specialists and professionals in the sector. This can promote the updating of knowledge on the most recent advances in bioeconomy. Another example is the development of more practical training modules as part of programs to accelerate business ideas that can lead to start-ups. Last but not least, the courses, programs and modules need to provide a global vision (in addition to the national perspective). Many trainers lack one or the other half of the total knowledge, which also need to be continuously updated through training of trainers' programs, using a holistic approach.

8 Extending adult learning and LLL programs and making them more accessible.

The study revealed the importance of extending VET and LLL programs (to extend the number, availability and accessibility). While, the importance of VET has been revealed by the results of this study, the significance of VET is also further confirmed by numerous official documents (European Council, 2020; Osnabrück Declaration 2020), the financial instruments (Erasmus+ programme, European Social Fund – ESF) and specific agencies (European Centre for the Development of Vocational Training – CEDEFOP, European Training Foundation – ETF) that support the Vocational Education in Europe. Indeed, the flexibility of Vocational Education is seen as the right tool to respond to the rapid changes of our society and the business environment. While it can also be solution to minimize the number of NEETs (Not in Education, Employment, or Training People) in Europe.

Besides, the study revealed the importance of making adult learning and LLL programmes more accessible. In fact, LLL is perceived as one of the most important levels of ET for facing the grand challenges of the future. This argument is in line with the fact that LLL is no longer regarded as a voluntary choice in many sectors, in contrary, it is argued that in our day, only an individual who has learnt how to learn, and who is willing to learn throughout his or her life, will be able survive in the labour market.

Therefore, it is crucial to take the necessary steps to make LLL a fundamental human right, and to provide it to all individuals from different backgrounds, profiles or demographics (rural/urban and/or employed/unemployed), who are looking forward to learning on the topic and opt for them. Hence, providing more opportunities and options to lifelong learners, in order to make it accessible to all, and to meet the needs of the bioeconomy sectors is crucial.
In this regard, designing affordable and free of charge courses would be an important step to extend their reach. The aspect discussed before, with regard to adopting flexible and modular approaches to learning also can contribute to extending the reach. Another suggestion was to provide ET programs locally, facilitating the participation of the local population in areas where the bioeconomy is applicable. Meanwhile, the task of promoting and conveying these training opportunities should also be entrusted to the various sector bodies, trade unions, professional bodies, and associations and so on.

Aligning the ET system with the necessary Job Profiles in the Bioeconomy sectors.

9

It is of utmost importance to first identify the necessary job profiles in the bioeconomy sectors and then to make it more visible to the public and learners, the future job opportunities and their links to the needs of the evolving bioeconomy sectors. This can support decision making for setting up training and curricula across all levels of bioeconomy ET and inform the governance system for training needs and skills needed for the transition. The fusion of science and business in the sector creates unique requirements for professions and occupations that include different mixtures of technical expertise and entrepreneurial skill sets. In this regard, integration of professional profiles in terms of bioeconomy in all sectors and all EQF levels carries importance.

Placing special emphasis on training of trainers/educators.

10

It is of critical importance for teachers to have the sufficient skills, in order to equip the students with the skills and competencies that are needed in the sector. Hence, the need to train the trainees is crucial. Besides, the skills of teachers need to be continuously updated so that they can better identify students' needs. Moreover, it is important that teachers also have the necessary practical experience and knowledge of local, national versus global contexts. In this regard, ensuring that trainers have real concrete and operational knowledge would also help creating the balance between theory and practice in ET.

It was also proposed that providing a modular approach to learning, to provide micro-qualifications and setting the regulatory framework that would facilitate training of trainers would be important. An important step in this regard, was seen as certification of trainers to ensure that their knowledge is up-to-date and can be continuously developed to meet the needs of the sector.

Enhancing the capacity of educational institutes/centres/spaces that can provide ET.

11

Capacity of educational structures refer to the capacity and infrastructure of educational centers (or spaces), which are fully equipped to provide its learners with the aimed skills and competencies. These spaces can be offline or online spaces, or schools or knowledge hubs, regional innovation hubs, or community centers, where learning (formal, informal or non-formal) can take place.

Within the scope of the BIOBEC Project (which is coordinated by UNIBO), the Deliverable 1.2 provided best case practices and guidelines for establishing bio-based education centers (Please refer to the BIOBEC Project for further information) (https://biobec.eu/). According to the outputs, it is of key importance to apply a long-term perspective in order to secure the supply of required resources to run the future educational centers or hubs, beyond the lifetime of projects or project funds. It was also stressed that involving stakeholders early on in the process and seeking political support are key, underlying that strong models of existing biobased education hubs are those, that receive political support and regional/state funding. Therefore, it is recommended to include regional politicians into the design of these centers from the beginning. Moreover, the importance of developing effective cooperation models and governance structures from early stages are of utmost importance. It is also recommended that study programs and educational formats (including non-formal and informal) offered by educational centers/hubs are co-created by involving stakeholders representing the employer and also involve them into education.

Raising awareness about bioeconomy and bioeconomy ET and raising the motivation of learners.

12

It is necessary to communicate the importance of the field to the public in order to understand what the bioeconomy is, why we cannot continue with the current ways. Raising awareness about bioeconomy ET is also linked to and constitutes one of the important steps in attracting learners and educators to this topic, as well as attracting skilled professionals and entrepreneurs to work on the topic.

In this regard, the importance of storytelling as a way to communicate with target groups was emphasized. In order to increase the interest in the field, reaching and attracting those who are interested in the sector but do not find their way to the related institutions or courses could be key. Besides, to make education and work life in this field attractive, it is important to demonstrate the opportunities for the future and careers, showing that there is a need for professionals and practitioners working on this topic (and the job profiles that will be needed in the future), in addition to communicating to the learners that there is a direction to go in this sector.
Given that research and higher education organizations are those organizations that are more likely to have the knowledge, capacity and opportunities to raise the awareness of the society through providing education and research, this can be an area where research and higher education organizations can take the lead in collaborating with all other relevant stakeholders to activate this process.

Part 2

EFFICIENCY of GOVERNANCE IN BIOECONOMY ET:

Functioning and sufficient Regulatory Frameworks, Administrative Procedures, Monitoring and Evaluation, Harmonization of policies in bioeconomy ET

1

Harmonization of policies and policy coherence.

This study revealed that ensuring coordination and harmonization of policies/governance mechanisms across education and training in different bioeconomy sectors, across different educational levels, as well as across different regions, as well as across the EU is of utmost importance.

Currently, with regard to harmonization of policies, there is a lack of comprehensive policies and validation of strategies that are missing in some EU countries, which leads to the failure of raising professionals that are ready to face the real context requirements in bioeconomy. In this regard, there is a need of policy harmonization, a more systematic and integrated policy, with a better coordination amongst General Directorates involved in the bioeconomy sectors, in addition to quick response mechanisms and procedures. Moreover, developing ET policies in parallel to policies stimulating sustainable practices, and circular economy (e.g. provision of incentives), as well as spreading of best practices would help harmonization efforts. Besides, efforts need to be aligned at academic, industry and policy level.
The process of coordination and harmonization of policies in ET is a particularly fundamental step for improving VET throughout Europe. The aim should be the harmonization of national laws with European guidelines in terms of VET. In this regard, monitoring of upcoming EU guidelines in order to stay up to date would be crucial. Hence, there is a need to harmonize ET policies within the Member States (e.g., national and regional laws) and among the Member States. Especially the latter is felt crucial to unlock the full potential of VET in the common market of job.

Enabling recognition of diplomas for VET and LLL.

2

An objective, perceived as urgent, is to enable recognition of diplomas, which can be achieved through a unified certification scheme valid throughout the EU for VET and LLL. To date, a general lack of recognition of VET diplomas and of learning experiences have been underlined. This gap points to the disconnection between formal and non-formal ET. To overcome this challenge, it is fundamental to set a unified certification scheme that allows the alignment of the non-formal education with the formal one, which could render VET and LLL courses and programs provided to be more attractive for learners.

In this regard, EU/National Policymakers can set up a regulation of the several certification scheme still in force (Bologna, Copenhagen, EAPA – European Alliance Professional Accreditation, etc.). Certification experts, with their knowledge, can help find a certification scheme suitable across different Member States. Furthermore, when the difference of education and training system is too wide from country to country, it is possible to put in force a national certification that overcomes this obstacle. Last but not least, educational organizations, industry and other key stakeholders can be involved in the co-creation of the scheme, in order to contribute to expressing their priorities, objective and aims according to their respective educational level.

Establishing a functional monitoring and evaluation (ME) system in bioeconomy.

3

It is critical to promote relevant institutions for ME that are endowed with sufficient capacity, appropriate degree of independence and resources and necessary instruments. Besides, developing reliable monitoring and reporting mechanisms to effectively guide decision-making is of utmost importance. ME is a tool that allows to assess if progress is made in achieving expected results and to spot bottlenecks in implementation. ME is hence critical to the success or failure of any educational program, as each educational system require effective planning and implementation as well as ensuring compliance between expectations and outcomes.

In this regard, the stakeholders/respondents stressed the importance of discussing what needs to be monitored and evaluated as well as a 360 thinking of the possible impacts of the ME systems in place and link them well with ET needs and outcomes. Besides, establishing of performance indicators would be needed. It was already argued that in the case of member states, there are already frameworks or mechanisms in place; hence, the already existing competencies, experiences, and tried models should also be taken into account and opportunities for cooperation should be soughed. Last but not least, the stakeholders stressed the importance of ME efforts to be accompanied by putting in place a national roadmap for bioeconomy (if it is not already in place). Besides, the need to explain the connection between green agreements or regulations related to circular bioeconomy was stressed.

Mobilising financing for the bioeconomy ET and allocating financial resources in an efficient, transparent and timely manner.

4

The importance of funding opportunities is critical in the design and provision of new courses and educational programs which are endowed with new and innovative approaches of learning and governance. Insufficient levels of financing are one of the main issues that negatively affect the output of the education sector. Meanwhile, distributing the available funds to securing quality of these courses/programs/modules, increasing the accessibility of these courses, and making sure it reaches a wide array of stakeholders, including the marginalised groups are essential. Moreover, making bioeconomy ET, and its programs, courses and modules attractive to students and learners would also require funding.

In the context of the study, stakeholders/respondents shared the areas of bioeconomy ET, which, in their opinion need financing. The details of the results can be found under Annex 3 of this Report and Section 7 on Country Profiles, while some of the main categories mentioned were as follows: Accessibility and inclusiveness of bioeconomy ET; Dissemination and awareness raising of bioeconomy and bioeconomy ET; Incentivizing innovation and sustainable ET across all educational levels; Community and Stakeholder engagement; Designing curriculums; Funding across different educational levels and sectors of the bioeconomy; Funding training of trainers/educators; Funding regional innovation hubs and learning spaces; Supporting the green transformation of bioeconomy ET; Retraining of target audiences; Conveying soft skills (e.g. entrepreneurial mindset, adaptability, sustainability competencies); Computer and digital skills; Innovative business models and approaches to bioeconomy ET.

Last but not least, a cross-cutting proposal was to balance short-term priorities with long-term perspectives in bioeconomy ET, so that funding provided for diverse areas can be active and functional beyond the lifetime of project and program funds.

Improving financial support for marginalised groups (including young professionals and NEETs) to have access to bioeconomy ET.

5

In the context of accessibility and inclusiveness of bioeconomy ET, improving financial support for marginalised groups (including young professionals and NEETs) to have access to bioeconomy ET is critical. The access to credit is one of the most challenging obstacles for young professionals and marginalised groups in general. It is true also for ET, especially when combined with other costs that young professionals must face (e.g., business start-up costs, mortgages, loans, etc.).

In this scope, the need for increasing financial support for young professionals and marginalised groups assumes a crucial role for the development not only of the young professionals per se but also for the nation (and the bioeconomy sectors) as a whole. In this context, in addition to mobilising these funds, an important step would be to put in place communication mechanisms to reach and inform the target audiences in a systematic way (as access to information is also challenging).

Increasing financial support for creating collaborations across educational levels.

6

It was also proposed that mobilising funds to integrate different educational levels in bioeconomy ET, and to connect actors providing education were considered necessary. In this regard, funding collaboration opportunities with Industry to secure funding for bioeconomy ET was proposed.
Enterprises can invest in educational institutes/centers/spaces, in form of instruments and technical support to ET activities. In this way, they would also be supporting the formation of their future resources. Besides, mobilising funds for practical experiences/internships in Industry would facilitate gaining real life experiences (companies that invest time and resources for these learners/practitioners need to be supplied with funds/incentives so that this system can be sustainable and long-lasting). For this, regional and country support, strategies and investments would also be required.

In this context, another proposal was to finance experience-sharing and collaboration between Universities/Higher Education Organisations and other educational levels to create bridges. Higher Education organizations act as hubs of knowledge and innovation, and sharing the know-how across the whole ET system would create a larger value for the society as a whole.

Last but not least, financing international exchanges between ET options across the EU would allow learners to experience/experiment different approaches and contexts and develop themselves both in terms of knowledge and in social capital. This is true also for trainers/educators and researchers, who, thanks to their experiences, can enrich their networks, experience and educational approaches and tools.

7

Creating a common understanding of terms in policy-making /regulations and administrative procedures and simplifying administrative procedures to accelerate innovation in the bioeconomy ET.

Currently there is a lack of common understanding of terms and procedures across different educational levels and across the EU. In this regard, public organizations (with the collaboration of Higher Education Organizations and the Industry) need to set clear definitions from an early stage to render a smoother process. In fact, difficult problems cannot readily be solved through the actions of an individual public sector organization, but a collaborative approach is required.

Besides, there is a need to reduce and simplify administrative procedures which is often standing in the way of updating the ET system in line with the changing needs of the bioeconomy sectors and to allow innovativeness in an educational context. Besides, the lack of effective communication between actors and legal entities (e.g., ministries, academia, chambers of commerce, districts, municipalities, educational institutions etc.) does not help improve the situation.

Building on the already existing regulations and procedures (when they are available) and "not re-inventing the wheel".

8

In terms of designing standards and a regulatory framework in bioeconomy ET, it was stressed repeatedly by stakeholders that the preferred strategy would be to build on what is already available and already functioning, putting efforts to improve it and not to build it from scratch. It was argued that there is already acquired knowledge and countless practical experiences in place.

It is hence important not to design all these systems separately but acquire knowledge on and create a database of what already works in VET and adult education in general, and make bridges and collaborations between different actors, regions, countries or experiences to improve the already existing regulations and standards in place. Some aspects to take into account in this process should be to evaluate how new standards would affect the existing ones, and if a new standard was to be introduced, how much would it be different than the already existing one.

Part 3

COLLABORATION AND STAKEHOLDER ENGAGEMENT IN BIOECONOMY ET:

Partnerships and Multi-stakeholder approaches, Collaborative decision and curriculum-making, Inclusion of marginalised groups and establishing links to creative and cultural industries.

Establishing partnerships and multi-stakeholder collaborations for improving the bioeconomy ET.

1

There is a need of establishing networks and dialogue between a wide series of actors and implementing a more interdisciplinary approach to achieve bioeconomy ET objectives. In this regard, collaboration between Universities and Industry, NGOs, local communities and bio-based sector professionals will be key.

Policy actions are required to enable inter-sectoral coordination. ET organizations have an important role to enable these networks, to form alliances and partnerships with a multitude of actors and organisations, and to design LLL programmes in a collaborative and a multi-stakeholder way.

One step towards this is to establish a permanent panel where representatives of Higher Education Organizations, Industry, Public Institutions and local communities can come together and express their requests and voices. Another step can be to mobilise community learning centers, or regional innovation hubs, which can become the vehicle for building effective multi-stakeholder partnerships. Legal and policy framework, therefore, has to support and promote this partnership-building. On other step can be to set experimental courses to apply new and innovative learning approaches to develop the skills and competencies of learners towards the needs of the job market. Joint efforts to develop work placement and applied projects would also be useful. This would also allow for a closer collaboration between different actors and educational levels. Last but not least, creating bridges between VET and entrepreneurs through provision of internships, co-supervision, mentorship opportunities, or by designing co-creation workshops to brainstorm on how the advancements in the bioeconomy sectors can shape their work and careers in the future would be critical.

Establishing multi-stakeholder decision and curriculum-making mechanisms.

2

The study revealed the need to include the views of a wider variety of stakeholders in decision and curriculum-making in the bioeconomy ET. It is necessary to include Bioeconomy professionals and practitioners and entrepreneurs in these processes, in addition to Local communities and the wider society and the NGOs. This can facilitate integrating the voice of those that are directly affected by the sector, to make sure the real needs on the ground are addressed and provide tailor-made solutions for local contexts.

One strategy can be to set periodical meetings with selected stakeholders or creating permanent platforms for discussion, where these key actors, who are usually not fully integrated in decision or curriculum-making processes in ET, can be integrated more. On the side of the industry, there is a need to involve private companies in the design of new courses and increase the chances for traineeship. In doing so, there is a need to stimulate participation of enterprises, and to provide motivation for them to participate (currently there are not enough incentives and adequate regulations to promote traineeships and involve enterprises in the ET system). Besides, within the study, the stakeholders/respondents were asked to name additional stakeholder groups which in their opinion should be integrated in decision and curriculum-making processes. The responses included: Creative industries (e.g. designers, craftsmen), entrepreneurs, industry (e.g. practitioners), NGOs, environmental organizations, living labs, teachers/educators, students and learners and kids and young people and young professionals.

3

Social-inclusion and inclusion of marginalised groups.

This topic carries particular importance for this Project, as inclusion of marginalized groups is among the key objectives. It is also a topic that is rarely addressed or insufficiently addressed in the context of ET related discourses. The study revealed the significance of integrating marginalised groups in the governance mechanisms (and decision-making processes) of bioeconomy ET. Hence, the necessary mechanisms need to be put in place to continuously evaluate and monitor the inclusion and the impact created on the targeted stakeholders.

The strategies proposed and suggestions made by the stakeholders/respondents included: - Carefully identifying the abilities in order to obtain compatible job placements; - Discussion with related public authorities and ministries responsible for social protection, social cohesion, integration and solidarity; - Provision of just wages and opportunities to make sure marginalised groups are sufficiently represented in the sector; - Facilitating the participation of marginalised groups by adopting a different and better approach to and for these target groups (through e.g. orientation, guidance, financing); - Providing digital skills to empower marginalised groups and to decrease the divide; - and emphasizing best practices and role models. Besides, it was proposed to pay attention to distribute responsibility across all decision-making levels of the ET, to avoid only a few people in managerial positions to make decisions, while those working on operational levels are more informed about the realities of the sector.

Integrating art and creative and cultural sectors in ET is an expanding field in educational research and exploring this topic constitutes an important pillar of the BioGov.net Project.

Art and creative and cultural areas remain one of the most valuable methods of spreading awareness to needs of science. These areas can respond to different learning styles and facilitate the inclusion of marginalized and/or disadvantaged groups, and convey messages, inspire the general public, increase awareness and interest in the bioeconomy; and it can interconnect with artistic professions such as architecture, design, etc., to introduce the bioeconomy. In this regard, some steps can be taken in this area:

4

- Using visual arts combined with educational material and local information to create resonance and understanding.
- Using inspiring case studies and artistic formats to inform about the bioeconomy. This can involve integrating opportunities offered by culture, art and eco-design to inform on bio-based products and materials of biological and renewable origin.
- Leveraging the “Nespresso marketing model” to combine beauty and the "wow" effect in communicating the bioeconomy through art and to inform and educate professionals active in the creative and cultural industries to use biomaterials for their work.
- Learners and professionals of the creative and cultural sectors can work closer to and collaborate with bioeconomy sectors, through co-creation of innovative spaces to establish dialogue. Communities of Practice (CoPs) in this regard presents a great opportunity to bring together different stakeholders from cultural and creative industries and bioeconomy practitioners or learners together.
- Providing opportunities for professionals (of science/art/humanities), educators and pedagogues to get closer and know each other in workshops, forums, etc., to better understand the reality and the challenges.
- Introducing a study program between universities, where the Academy of Arts could provide opportunities for students to use bioresources in the creation of materials and their use in the creation/design of products, e.g. seaweed lamp dome, fish skin dress, etc.
- Integrating subjects or guest lectures into creative training and involve the purchasing department that purchases work materials.
- Using interactive games and role-playing with relevant educational visits to cultural sites.

7 Country Profiles

This section presents the results of this study and results of the questionnaire in the differentiation of eight countries that took part in this study.

CZECH REP.

MOST IMPORTANT EDUCATIONA LEVELS

VET, workplace-training

WHAT OTHER APPROACHES TO ADOPT

NA

HOW TO ALLOW POLICY COHERENCE

Enhance coordination of policies/governance mechanisms across ET in different bioeconomy sectors, Harmonize policies/governance mechanisms throughout all educational levels..

MOST IMPORTANT TOPICS TO INCLUDE IN CURRICULA

Sustainability, digital skills and literacy

WHERE DO WE NEED MORE FINANCING

It is necessary to expand education to include general computer skills.

MOST IMPORTANT ASPECTS IN PARTNERSHIPS, COLLABORATIONS

Strengthening the collaboration between education and training providers,
Strengthening the collaboration of educational institutions and other organisations, entities.

MOST IMPORTANT APPROACHES

Making adult learning and LLL programs more accessible, integrating informal learning

HOW TO INCREASE QUALITY/CAPACITY OF ET

NA

HOW TO INCLUDE MARGINALISED GROUPS

NA

STAKEHOLDERS TO INCLUDE IN DECISION-MAKING

Bioeconomy professionals/workers of bioeconomy sectors, Local communities/wider society.

WHAT OTHER TOPICS TO INCLUDE

NA

HOW CAN MONITORING AND EVALUATION SYSTEMS BE IMPROVED

NA

HOW TO LINK CREATIVE INDUSTRIES

NA

MOST IMPORTANT ASPECTS IN REGULATORY FRAMEWORKS

Simplifying administrative procedures and burden,
To incentivize (through e.g. tax benefits) innovation and sustainable ET.

ESTONIA

MOST IMPORTANT TOPICS TO INCLUDE IN CURRICULA

Sustainability, entrepreneurship and innovation

MOST IMPORTANT APPROACHES

Multidisciplinary approaches; Promoting collaboration between academia and other stakeholders (e.g. industry).

WHAT OTHER TOPICS TO INCLUDE

Technical scientific knowledge (environmental solutions, biomaterials, technology, licensing, operation, business development);
Soft skills and competencies (addressing real life problems).

MOST IMPORTANT EDUCATIONA LEVELS

VET, Higher education, training of trainers

WHERE DO WE NEED MORE FINANCING

Educational levels: Kindergartens up to undergraduate studies with a broader focus; VET, continuing education - in modules.
Specific programs/skills/topics: Circular economy, green revolution, design of sustainable services and products, sustainable production in agriculture and forestry, environmental management/environmental audit. There is a lack of specialists, due to underfunding of the subject. Knowledge of resources, valorization techniques, inspiring examples, systems thinking, and interdisciplinarity.

HOW TO INCREASE QUALITY/CAPACITY OF ET

Communicating the importance to the public and awareness raising; Holistic approach of governance; Balancing short term and long term.

HOW CAN MONITORING AND EVALUATION SYSTEMS BE IMPROVED

ME needs to impose scientific decision making, not belief-based;
Harmonization/cooperation of mechanisms. Cooperation among functioning areas and not inventing the wheel; Need to explain in more detail, the connection with green agreements.

WHAT OTHER APPROACHES TO ADOPT

Building on already existing knowledge; Formal education to build on previous work and study experience; A balance of a national and a global perspective; Multidisciplinary/interdisciplinary; Learning by doing/learning by practice; Training of trainers and certification of teachers are essential to distinguish a science-based ET rather than belief-based; Student-centered approach.

HOW TO LINK CREATIVE INDUSTRIES

Inter-university curricula;
Interdisciplinary hackathons.

HOW TO INCLUDE MARGINALISED GROUPS

NA

HOW TO ALLOW POLICY COHERENCE

Harmonize policies/governance mechanisms throughout all educational levels;
Strengthen the coordination among member states to harmonize policies in VET and LLL;
Collaboration between secondary schools and universities; Focus on existing mechanisms rather than developing new ones; Think how new standards affect the existing ones?

MOST IMPORTANT ASPECTS IN PARTNERSHIPS, COLLABORATIONS

Strengthening collaboration of educational institutions and other organisations; Facilitating exchange of good practices between different regions; VET to cooperate with entrepreneurs and establishing digital platforms to do that;
Problem-based approach, provision of places for internships, co-supervision; Focusing on needs of stakeholders, this way learning will not fall behind of new EU guidelines. Discussing is important but action should be taken.

STAKEHOLDERS TO INCLUDE IN DECISION-MAKING

Bioeconomy professionals; Entrepreneurs; Public sector; Local governments; Educational institutions; Environmental managers, Young professionals, kindergardens and kids.

MOST IMPORTANT ASPECTS IN REGULATORY FRAMEWORKS

To put in place mechanisms/programs to raise awareness; Balance short term priorities with long term perspectives; To put in place mechanisms/programs to raise awareness about the bioeconomy ET; Simplify administrative procedures and burden.

GERMANY

MOST IMPORTANT EDUCATIONA LEVELS

VET, Re-training

WHAT OTHER APPROACHES TO ADOPT

NA

HOW TO ALLOW POLICY COHERENCE

Harmonize policies/governance mechanisms throughout all educational levels

MOST IMPORTANT TOPICS TO INCLUDE IN CURRICULA

Sustainability, soft skills

WHERE DO WE NEED MORE FINANCING

Educational levels: Courses for students from grade 9: project weeks at schools, cooperation with companies and scientific institutions.
Educational institutions/centers.
Extracurricular activities: Secondary schools (excursions, project work, etc.).
Professionals: Employees in agricultural businesses.

MOST IMPORTANT ASPECTS IN PARTNERSHIPS, COLLABORATIONS

Strengthening the collaboration of educational institutions and other organisations, entities.
Facilitating the exchange of good practices of bioeconomy education between different regions.

MOST IMPORTANT APPROACHES

Making the adult learning and LLL programs more accessible, multidisciplinary approach

HOW TO INCREASE QUALITY/CAPACITY OF ET

NA

HOW TO INCLUDE MARGINALISED GROUPS

NA

STAKEHOLDERS TO INCLUDE IN DECISION-MAKING

Bioeconomy professionals/workers of bioeconomy sectors, Entrepreneurs.

WHAT OTHER TOPICS TO INCLUDE

NA

HOW CAN MONITORING AND EVALUATION SYSTEMS BE IMPROVED

NA

HOW TO LINK CREATIVE INDUSTRIES

NA

MOST IMPORTANT ASPECTS IN REGULATORY FRAMEWORKS

To put in place mechanisms/programs to raise awareness about the bioeconomy education and training.
Simplify administrative procedures and burden.

GREECE

MOST IMPORTANT EDUCATIONA LEVELS

VET, re-training

WHAT OTHER APPROACHES TO ADOPT

Continuous update of knowledge, parent education, training of trainers in science communication, produce easy-to digest information in several formats for different audiences and ET levels.

HOW TO ALLOW POLICY COHERENCE

Harmonize governance mechanisms across different regions (and the EU); Enhance coordination of policies/governance mechanisms across ET in different bioeconomy sectors; Focusing on what already exists and works.

MOST IMPORTANT TOPICS TO INCLUDE IN CURRICULA

Sustainability, circular economy

WHERE DO WE NEED MORE FINANCING

Showcase of successful examples and pitching to angel/impact investors.
Educational levels: secondary education, higher education, LLL, adult education, pre-school, basic education, primary education, post graduate schools, municipal high school.
Specific topics/programs: Agri-nutrition, smart farming, new products, European programs that are related to education in bioeconomy. Professionals: civil servants, bank employees, cultural and creative industries. Funding for voluntary actions in bioeconomy.

MOST IMPORTANT ASPECTS IN PARTNERSHIPS, COLLABORATIONS

Promotion of public dialogues to increase the understanding of bioeconomy; Establishing bridges between different levels of bioeconomy ET. Cooperation with the institutes of ELGO DIMITRAS, formerly ETHIAGE. Promoting collaborations between different fields and specialties. Education of minorities, people with mobility problems; Education of those involved in primary production. Free events and daily happenings to become the talk of the town.

MOST IMPORTANT APPROACHES

Integrating informal learning, promoting collaboration between academia and other stakeholders (e.g. industry).

HOW TO INCREASE QUALITY/CAPACITY OF ET

ET in circular bioeconomy should be provided in a free way. Free of charge courses and certifications, more ET programs/seminars, provision of ET programs locally, facilitation of local events.

HOW TO INCLUDE MARGINALISED GROUPS

Discussion with the Ministry of Labor / General Secretariat for Combating Poverty responsible for social protection, social cohesion, integration and solidarity.

STAKEHOLDERS TO INCLUDE IN DECISION-MAKING

Bioeconomy professionals/workers of bioeconomy sectors, Local communities. Creation of a committee with interested parties; Recommendations to public bodies for the formulation of programs; Elementary/middle/high school students.

WHAT OTHER TOPICS TO INCLUDE

NA

HOW CAN MONITORING AND EVALUATION SYSTEMS BE IMPROVED

There is no national roadmap for the Bioeconomy in Greece. This needs to change. 360 thinking of possible impacts of ME. The accreditation system can create negative reflections on society.

HOW TO LINK CREATIVE INDUSTRIES

Integrating courses into schools; With interactive games and role-playing games and with relevant educational visits to cultural sites; The use of visual arts combined with educational material and local information to create understanding.

MOST IMPORTANT ASPECTS IN REGULATORY FRAMEWORKS

To put in place mechanisms/programs to raise awareness about the bioeconomy ET; To put in place a sufficient accreditation system for bioeconomy education and training.

ITALY

MOST IMPORTANT TOPICS TO INCLUDE IN CURRICULA

Sustainability, circular economy

MOST IMPORTANT EDUCATIONA LEVELS

Higher education, workplace training

WHERE DO WE NEED MORE FINANCING

Cultural and creative industries, and the whole ET system as a whole; VET/professional education/continuing education; Areas: architectural and urban planning, cultural planning, service&civic design, planning of participatory processes; Professionals: Manufacturers, installers, or companies that apply specific procedures effectively and successfully. Training of trainers; Different models of governance; Company experiences (by making contributions to the host company which invests time and resources in following people).

WHAT OTHER APPROACHES TO ADOPT

Balance theory and practice, avoid excessive theory, multidisciplinary/interdisciplinary; Approaches to focus on experiential pedogogy; Declination of professional profiles across all bioeconomy sectors; Focus on territorial competencies, hire teachers who have concrete and operational experience, not just those who knows the theory.

MOST IMPORTANT ASPECTS IN PARTNERSHIPS, COLLABORATIONS

Strengthening the collaboration of educational institutions and other organisations, entities; Strengthening the collaboration between education and training providers. Development cooperation, technology transfer; involve third sector entities.

HOW TO ALLOW POLICY COHERENCE

Set up a unified certification scheme valid through EU for VET and LLL; Enhance coordination of policies/governance mechanisms across ET in different bioeconomy sectors.

MOST IMPORTANT APPROACHES

Integrating informal learning, promoting collaboration between academia and other stakeholders (e.g. industry).

WHAT OTHER TOPICS TO INCLUDE

Adequate work organizational models; Soft skills and competencies (Project thinking, aptitude for design, methodologies of design thinking and participatory processes).

HOW TO INCREASE QUALITY/CAPACITY OF ET

Making programs more accessible and free, promoting and conveying these opportunities to be entrusted to different sector bodies, unions; Tutoring and accompaniment to job placement.

HOW CAN MONITORING AND EVALUATION SYSTEMS BE IMPROVED

NA

HOW TO INCLUDE MARGINALISED GROUPS

Identifying abilities: Carefully identify and enhance the person's real abilities, in order to obtain excellent job placement.

HOW TO LINK CREATIVE INDUSTRIES

Festivals of the mind and of philosophy could be centered on this theme. The kids could be made to work in the theatre.

STAKEHOLDERS TO INCLUDE IN DECISION-MAKING

Bioeconomy professionals/workers of bioeconomy sectors; Entrepreneurs; Environmental professionals; Focus groups and dedicated living labs.

MOST IMPORTANT ASPECTS IN REGULATORY FRAMEWORKS

To put in place mechanisms/programs to raise awareness about the bioeconomy ET; To put in place a sufficient accreditation system for bioeconomy ET.

NETHERLANDS

MOST IMPORTANT TOPICS TO INCLUDE IN CURRICULA

Sustainability, circular economy

MOST IMPORTANT APPROACHES

Multidisciplinary approach, promoting collaboration between academia and other stakeholders (e.g. industry).

WHAT OTHER TOPICS TO INCLUDE

NA

MOST IMPORTANT EDUCATIONA LEVELS

VET, higher education

WHERE DO WE NEED MORE FINANCING

Partnerships: linkage and coordination between the various educational areas and alternative educational areas; Educational levels and harmonization among them; Learning spaces: LLL for the network of professionals linked to the regional innovation hubs; Designing curriculums: Bioeconomy should be an integral part of the entire curriculum.

HOW TO INCREASE QUALITY/CAPACITY OF ET

Multidisciplinary approach

HOW CAN MONITORING AND EVALUATION SYSTEMS BE IMPROVED

A similar system of valuation and assessment of traditional training and alternative, hybrid and modular training. Open Badge system and Skills passports.

WHAT OTHER APPROACHES TO ADOPT

Building on already acquired knowledge in practice; Linking the different domains: design & technology and finance & economy and social; Holistic approach in teaching – explain "why" at various levels of abstraction. Many reasons for a transition to bioeconomy is not visible or tangible on a Daily basis. Making use of regional innovation hubs and create hybrid learning and development environments.

MOST IMPORTANT ASPECTS IN PARTNERSHIPS, COLLABORATIONS

Strengthening the collaboration between education and training providers; Strengthening the collaboration of educational institutions and other organisations, entities. Include in the training processes stakeholders who belong to the third sector, and especially to the world of NGOs; organize regional innovation hubs.

HOW TO INCLUDE MARGINALISED GROUPS

Adopting new approaches for inclusion

HOW TO LINK CREATIVE INDUSTRIES

Integrate subjects or guest lectures into creative training and involve the purchasing department that purchases work materials; Art is a way through which humans can make complex stories/concepts visible. Using relevant forms of expression such as a written article, book, etc.

HOW TO ALLOW POLICY COHERENCE

Harmonize policies/governance mechanisms throughout all educational levels; Set up a unified certification scheme valid through EU for VET and LLL. Design the system so that it is adaptive; Develop while doing; Create a design and get started - use the monitor & evaluate & improve mechanism to detect improvement steps and use them in a new loop.

STAKEHOLDERS TO INCLUDE IN DECISION-MAKING

Entrepreneurs, Bioeconomy professionals/workers of bioeconomy sectors; professors, chairs.

MOST IMPORTANT ASPECTS IN REGULATORY FRAMEWORKS

To put in place mechanisms/programs to raise awareness about the bioeconomy ET; Simplify administrative procedures and burden.

PORTUGAL

MOST IMPORTANT TOPICS TO INCLUDE IN CURRICULA

Sustainability, circular economy

MOST IMPORTANT APPROACHES

Making adult learning and LLL programs more accessible; Promoting collaboration between academia and other stakeholders (e.g. industry).

WHAT OTHER TOPICS TO INCLUDE

Scientific knowledge (Information on new value chains), Sustainability (social and financial sustainability).

MOST IMPORTANT EDUCATIONA LEVELS

Re-training, Community ET (through e.g. associations, CoPs)

WHERE DO WE NEED MORE FINANCING

Accessibility/awareness: We need to make Bioeconomy known to ordinary citizens and companies. Balancing theory and practice: Practical professional teaching, giving priority to sustainability. Educational levels: VET/professional education. Specific programs: CTESP levels in a wide range of bioeconomy fields (blue, agriculture, farm, etc). Specific topics: understanding climate change and its impacts (science-based and/or citizen-science and/or hands-on approach). Partnerships between industry and education.

HOW TO INCREASE QUALITY/CAPACITY OF ET

Making access easy to everyone.

HOW CAN MONITORING AND EVALUATION SYSTEMS BE IMPROVED

The efforts of ME needs to be accompanied by European regulations related to packaging, pollutants and fertilizers.

WHAT OTHER APPROACHES TO ADOPT

More professional education adapted to the needs of the labor market. Implementation of teaching methods beyond the training modules, such as workshops and conferences that bring together specialists and professionals; Extend train the trainers programs. More practical training modules as part of programs to accelerate business ideas that can lead to startups.

HOW TO INCLUDE MARGINALISED GROUPS

NA

HOW TO LINK CREATIVE INDUSTRIES

A study program between universities, where the Academy of Arts and TalTech material technology could open opportunities for students to use bioresources in the creation of materials and their use in the creation/design of products, e.g. seaweed lamp dome, fish skin dress, etc.

HOW TO ALLOW POLICY COHERENCE

Put in place a unified accreditation system across different regions (and the EU); Set up a unified certification scheme valid through EU for VET and LLL; There is a need for differentiation and even positive discrimination, more than a unified or standard system.

MOST IMPORTANT ASPECTS IN PARTNERSHIPS, COLLABORATIONS

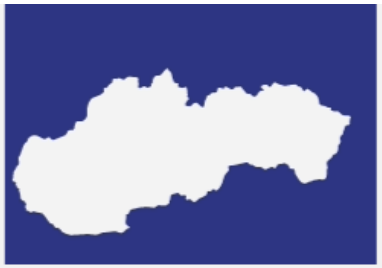
Strengthening the collaboration of educational institutions and other organisations, entities; Facilitating the exchange of good practices of bioeconomy education between different regions. Creating incentives for SMEs (otherwise they are always busy on a Daily basis), also to create indicators to verify if collaboration between stakeholders is really effective/productive leading to measurable results.

STAKEHOLDERS TO INCLUDE IN DECISION-MAKING

Bioeconomy professionals/workers of bioeconomy sectors, Local communities/wider society; Environmental and social sustainability activists; Academy.

MOST IMPORTANT ASPECTS IN REGULATORY FRAMEWORKS

Simplify administrative procedures and burden; To put in place mechanisms/programs to raise awareness about the bioeconomy ET.



SLOVAKIA

MOST IMPORTANT EDUCATIONA LEVELS

Training of trainers, workplace training

WHAT OTHER APPROACHES TO ADOPT

Building on already existing knowledge, what is already going well, do not touch. Integrating formal, non-formal and informal ET, which uses an innovative model based on education through a collaborative circular economy. Learning by doing, more synergy, open access and possibilities for failures of learners. Networking, good practices, community engagement.

HOW TO ALLOW POLICY COHERENCE

Harmonize policies/governance mechanisms throughout all educational levels; ME of educational levels; Validation of LLL.

MOST IMPORTANT TOPICS TO INCLUDE IN CURRICULA

Sustainability, soft skills

WHERE DO WE NEED MORE FINANCING

Partnerships: Connecting actors providing education; Monitoring and Evaluation; Educational levels: Supporting the green transformation of VET; Countryside/rural spaces for ET; Training of trainers, support for educators. Skills: development of competence for life, entrepreneurship and also the so-called hard competences in the field of bioeconomy; Specific programs: expansion of micro programs also at formal school institutions; retraining of target audiences, entrepreneurial mindset, adaptability and sustainability competences.

MOST IMPORTANT ASPECTS IN PARTNERSHIPS, COLLABORATIONS

Strengthening the collaboration of educational institutions and other organisations, entities; Facilitating the exchange of good practices of bioeconomy education between different regions. Collaborative circular economy; Linking with policies to give a louder voice. Alignment between the contents provided by different actors in bio-economy education. Collaboration of actors offering education in the field of bio-economy on different projects; Stakeholders' meetings to coordinate the potential common ground actions to be taken.

MOST IMPORTANT APPROACHES

Promoting collaboration between academia and other stakeholders (e.g. industry); Integrating informal learning; Making adult learning and LLL more accessible.

HOW TO INCREASE QUALITY/CAPACITY OF ET

NA

HOW TO INCLUDE MARGINALISED GROUPS

Key issues and topics are pretty much the same in this case as in general in the society (equity, gender issues, LGBTQI+, minorities, migrants, etc.). Be inclusive, and operation-wise too.

STAKEHOLDERS TO INCLUDE IN DECISION-MAKING

Bioeconomy professionals/workers of bioeconomy sectors, Local communities/wider society; The QUINTUPLE HELIX model for educational collaboration.

WHAT OTHER TOPICS TO INCLUDE

Tehcnical knowledge (circular biowaste, knowledge on cooperatives), Sustainability and green competencies.

HOW CAN MONITORING AND EVALUATION SYSTEMS BE IMPROVED

Validation of life-long learning outcomes.

HOW TO LINK CREATIVE INDUSTRIES

Culture forms the basis for development - the combination & facilitation & cultivation of the different aspects (history, music, poetry, visual arts, architecture, etc.).

MOST IMPORTANT ASPECTS IN REGULATORY FRAMEWORKS

Simplify administrative procedures and burden; To incentivize (e.g. through tax benefits) innovative and sustainable education and training systems in bioeconomy.

8 Conclusion

In order to address the variety of complex “wicked” global challenges of our day, ranging from climate crisis and resource depletion to pandemics and economic inequality, the need to establish robust and innovative education and training systems is imperative, which can then educate and train the learners, practitioners and professionals of the bioeconomy sectors. Towards this direction, effective and participatory governance mechanisms in bioeconomy ET are needed, for a systematic and structured transition of the whole learning eco-systems. This report proposed a governance model in the context of the bioeconomy, and explored what potential components the model could consist of, by relying on the data collected by the stakeholders of the bioeconomy sectors through an online survey. The report then proposed guidelines that would allow the transition of the governance systems in ET towards addressing the needs of the sector.

The results revealed the need to enhance networking, collaboration, sustainability, entrepreneurship, and innovative learning methods in the sector. These results emphasize that to realise the much-needed transition of the bioeconomy sectors towards sustainability solutions, development of methods, approaches, methodologies and policies that support initiatives for learner-centred and multi and interdisciplinary education, that is flexible, non-traditional, and supported by non-formal and life-long learning approaches, is needed.

The results also suggested the necessity to establish functioning regulatory frameworks, monitoring and evaluation systems and funding mechanisms that are reliable, transparent and simplified to support the innovativeness of these systems, and that are inclusive in terms of involving the stakeholders of the bioeconomy sectors in decision-making processes.

In addition, while cross-cutting knowledge and efforts on the European level proves to be essential, the differences among regional contexts, which have also come out as a result of this study, calls for a need to design tailor-made solutions specific to regional or national needs. This requires knowledge and experience acquired on all local, national and EU levels, and the need for stakeholders of the sector to collaborate across all these levels to find mutual solutions and to share good practices.

Hence, the need for a collaborative approach was apparent across the whole governance system, that calls for cooperation and collaboration, not only among industry, academia and policymakers, but also among bioeconomy workers, professionals, practitioners, local actors and learners. This study also revealed the need to include marginalised groups in the decision and curriculum-making efforts in the bioeconomy sectors and to set up platforms or settings where their voice and needs can be heard and integrated into the ET systems.

The conceptual framework which is applied to the governance of education and training in the bioeconomy included a wide range of elements shown to be complementary. In addition, the framework incorporated different levels of governance, including first, institutional governance by focusing on the infrastructure, second, a process driven framework in which continuous monitoring and learning by doing are key elements, third, a framework which is based on the practice of collaboration between stakeholders and inclusion of all groups in the society. Hence, through these elements, the guidelines presented aimed at providing relevant tools to manage and govern the lifelong learning of a diverse sector that is in transition.
The study has some limitations. While the study provided the relative importance of issues faced in the field, applying inferential statistical tests was not possible. The sample size not being too large, and the sample's composition, including numerous countries, made it difficult to arrive at statistically significant conclusions. However, the results allowed us to arrive at cross-cutting solutions across the EU in addition to capturing regional differences, which requires collaboration on different levels across the ET systems. Besides, the study provided

an important step to start identifying major issues and challenges in the governance of bioeconomy sectors from different regional contexts, raising attention to key policy issues, and providing important insight for future research.

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10 Annex

10.1 Annex 1. Technical Notes on the Methodology: Details of Bioeconomy Education and Training Governance Framework

Under this section, we explain in detail, each of the components of the Governance of Bioeconomy Education (Training and Mentoring) Framework, as well as what each of the components consist of. In this section, we also provide references to strategic documents, frameworks and EU project results, that are supporting the inclusion of elements/components in our framework. Below, the different layers and sections of our framework is provided in detail.

The Governance Model

This part of the framework constitutes the main body of the governance framework. The second part of the framework (that is formed by the outer circle seen in Figure 1), titled "impact of the governance model" is the secondary part of the framework, that aims to ensure the effective functioning of the framework. In other word, the components found in the outer circle of the framework are placed there in order to make sure that the components in the "governance model" can create the desired impacts.

Below, the three main components of the governance model, and their sub-components are provided in detail.

Component I: Effectiveness of education governance

A. Capacity and quality of innovative educational content & approaches

This component focuses on the following elements, which are crucial for governance of bioeconomy education and training:

- Designing new curriculums that adopt innovative learning approaches (integrating formal, informal, non-formal education – linking educational programmes to real life examples through internships, mentorship, apprenticeship, student-centered learning and modular programmes)
- Integration of digital skills and transversal soft skills into the curricula
- Integrating these curriculums (and programmes) into all levels of the education and training system (starting from early ages – Pre-University – to Vocational Education, University, Lifelong-learning programmes – including mentoring programmes, and training of trainers)

While the Capacity component is adapted from the OECD principles on governance (OECD, 2015), and the Strategic Education Governance Framework (OECD, 2019), the concept of innovative educational content and approaches is adapted from the outputs of the WP4 of the NextFOOD Project (https://www.nextfood-project.eu/) (in the scope of which UNIBO has been the WP leader), which produced findings on New Instruments' Design and Implementation Options for policy assessment and recommendation in agri-food and forestry education and training systems (https://www.nextfood-project.eu/wp-content/uploads/2022/06/d4.4.pdf).

B. Capacity and quality of educational infrastructure

Capacity of educational structures refer to the capacity and infrastructure of educational centers (or spaces), which are fully equipped to provide its learners with the aimed skills and competencies. These spaces can be offline or online spaces, or schools or knowledge hubs, or community centers, where learning (formal, informal or non-formal) can take place.

While the Capacity component in general is adapted from the OECD principles on governance (OECD, 2015), and the Strategic Education Governance Framework (OECD, 2019), the concept of educational structures is adapted from the BIOBec Project (https://biobec.eu/) (in the scope of which UNIBO is the coordinator). BIOBec proposes a holistic framework that merges the traditional idea of an education centre, with that of a knowledge hub. In a nutshell, the Project aims to establish multi-level Bio-Based Education Centres (BBECs) to act as knowledge hubs bridging the gaps between academic institutions, students, innovation entities and policy makers. Likewise, the BBECs will be flexible enough to answer the actual and future needs of the industry and surrounding ecosystem at local, regional and national levels. Hence, for this component, the BioGov.net Project will build on the relevant findings from the BIOBec Project.

C. Capacity and quality of educators

Capacity and quality of educators refer to the capacity (and quality) of teachers, trainers, professors and educators in the educational and training systems in bioeconomy. This section aims to identify the main issues that need to be addressed in the scope of bioeconomy education and training governance, in order to train teachers and educators that are equipped to train the future professionals of the sector.

This component is added to the model to make sure that the conceptual framework clearly addresses the issue of training of trainers.

Component II: Efficiency of education governance

A. Monitoring, evaluation and quality assurance

This component is dedicated to promoting relevant institutions for monitoring and evaluation that are endowed with sufficient capacity, appropriate degree of independence and resources as well as the necessary instruments. Besides, developing reliable monitoring and reporting mechanisms to effectively guide decision-making is of utmost importance.

This component is a component adapted from the OECD principles on governance (OECD, 2015). The framework was adapted and updated to be utilized in the scope of preparing guidelines for improving of the bioeconomy education and training governance systems.

B. Financing

This component refers to ensuring that governance arrangements help mobilise financing for the bioeconomy education and training systems, and allocate financial resources in an efficient, transparent and timely manner.

The component is taken from OECD principles on governance (OECD, 2015).

C. Regulatory frameworks, administrative procedures

This component refers to ensuring that sound educational regulatory frameworks are effectively implemented and enforced in a transparent and accountable way. Promoting innovative ways to co-operate, to pool resources and capacity, to build synergies across sectors and ministries, municipalities for efficient implementation of the necessary regulatory frameworks.

This involves also simplifying the bureaucratic process to allow for a better interaction between educational institutes and or experts; and putting in place an accreditation system and integrated qualification framework and a unified certification scheme (across Europe) to ensure the provision of qualified education and training. It also includes, balancing short-term priorities with long-term perspectives in educational policy-making – creating, sharing and consolidating a system vision, adapting to changing contexts and new knowledge.

This component is adapted from the OECD principles on governance (OECD, 2015) and the outputs of the WP4 of the NextFOOD Project (https://www.nextfood-project.eu/) (in the scope of which UNIBO has been the WP leader), which produced findings on New Instruments' Design and Implementation Options for policy assessment and recommendation in agri-food and forestry education and training systems (https://www.nextfood-project.eu/wp-content/uploads/2022/06/d4.4.pdf).

D. Harmonization of policies and policy coherence

This component refers to ensuring coordination and harmonization of policies/governance mechanisms across education and training in different bioeconomy sectors, across different educational levels, as well as across different regions.

This component is adapted from the "policy coherence" component of the OECD principles on governance (OECD, 2015) and the "strategic thinking" component of the Strategic Education Governance Framework (OECD, 2019).

Component II: Collaboration and engagement and multi-stakeholder education governance

A. Partnerships and multi-stakeholder collaborations

This component refers to establishing partnerships and multi-stakeholder collaborations for governance of bioeconomy education and training systems. More specifically, these partnerships and collaborations include, spreading and improving university collaborations with industry, NGOs, local communities, bio-based sector professionals; enhancing international cooperation; financing international exchanges between universities; incentivizing joint lessons of classes from different countries; and enhancing Private-Public partnerships.

This component is adapted from the outputs of the WP4 of the NextFOOD Project (https://www.nextfood-project.eu/) (in the scope of which UNIBO has been the WP leader), which produced findings on New Instruments' Design and Implementation Options for policy assessment and recommendation in agri-food and forestry education and training systems (https://www.nextfood-project.eu/wp-content/uploads/2022/06/d4.4.pdf).

B. Social inclusion, inclusion of minorities and underprivileged groups

This component aims to make sure that minorities and underprivileged groups are included in the governance mechanisms of bioeconomy education and training. In other words, the necessary mechanisms need to be put in place to continuously evaluate and monitor the inclusion and the impact created on the targeted stakeholders (in the scope of the BioGov.net project, minorities and underprivileged groups); hence, this component of the governance framework carries key importance.

C. Multi-stakeholder policy-making (and decision-making); inclusion of stakeholders in policy-making (and curriculum-making)

This component refers to stakeholder engagement for informed and outcome-oriented contributions to educational policy design and implementation. In this regard, collaboration among actors and integrating entrepreneurs, local communities, students and bioeconomy professionals in decision-making mechanisms in the education and training system is key.

This component is adapted from the "stakeholder engagement" component of the OECD principles on governance (OECD, 2015) and the "decentralization of decision-making" component of the Education Policy Outlook 2015: Making reforms happen (OECD, 2015). However, details with regard to education and training policies and governance has been adapted from the outputs of the WP4 of the NextFOOD Project (https://www.nextfood-project.eu/) (in the scope of which UNIBO has been the WP leader), which produced findings on New Instruments' Design and Implementation Options for policy assessment and recommendation in agri-food and forestry education and training systems (https://www.nextfood-project.eu/wp-content/uploads/2022/06/d4.4.pdf).

D. Establishing the necessary links and collaborations with arts, humanities and eco-design approaches

This component will address the question of how can arts, humanities, culture and eco-design approaches and solutions can be integrated into the bioeconomy education governance mechanisms, and which kinds of impacts can this have on the bioeconomy education (training and mentoring).

Impact of the governance model

This section of the conceptual framework consists of the components of value propositions, target stakeholders, channels scaling outreach, assessment of outcomes & impact and adaptation of the governance framework. This part of the framework is in charge of making sure that the governance model creates the desired outcomes.

Value Propositions: Value that is aimed to be created for the key stakeholders.

Value propositions refer to the value that is aimed to be created for the stakeholders, as well as the societal problems we are going to help solve. Having this component in the framework is of utmost importance as through value propositions, it will be possible to determine the value to be created for the key stakeholders of the system, starting with the beginning of the process. Identifying these in the beginning of the process also will allow us to measure or assess the impact created (and whether it was the impact aimed for) in the end of the process.

Value propositions is an integral part of the Business Model Canvas (BMC) (Osterwalder and Pigneur, 2010) and has been integrated into our governance framework due to its aforementioned importance.

Target stakeholders/beneficiaries/actors: For whom we are creating value; who are our most important beneficiaries/stakeholders.

It is of utmost importance to establish our target stakeholders and beneficiaries in the beginning of the process. This will allow for the evaluation and monitoring of both planned and unplanned impact on target beneficiaries. This component will be critical for the assessment of impact (and change).

Target stakeholders/beneficiaries is also an integral part of the Business Model Canvas (BMC) (Osterwalder and Pigneur, 2010) and has been integrated into our governance framework due to its aforementioned importance.

Channels, scaling, outreach

This component aims to identify through which channels do we deliver bioeconomy education and training governance; how we are reaching out to our beneficiaries; how are these channels integrated (and how are they integrated with the already ongoing systems).

This component is an integral part of the Business Model Canvas (BMC) (Osterwalder and Pigneur, 2010) and has been integrated into our governance framework due to its importance.

Assessment of outcomes and impact

This component aims to continuously assess the outcomes of the governance framework and the impact it creates on its main stakeholders (and beneficiaries).

Adaptation of the governance framework

This component aims to continuously assess the changing needs and contexts of the bioeconomy sector (and educational and skill needs associated with it) and aims to update the framework components if and when necessary, in an iterative way, to make sure that the bioeconomy education and training governance framework is always up-to-date and that it can create the intended impacts. In this way, the governance framework also will remain a dynamic framework instead of becoming a static one.

This component is adapted from the Integrative Framework for Collaborative Governance (Emerson et al., 2012), who identify potential for a transformative change, as adaptation to impacts is fostered by the governance regime. They provide the example that based on the impacts of an action, problems can be solved, new research findings can arise, and different set of challenges and opportunities may arise, which then need adaptations to the governance regime.

10.2 Annex 2. The Questionnaire on governance of education and training in bioeconomy

This questionnaire is prepared in the scope of the BioGov.net project, which aims to establish innovative governance models in the bioeconomy by providing an inclusive training and mentoring framework in specific European regions and building a bridge between knowledge and skills in the bioeconomy, secured by effective governance. The project will have a role in enabling better-informed decision-making processes, improving the social engagement of all actors and increasing the uptake of sustainable innovations in the bioeconomy.

This questionnaire aims to identify the needs, opportunities, expectations and solutions that stakeholders encounter regarding the governance of education and training in the bioeconomy. The data collected via the questionnaire will be used to prepare guidelines for the training governance framework.

The questionnaire will take around 15-20 minutes. We appreciate your participation and contribution to this work.

Privacy and confidentiality

Your answers to the questionnaires will be recorded. Your recorded data will not be identified, so it will not be possible to identify you later. The information will be processed during the analysis phase. It will not be possible to identify the source of the information. The results of this investigation can be published in scientific journals or conferences and used in further studies. None of the personal data provided will be transferred to third parties. We also specify that any consent expressed by you is freely given and can be revoked at any time without this entailing any disadvantage or prejudice and without prejudice to the lawfulness of the treatment based on the consent given before the revocation. Requests relating to the exercise of these rights may be presented to the Data Controller by contacting Alma Mater Studiorum - University of Bologna - registered office: via Zamboni 33, 40126 - Bologna, Italy; email: privacy@unibo.it; PEC: scriviunibo@pec.unibo.it.

1. **Consent to the processing of personal data: Choose one of the options below.**
   Please note that only if you give consent (choose option a), you will continue with the questionnaire. If you choose the second option (option b) and therefore decide not to consent to the use of the data you provide, you will be asked not to participate and will be redirected to the end of the questionnaire.

   a. Having read the information regarding the processing of personal data, I GIVE CONSENT to the use of personal data for the sole purposes connected to the project and any research associated with it.
   b. I DO NOT CONSENT to the use of personal data for the sole purposes connected to the project.

Section A. Respondent information

2. Which type(s) of stakeholder are you?*

Research and higher educational organizations [ ]

Vocational education organizations [ ]

Business organisation [ ]

Union/trade union [ ]

Policy makers and administrations [ ]

NGOs & marginalised groups [ ]

Active Communities, Cultural and creative sectors [ ]

Citizens & Wider Society [ ]

Other (please specify) _____ [ ]

3. Follow up of question 2: If you are an education organisation/provider, please indicate which type/level of education you offer or are specialised in:

_____

4. Which country are you based in?*

_____

5. Which region are you based in?*

_____

6. In which field(s) do you have experience/expertise?*

Education [ ]

Research [ ]

Communication [ ]

Policy [ ]

Production [ ]

Arts, design, architecture [ ]

Citizens' engagement and inclusion of marginalised/disadvantages groups [ ]

Other (please specify) _____ [ ]

7. Do you have any experience/expertise in any of the bioeconomy sectors (e.g. agri-food, forestry, bio-based products, marine bioeconomy)?

Yes [ ]

No [ ]

8. (If yes) Please indicate in which bioeconomy sector you have experience/expertise in:

_____

9. Age

<30

31-40

41-50

51-60

>60

10. Gender

Male [ ]

Female [ ]

NA/I rather not answer [ ]

11. The highest level of studies you have completed.

Primary education [ ]

Secondary education/high school [ ]

Bachelor (Undergraduate) [ ]

Master [ ]

PhD [ ]

Other _____

Section B: Education and training needs

12. Please rate the different types of education and training options provided below according to which ones are important/most needed in the field of bioeconomy in your region.

	Not at all important	Slightly important	Moderately important	Important	Very important	Absolutely essential	I don't know/No opinion
Vocational education and training (VET)							
Higher education							
Workplace training							
Re-training (teaching new skills to change paths)							
Training of trainers							
Community education and training (education and training promoted through communities of practice, associations, organisations)							

Section C. Governance model – Effectiveness

Capacity /quality of educational content and approaches

13. Please rate the importance of the below topics in terms of designing new courses and curricula in bioeconomy education and training in your region (with a special focus on vocational education and training and life-long learning).

Integration of the following topics in the curricula:	Not at all important	Slightly important	Moderately important	Important	Very important	Absolutely essential	I don't know /No opinion
Sustainability (e.g. sustainable production methods, responsible use of resources, environmental/social impact assessments)							
Circular economy							
Inclusivity (e.g. gender)							
Soft skills (e.g. communication, networking, systems thinking, critical thinking, management)							
Digital skills and literacy							
Practical Skills and hands-on experience on bioeconomy-related tools and technologies (e.g. laboratory techniques, data analysis, problem-solving)							
Global perspective							
Ethical implications of bioeconomy-related practices and technologies							
Entrepreneurial skills and promote a culture of innovation							

14. (optional) Is there any other item with regard to the design of courses and curricula in bioeconomy (in vocational education and lifelong learning) that, in your opinion, is worthwhile mentioning?

_____

15. Please rate the importance of the below approaches in providing bioeconomy training and education in your region (with a special focus on vocational education and training and life-long learning)

	Not at all important	Slightly important	Moderately important	Important	Very important	Absolutely essential	I don't know/ No opinion
Utilising a flexible modular approach* (*dividing the curriculum into independent/short modules)							
Adopting learner-centered approach* (*Tailor-made according to the needs of the learner)							
Integrating informal learning (e.g. peer to peer learning, learning by doing)							
Making adult learning and lifelong learning programs more accessible							
Multidisciplinary approach (e.g. establishing links between different disciplines, fields, sectors)							
Promoting collaboration between academia, industry, and government (e.g. Promoting the inclusion of practitioners as facilitators or teachers in courses)							

16. (optional) Is there any other item with regard to approaches in bioeconomy education and training (with a focus on vocational education and lifelong learning) that, in your opinion, is worthwhile mentioning?

_____

Capacity /quality of educational infrastructure/educators

17. Please indicate to what extent you agree or disagree with the statements below:

In my region:	Strongly disagree	Disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Agree	Strongly agree	I don't know /No opinion
There is sufficient capacity of educational institutes/centers providing educational and training activities in the field of bioeconomy								
The educators of bioeconomy are provided with sufficient opportunities to continuously update their knowledge and competence regarding bioeconomy.								
There is a need to certify trainers/educators to ensure they are aligned with real needs of the bioeconomy sectors.								

18. (optional) Please indicate (if relevant) how capacity/quality of education and training infrastructure can be improved in your region?

Section D. Governance model - Efficiency

Monitoring and evaluation

19. Please indicate to what extent you agree or disagree with the statements below:

In my region:	Strongly disagree	Disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Agree	Strongly agree	I don't know /No opinion
It is essential to have a monitoring and evaluation system of								

In my region:	Strongly disagree	Disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Agree	Strongly agree	I don't know /No opinion
bioeconomy education and training in place								
There is an effective monitoring and evaluation system of bioeconomy education and training in place								

20. (optional) Please indicate (if relevant) how the monitoring and evaluation system of bioeconomy education and training can be improved in your region:

Financing

21. Please indicate how sufficient in your opinion is funding opportunities of bioeconomy education and training in your region?

□ Not at all sufficient

□ Slightly sufficient

□ Moderately sufficient

□ Sufficient

□ Very sufficient

□ Completely sufficient

□ I don't know / I don't' have an opinion.

22. Please indicate below the main areas/educational levels or aspects where better/improved financing is needed in your region in terms of bioeconomy education and training.

Regulatory framework / administrative procedures

23. Please rate the importance of the below topics with regard to the regulatory framework of bioeconomy education and training for your region

	Not at all important	Slightly important	Moderately important	Important	Very important	Absolutely essential	I don't know / No opinion
Ensure transparency and accountability in administrative procedures							
Simplify administrative procedures and burden							
Improve privacy regulations							
Balance short-term priorities with long-term perspectives in bioeconomy education and training							
To incentivize (e.g. through tax benefits) innovative and sustainable education and training systems in bioeconomy							
To put in place mechanisms/programs to raise awareness about the bioeconomy education and training							
To put in place a sufficient accreditation system for bioeconomy education and training							

24. (optional) Is there any other item with regard to regulatory frameworks and administrative procedures in bioeconomy education and training that, in your opinion is worthwhile mentioning?

_____

Harmonization of policies and policy coherence

25. Please indicate below to what extent you agree or disagree with the statements with regard to the harmonization of policies and policy coherence in bioeconomy education and training.

In my country, there is a need to:	Strongly disagree	Disagree	Slightly Disagree	Neither agree nor disagree	Slightly Agree	Agree	Strongly agree	I don't know /No Opinion
Harmonize policies/governance mechanisms throughout all educational levels								
Harmonize governance mechanisms across different regions (and the EU)								
Enhance coordination of policies/governance mechanisms across education and training in different bioeconomy sectors								
Strengthen the coordination among the member states to harmonize policies in vocational education and life-long learning								
Set up a unified certification scheme valid through EU for vocational education and life-long learning								
Put in place a unified accreditation system across different regions (and the EU)								
Put in place a unified integrated qualification framework across different regions (and the EU)								

26. (optional) Is there any other item with regard to the harmonization of policies in bioeconomy education and training that, in your opinion is worthwhile mentioning?

_____

Section E. Governance model – Collaboration and engagement

Partnerships and multi-stakeholder collaborations

27. Please rate the importance of the below topics with regard to partnerships and multi-stakeholder collaborations in bioeconomy education and training for your region

	Not at all important	Slightly important	Moderately important	Important	Very important	Absolutely essential	I don't know/ No opinion
Facilitating the exchange of good practices of bioeconomy education between different regions							
Strengthening the collaboration of educational institutions and other organisations/entities (e.g. industry, NGOs) (through joint projects or joint activities, e.g. scholarships, internships, guess lectures, thesis)							
Strengthening the collaboration between education and training providers (e.g. collaborations between University departments)							
Establishing bridges between different levels of bioeconomy education (e.g. University and life-long learning)							
Supporting educational institutions to pursue international cooperation (e.g. international exchanges between universities or joint classes of different countries)							
Enhancing public-private partnerships for bioeconomy education and training							
Promotion of public dialogues to increase the understanding of bioeconomy (and bioeconomy education)							
Putting in place necessary feedback mechanisms that allow							

	Not at all important	Slightly important	Moderately important	Important	Very important	Absolutely essential	I don't know/ No opinion
stakeholders to voice their needs and opinions							
Setting platforms (e.g. permanent table) with diverse stakeholders to allow multi-stakeholder discussions							

28. (optional) Please indicate in the box below, what are, in your opinion, important steps to be taken or topics or issues to be improved in terms of multi-stakeholder collaborations in bioeconomy education and training in your region.

Multi-stakeholder decision-making

29. Please rate the importance of integrating the below-listed stakeholders in decision-making/curriculum-making in bioeconomy education and training in your region

	Not at all important	Slightly important	Moderately important	Important	Very important	Absolutely essential	Not at all important	I don't know /No opinion
Entrepreneurs								
Local communities/wider society								
Life-long learners								
Bioeconomy professionals/workers of bioeconomy sectors								
Professionals in cultural and creative industries								

30. (optional) Please indicate in the box below which other stakeholders (if any) should be integrated into decision-making processes in education and training of bioeconomy; and in which ways multi-stakeholder decision-making can be facilitated or supported.

Social inclusion, inclusion of minorities and underprivileged groups

31. Please rate the importance of the below topics with regard to the inclusion of marginalized groups and underprivileged groups in bioeconomy education and training

To put in place mechanisms to:	Not at all important	Slightly important	Moderately important	Important	Very important	Absolutely essential	I don't know /No opinion
Increase the inclusion of marginalized groups in bioeconomy education and training							
Prioritise the needs and voice of marginalized groups when making strategic decisions (e.g. curriculum making, policy-making)							

32. (optional) Please indicate in the box below what are key topics or issues to be discussed or addressed with regard to the inclusion of marginalised groups in bioeconomy education and training; and what can be some steps to be taken in order to facilitate this process.

Establishing necessary links and collaborations with arts, culture, humanities, and eco-design options

33. Please indicate to what extent you agree or disagree with the statements below:

	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree	I don't know /No opinion
I know of examples/cases where cultural and creative industries offer possibilities for the bioeconomy						
In the work that I do, there are examples/cases where cultural and creative industries offer possibilities for the bioeconomy						
I am unaware of the connection between cultural and creative industries and the bioeconomy						

	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree	I don't know /No opinion
I would like to learn more about the possible uses of cultural and creative industries for bioeconomy, if it was offered as a course/teaching activity						
In my opinion, establishing links to, and collaborations with cultural and creative industries offer possibilities for the development, innovativeness and sustainability of bioeconomy						

34. (option) Please discuss/explain if you have any suggestions on how to integrate culture or art in bioeconomy education and training:

If you have missed any topics in the questionnaire or have any feedback, please leave it here before the survey ends.

If you would like to follow-up on the results of this survey, please write down your e-mail address in the space provided below.

10.3 Annex 3. Detailed tables of results of the data analysis

10.3.1 The relative importance Index

The box below provides a short description of the Relative Importance Index used in this study.

Box 1. The Relative Importance Index

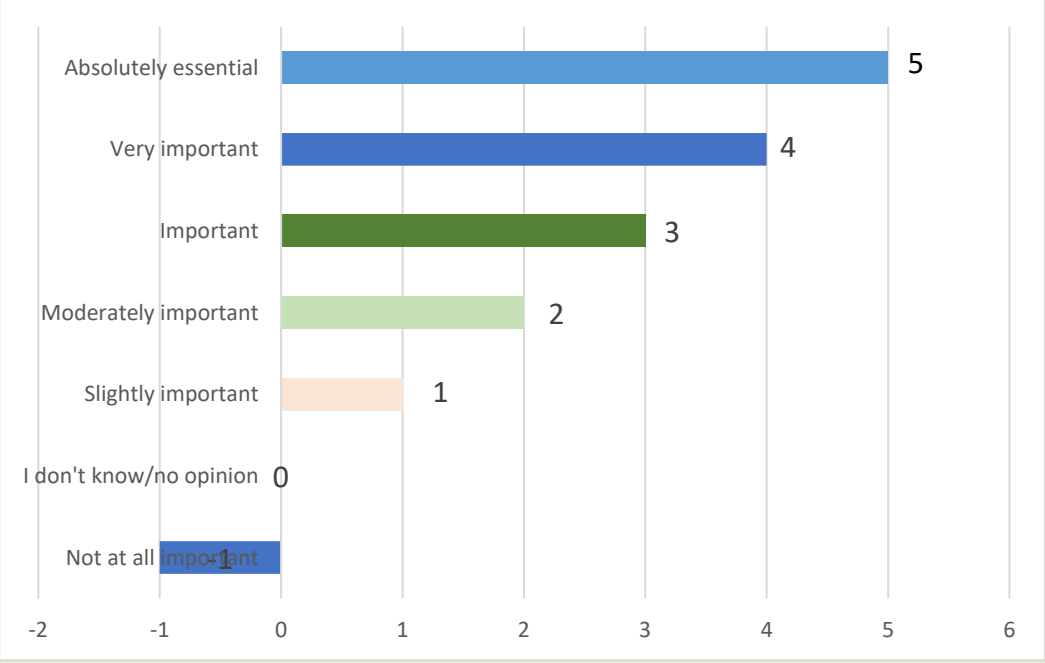
THE RELATIVE IMPORTANCE INDEX

The Relative Importance Index allocates a value (from 0 to 5) to each of the answers as shown in the Table below, in order to calculate the relative importance of each of the ET levels provided in bioeconomy, according to the perception of the respondents.

The relative importance index values allocated to each of the Likert Scale-type answers.

RELATIVE IMPORTANCE INDEX
I don't know=0
Not at all important = -1
Slightly important = 1
Moderately important =2
Important=3
Very important=4
Absolutely essential =5

The relative importance index values allocated to each of the Likert Scale-type answers.



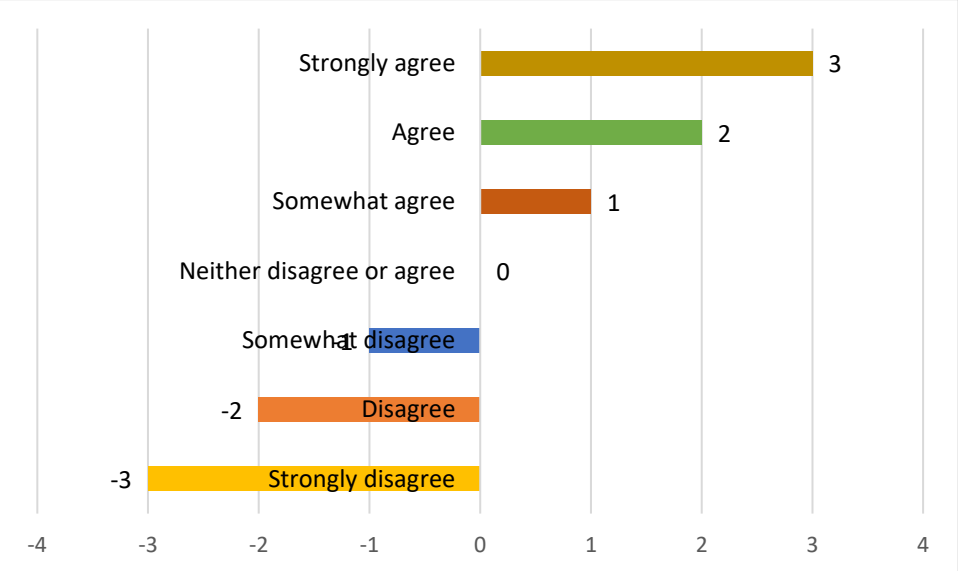
THE RELATIVE AGREEMENT INDEX

The Relative Agreement Index allocates a value (from 0 to 5) to each of the answers), in order to calculate the relative importance of each of the ET levels provided in bioeconomy, according to the perception of the respondents.

The relative importance index values allocated to each of the Likert Scale-type answers.

RELATIVE AGREEMENT INDEX
Strongly disagree= -3
Disagree= -2
Somewhat disagree= -1
Neither disagree nor agree= 0
Somewhat agree= 1
Agree= 2
Strongly agree= 3

The relative importance index values allocated to each of the Likert Scale-type answers.



10.3.2 Effectiveness of Governance in Bioeconomy Education and Training

10.3.2.1 Capacity of educational content

i. Which are the most needed/most important ET levels provided in the field of bioeconomy?

Table 10. The calculation of the Relative Importance, by using the Relative Importance Index, to explore how different types of ET options in bioeconomy are rated according to how important/needed they are in the field of bioeconomy.

	VET	Higher education	Workplace training	Re-training (teaching new skills to change paths)	Training of Trainers	Community education and training (education and training promoted through communities of practice
Not at all important	-2	-3	-2	-1	0	-1
Slightly important	5	5	3	2	10	3
Moderately important	10	30	26	36	28	30
Important	111	123	108	93	84	126
Very important	228	212	228	272	216	264
Absolutely essential	265	245	260	230	270	205
I don't know/No opinion	0	0	0	0	0	0
TOTAL INDEX VALUE	617	612	623	632	608	627
MEAN INDEX VALUE	4.006493506	3.621301775	3.686390533	3.73964497	3.597633136	3.710059172

Table 11. The Relative Importance Index of which educational levels are placed the most importance by the respondents, according to which stakeholder group they belong to

	VET	Higher education	Workplace training	Re-training	Training of trainers	Community ET
Active Communities, Cultural and creative sectors	4	3.777777778	4.111111111	3.666667	3.888888889	3.777777778
Business organisation	3.857142857	3.380952381	3.857142857	4.095238	3.285714286	3.714285714
Citizens & Wider Society	3.283018868	3.132075472	3.396226415	3.433962	3.358490566	3.58490566
NGOs & marginalised groups	3.6	3.933333333	3.466666667	4.133333	3.333333333	3.733333333
Other	3.631578947	3.736842105	4.105263158	4.105263	3.947368421	4.052631579
Policy makers and administrations	3.714285714	3.571428571	3.214285714	3.357143	3.285714286	3.285714286
Research and higher educational organizations	4.208333333	4.416666667	3.833333333	3.583333	3.875	3.916666667
Union/trade union	5	4	5	5	4	5
Vocational education organizations	4.230769231	3.923076923	4.076923077	4.076923	4.461538462	3.615384615

Table 12. The Relative Importance Index of which educational levels are placed the most importance by the respondents, according to which country they are based in.

Countries	VET	Higher education	Workplace training	Re-training	Training of trainers	Community ET
Czech Republic	3.390243902	2.975609756	3.390243902	3.317073	3.073170732	3.317073171
Estonia	3.666666667	4.166666667	3.5	3.666667	4	3.5
Germany	4.333333333	3.333333333	3.833333333	4.166667	3.333333333	3
Greece	3.840909091	3.75	3.522727273	3.886364	3.75	3.818181818
Italy	4.133333333	4.333333333	4.333333333	4	3.933333333	3.866666667
Netherlands	4.545454545	4.363636364	3.636363636	3.454545	3.727272727	3.818181818
Portugal	3.466666667	3.733333333	4.066666667	4.266667	3.533333333	4.133333333
Slovakia	3.238095238	3.380952381	3.952380952	3.809524	4.047619048	4

Table 13. The Relative Importance Index of which educational levels are placed the most importance by the respondents, according to whether they are experienced in any of the bioeconomy fields.

	VET	Higher education	Workplace training	Re-training	Training of trainers	Community ET
No	3.481012658	3.35443038	3.443037975	3.658228	3.253164557	3.455696203
Yes	3.928571429	3.845238095	3.880952381	3.809524	3.869047619	3.964285714

Table 14. The Relative Importance Index of which educational levels are placed the most importance by the respondents, according to which age group they belong to.

	VET	Higher education	Workplace training	Re-training	Training of trainers	Community ET
<30	2.944444444	3.833333333	4.277777778	4.222222	3.611111111	4.055555556
>60	4.5	3.875	4.125	3.8125	4.3125	4
31-40	3.773584906	3.566037736	3.830188679	3.886792	3.660377358	3.679245283
41-50	3.755102041	3.734693878	3.224489796	3.44898	3.510204082	3.653061224
51-60	3.575757576	3.303030303	3.606060606	3.636364	3.272727273	3.515151515
(blank)						
Grand Total	3.710059172	3.621301775	3.686390533	3.739645	3.597633136	3.710059172

Table 15. The Relative Importance Index of which educational levels are placed the most importance by the respondents, according to the highest educational level they completed.

	VET	Higher education	Workplace training	Re-training	Training of trainers	Community ET
Bachelor (Undergraduate)	3.75862069	3.655172414	3.896551724	3.758621	3.448275862	3.689655172
Master	3.64	3.706666667	3.76	3.773333	3.666666667	3.64
Other	3.75	3.625	3.75	4.25	3.875	4.25
PhD	4.108108108	3.891891892	3.513513514	3.594595	3.783783784	3.864864865
Primary education	1.333333333	-0.333333333	1.666666667	2.666667	2	3
Secondary education/high school	3.470588235	3.294117647	3.705882353	3.823529	3.294117647	3.588235294

	VET	Higher education	Workplace training	Re-training	Training of trainers	Community ET
Grand Total	3.710059172	3.621301775	3.686390533	3.739645	3.597633136	3.710059172

Table 16. Importance attributed to different ET levels by respondents with various profiles.

	Stakeholder Groups	Countries	Whether they have expertise in bioeconomy	Age	Highest level of studies completed
VET as the most important	Research and higher education organizations	Germany and Netherlands	Both for those that have expertise in bioeconomy and those that do not	Over 60, 40-50	
Higher education as the most important	Research and higher education organizations	Italy and Netherlands			
Workplace training as the most important	VET organisations and stakeholders from active communities, cultural and creative sectors	Italy and Portugal		31-40, Below 30	Bachelor's degree holders
Re-training (to change paths)	NGOs and marginalised groups	Germany and Portugal		31-40, Below 30	Master holders
Training of trainers as the most important	VET organizations	Estonia and Slovakia		Over 60, 51-60	PhD holders
ET through Communities	Policy makers	Portugal and Slovakia	Both those that have expertise in bioeconomy and those		PhD holders

i. Which are the most needed/most important topics in terms of designing new courses and curricula in bioeconomy ET?

Table 17. The calculation of the Relative Importance, by using the Relative Importance Index, to explore how important is integrating different topics in the design of bioeconomy courses and curricula, by the respondents.

	Sustainability (e.g. sustainable production methods, responsible use of resources)	Circular Economy	Inclusivity (e.g. Gender)	Soft skills (e.g. communication, networking, systems thinking, critical thinking, management)	Digital skills and literacy	Practical Skills and hands-on experience on bioeconomy-related tools and technologies	Global perspective	Ethical implications	Entrepreneurial skills and innovation
I don't know/No opinion	0	0	0	0	0	0	0	0	0
Not at all important	-1	-3	-7	-1	-4	0	0	-2	0
Slightly important	4	4	8	7	2	5	9	8	2
Moderately important	12	10	46	30	16	28	56	34	28
Important	18	15	69	45	24	42	84	51	42
Very important	208	228	192	200	200	204	176	244	248
Absolutely essential	415	340	185	285	275	260	170	175	245
TOTAL INDEX POINTS	656	594	493	566	513	539	495	510	565

INDEX MEAN	3.881656805	3.514792	2.9171597	3.3491124	3.0355029	3.1893491	2.928994	3.017751	3.424242

Table 18. The Relative Importance Index of which topics are placed the most importance by the respondents, according to which stakeholder group they belong to

	Sustainability (e.g. sustainable production methods, responsible use of resources)	Circular Economy	Inclusivity (e.g. Gender)	Soft skills (e.g. communication, networking, systems thinking, critical thinking, management)	Digital skills and literacy	Practical Skills and hands-on experience on bioeconomy-related tools and technologies	Global perspective	Ethical implications	Entrepreneurial skills and innovation
Active Communities, Cultural and creative sectors	4.333333333	4.4444444	4.111111111	4.444444444	3.888888889	3.444444444	4.222222222	4.222222222	4.111111111
Business organisation	4.047619048	3.9047619	3.047619048	4	3.761904762	3.095238095	3.285714286	3.523809524	3.666666667
Citizens & Wider Society	3.830188679	3.4150943	2.698113208	3.433962264	3.58490566	3.509433962	3.056603774	3.20754717	3.471698113
NGOs & marginalised groups	4.466666667	4.2	3.8	3.866666667	3.8	3.8	3.666666667	4.266666667	3.733333333
Other	4.473684211	4.2631579	3.578947368	3.947368421	3.894736842	4.157894737	3.578947368	3.368421053	4.105263158
Policy makers and administrations	4.5	4.3571429	3.642857143	3.857142857	4	4.285714286	3.357142857	3.642857143	3.785714286
Research and higher educational organizations	4.166666667	3.9583333	3.541666667	3.458333333	3.458333333	4	3.375	3.458333333	3.416666667
Union/trade union	5	5	2	2	2	3	2	3	2
Vocational education organizations	4.153846154	4	3.307692308	4.153846154	3.923076923	3.769230769	3	3.153846154	3.769230769
			2	3.666666667	2.666666667	3	3.333333333	3.666666667	1.666666667
Grand Total	4.151162791		3.23255814	3.738372093	3.691860465	3.691860465	3.319767442	3.48255814	3.622093023

Table 19. The Relative Importance Index of which topics are placed the most importance by the respondents, according to in which country the respondents are based.

	Sustainability (e.g. sustainable production methods, responsible use of resources)	Circular Economy	Inclusivity (e.g. Gender)	Soft skills (e.g. communication, networking, systems thinking, critical thinking, management)	Digital skills and literacy	Practical Skills and hands-on experience on bioeconomy-related tools and technologies	Global perspective	Ethical implications	Entrepreneurial skills and innovation
Belgium	3	2	3	3	2	3	2	3	3
Czech Republic	3.5853658	3.170731	2.53658536	3.512195122	3.73170731	3.5609756	2.8780487	3.0243902	3.34146341
Estonia	4	3.583333	2.75	3.583333333	3.583333333	3.583333	3	3	3.75
Germany	4.6666666	4	3.33333333	4.166666667	3.83333333	3.5	3.1666666	3.1666666	3.6666666
Greece	4.2272727	4.227272	3.54545454	3.727272727	3.79545454	3.8636363	3.3863636	3.9318181	3.70454545
Hungary	4	4	-1	2	3	5	2	2	5
Italy	4.5333333	4.533333	4.13333333	4.2	3.8	3.8	3.7333333	4.2	3.93333333
Netherlands	4.4545454	4.272727	3	3.818181818	3.36363636	3.9090909	3.2727272	3.0909090	4.09090909
Portugal	4.6666666	4.466666	3.6	3.733333333	4	3.6666666	3.8666666	3.8	3.93333333
Russian Federation	1	2	5	-1	-1	5	4	-1	-1
Slovakia	4.3809523	3.952381	3.66666666	4.095238095	3.76190476	3.4761904	3.6190476	3.7142857	3.71428571
Spain	5	4	4	5	4	5	5	0	3
Grand Total	4.1511627	3.912790	3.23255814	3.738372093	3.69186046	3.6918604	3.3197674	3.4825581	3.62209302

Table 20. The Relative Importance Index of which topics are placed the most importance by the respondents, according to whether or not they are experienced in any of the bioeconomy sectors.

	Sustainability	Circular Economy	Inclusivity (e.g. Gender)	Soft skills	Digital skills and literacy	Practical Skills and hands-on experience on bioeconomy-related tools and technologies	Global perspective	Ethical implications	Entrepr skills a innovat
No	3.9620253	3.6455696	3.139240506	3.6962025	3.784810127	3.405063291	3.2658227	3.481012658	3.50
Yes	4.3214285	4.1428571	3.321428571	3.7738095	3.642857143	3.988095238	3.3690476	3.452380952	3.84
(blank)	4.3333333	4.3333333	2	3.6666666	2.666666667	3	3.3333333	3.666666667	1.66

	Sustainability	Circular Economy	Inclusivity (e.g. Gender)	Soft skills	Digital skills and literacy	Practical Skills and hands-on experience on bioeconomy-related tools and technologies	Global perspective	Ethical implications	Entrepr skills a innovat
Grand Total	4.1511627	3.9127907	3.23255814	3.7383720	3.691860465	3.691860465	3.3197674	3.48255814	3.62

Table 21. The Relative Importance Index of which topics are placed the most importance by the respondents, according to respondents ages.

	Sustainability (e.g. sustainable production methods, responsible use of resources)	Circular Economy	Inclusivity (e.g. Gender)	Soft skills (e.g. communication, networking, systems thinking, critical thinking, management)	Digital skills and literacy	Practical Skills and hands-on experience on bioeconomy-related tools and technologies	Global perspective	Ethical implications	Entrep skills a innova
<30	4.5	3.4444444	3.777777778	4	3.7222222	3.888888889	3.833333333	3.777777778	3
>60	4.375	4	3.1875	4.25	3.93	3.875	3	3.3125	
31-40	4.245283019	4.1132075	3.339622642	3.830188679	3.8679245	3.716981132	3.471698113	3.698113208	3
41-50	3.93877551	3.9387755	3.12244898	3.530612245	3.6734693	3.530612245	3.285714286	3.612244898	3
51-60	4	3.7272727	3.060606061	3.515151515	3.3939393	3.757575758	3	2.848484848	3
(blank)	4.333333333	4.3333333	2	3.666666667	2.6666666	3	3.333333333	3.666666667	1
Grand Total	4.151162791	3.9127907	3.23255814	3.738372093	3.6918604	3.691860465	3.319767442	3.48255814	3

Table 22. The Relative Importance Index of which topics are placed the most importance by the respondents, according to which highest educational level they completed.

	Sustainability	Circular Economy	Inclusivity (e.g. Gender)	Soft skills	Digital skills and literacy	Practical Skills and hands-on experience	Global perspective	Ethical implications	Ent skil inno
Bachelor (Undergraduate)	4.1379310	3.7931034	3.310344828	3.8275862	3.827586207	3.4137931	3.5862068	3.9310344	
Master	4.2266666	4.1066667	3.413333333	3.7333333	3.76	3.8133333	3.4	3.4666666	
Other	4.625	4.75	3.375	4	3.625	3.625	3.5	4	
PhD	4.2162162	3.9189189	3.324324324	3.7027027	3.540540541	3.8108108	3.2162162	3.3783783	
Primary education	2	1.3333333	0	1.3333333	1	2	1.6666666	1.3333333	
Secondary education/high school	3.8235294	3.2352941	2.823529412	4	4.176470588	3.8235294	2.9411764	3.1176470	
(blank)	4.3333333	4.3333333	2	3.6666666	2.666666667	3	3.3333333	3.6666666	
Grand Total	4.1511627	3.9127907	3.23255814	3.7383720	3.691860465	3.6918604	3.3197674	3.482558	

Table 23. Importance attributed to different topics to integrate into the curricula by respondents with various profiles.

	Stakeholder Groups	Countries	Whether they have expertise in bioeconomy	Age	Highest studies completed
Sustainability as the most important	All stakeholder groups	All stakeholder groups as the most important	All stakeholder groups as the most important	Below 30	Bachelor, Masters, PhD
Circular Economy as the most important	All stakeholder groups, apart from Citizens and Wider Society		For those that are experienced in bioeconomy, Circular Economy was the second important	31-40	
Inclusivity as the most important	(Not regarded as most important by none, but within the topic, Policy makers placed the most importance)	Not regarded as the most important by none, but within the topic, Italy placed the most importance)		Below 30	
Soft skills as the most important	Active Communities, Cultural and Creative Sectors	Not regarded as the most important by none, but within the topic, Italy placed the most importance		Over 60	
Digital Skills and Literacy			Both those that are and that are not experienced in bioeconomy, second important was Digital skills	Over 60	Secondary education/ high school
Practical skills as the most important	Not regarded as the most important by none, but within the topic, Policy makers placed the most importance)	Not regarded as the most important by none, but within the topic, Netherlands placed the most		Below 30	
Global perspective	Not regarded as the most important by none, but within the topic, Active Communities, Cultural and Creative Industries placed the most importance)	Not regarded as the most important by none, but within the topic, Italy placed the most importance		Below 30	
Ethical implications	Not regarded as the most important by none, but within the topic, NGOs and marginalised groups placed the most importance)			Below 30	
Entrepreneurial skills and innovation	Not regarded the most important by none, but within the topic, Active Communities, Cultural and Creative Industries placed the most importance)	Not regarded as the most important by none, but within the topic, Netherlands placed the most		31-40	

Table 24. The categorization of responses provided to the open-ended question Q14: With this regard, one question focused on identifying "any other items/topics with regard to design of courses and curricula in bioeconomy (in VET and LLL).

Category	Topic	Actions/Strategies	Country
Technical/scientific knowledge	Focusing on environmental solutions	Natural science knowledge. For example, the laws of conservation of energy and matter, the functioning of nature in general. Because the decision-makers should see behind the slogans and understand what is optimal from the point of view of nature	EST
	Materials, technology, biomaterials. Being transparent about bioeconomy (risks of bioeconomy)	Among the general subjects, could you tell everyone something about materials technology, also about the possibilities produced from biomaterials (biomass, wood processing possibilities, products from mushroom farms in the future, etc.)? The risks of the bioeconomy must also be reflected and their mitigation activities introduced, so that there is not a lot of mistrust.	EST
	Technical knowledge	Technical knowledge	EST
	Access to/providing more information on	Licensing, operation and business development procedures in the field of bioeconomy	EST
	Adequate work organizational models	adequate work organizational models (at all levels) and compatible with a development system centered on the bioeconomy	IT
	More information on new value chains	It is important to contextualize what are the new value chains in the bioeconomy, integrated in knowledge and in what the majority of civil society has as knowledge of the know-how of the different possibilities that the bioeconomy brings, not only in terms of new businesses, but also value enhancement, waste reduction, circular economy principles, increased energy efficiency, etc.	PR
	Technical knowledge	Circular biowaste	SL
	More info on cooperatives	Teachings of Samuel Jurkovič - the first organizer of cooperatives.	SK
	Technical knowledge	Regional view of existing and potential bioresources, regulations and funding opportunities (especially for a starting company / start-up)	
Soft skills and competencies	Soft skills and competencies	Project thinking, aptitude for design, methodologies of design thinking and design of participatory processes.	IT
	Addressing real life problems/needs/solutions	Solving problems based on companies' problems (dealing with real problems early)	EST
Sustainability	Social sustainability	Social sustainability aspect - equity / justice / solidarity	PR
	Financial sustainability	Approach to the financial sustainability of methodologies, technologies and solutions developed within the bioeconomy.	PR
	Sustainability	sustainability/green competences	SK

ii. Which are the approaches most needed/most important to be utilized in designing new courses and curricula in bioeconomy ET?

Table 25. The calculation of the Relative Importance, by using the Relative Importance Index, to explore how important is utilising different approaches in the design of bioeconomy courses and curricula, by the respondents.

	Utilising a flexible modular approach	Adopting learner-centered approach (Tailor-made according to the needs of the learner)	Integrating informal learning (e.g. peer to peer learning	Making adult learning and lifelong learning programs more accessible	. Multidisciplinary approach	Promoting collaboration between academia, industry, and government
I don't know/No opinion	0	0	0	0	0	0
Not at all important	-6	-5	-3	-1	-1	-2
Slightly important	2	2	3	2	5	7
Moderately important	40	30	30	20	26	18
Important	153	129	102	108	105	84
Very important	216	276	244	284	252	176
Absolutely essential	130	130	240	220	240	365
TOTAL INDEX VALUE	535	562	616	633	627	648
INDEX MEAN	3.165680473	3.325443787	3.644970414	3.74556213	3.710059172	3.834319527

Table 26. The Relative Importance Index of which approaches are placed the most importance by the respondents, according to which stakeholder group they belong to

	Utilising a flexible modular approach	Adopting learner-centered approach (Tailor-made according to the needs of the learner)	Integrating informal learning (e.g. peer to peer learning	Making adult learning and lifelong learning programs more accessible	Multidisciplinary approach	Promoting collaboration between academia, industry, and government
Active Communities, Cultural and creative sectors	3.444444444	3.666666667	4	4.111111111	3.888888889	4
Business organisation	3.047619048	3.285714286	3.619047619	4	3.904761905	4.333333333
Citizens & Wider Society	2.849056604	2.943396226	3.490566038	3.471698113	3.528301887	3.471698113
NGOs & marginalised groups	2.933333333	3.533333333	3.866666667	3.666666667	3.866666667	4.133333333
Other	3.473684211	3.578947368	3.842105263	3.842105263	3.526315789	4
Policy makers and administrations	3.571428571	3.571428571	3.714285714	4.214285714	3.857142857	3.428571429
Research and higher educational organizations	3.333333333	3.416666667	3.541666667	3.708333333	3.916666667	4
Union/trade union	2	2	3	3	3	3
Vocational education organizations	3.615384615	3.769230769	3.692307692	3.769230769	3.615384615	4
(blank)	2.666666667	3	2.666666667	3	3.666666667	3.666666667
Grand Total	3.156976744	3.319767442	3.627906977	3.73255814	3.709302326	3.831395349

Table 27. The Relative Importance Index of which approaches are placed the most importance by the respondents, according to which country the respondents are based in.

	Utilising a flexible modular approach	Adopting learner-centered approach (Tailor-made according to the needs of the learner)	Integrating informal learning (e.g. peer to peer learning	Making adult learning and lifelong learning programs more accessible	Multidisciplinary approach	Promoting collaboration between academia, industry, and government
Belgium	3	2	3	3	3	3
Czech Republic	2.975609756	3.048780488	3.317073171	3.43902439	3.292682927	3.146341463
Estonia	2.916666667	3.083333333	3	3.416666667	3.5	3.583333333
Germany	2.833333333	3	3	3.666666667	4.333333333	4.5
Greece	3.272727273	3.477272727	3.772727273	3.75	3.568181818	3.75
Hungary	4	2	2	2	4	5
Italy	3.866666667	3.866666667	4.466666667	4.066666667	4.133333333	4.533333333
Netherlands	3	2.545454545	3	3.454545455	3.909090909	3.909090909
Portugal	3.533333333	3.933333333	3.933333333	4.2	4.133333333	4.666666667
Russian Federation	-1	-1	5	5	2	1
Slovakia	3	3.619047619	4.142857143	4.142857143	4.095238095	4.238095238
Spain	4	5	4	5	5	5
(blank)	2.666666667	3	2.666666667	3	3.666666667	3.666666667
Grand Total	**3.156976744**	**3.319767442**	**3.627906977**	**3.73255814**	**3.709302326**	**3.831395349**

Table 28. The Relative Importance Index of which approaches are placed the most importance by the respondents, according to whether or not respondents are experienced in any of the bioeconomy sectors.

	Utilising a flexible modular approach	**Adopting learner-centered approach (Tailor-made according to the needs of the learner)**	**Integrating informal learning (e.g. peer to peer learning**	**Making adult learning and lifelong learning programs more accessible**	**. Multidisciplinary approach**	**Promoting collaboration between academia, industry, and government**
No	3.088607595	3.316455696	3.582278481	3.607594937	3.493670886	3.544303797
Yes	3.273809524	3.369047619	3.75	3.916666667	3.964285714	4.119047619
(blank)	2.666666667	3	2.666666667	3	3.666666667	3.666666667
Grand Total	**3.156976744**	**3.319767442**	**3.627906977**	**3.73255814**	**3.709302326**	**3.831395349**

Table 29. The Relative Importance Index of which approaches are placed the most importance by the respondents, according to their age group.

	Utilising a flexible modular approach	**Adopting learner-centered approach (Tailor-made according to the needs of the learner)**	**Integrating informal learning (e.g. peer to peer learning**	**Making adult learning and lifelong learning programs more accessible**	**. Multidisciplinary approach**	**Promoting collaboration between academia, industry, and government**
<30	2.666666667	3.166666667	3.833333333	4	3.888888889	3.777777778
>60	3.375	3.125	4	3.875	4	4.25
31-40	3.283018868	3.358490566	3.962264151	3.886792453	3.905660377	4.150943396
41-50	3.102040816	3.387755102	3.448979592	3.571428571	3.612244898	3.653061224
51-60	3.242424242	3.363636364	3.151515152	3.575757576	3.303030303	3.424242424

(blank)	2.666666667	3	2.666666667	3	3.666666667	3.666666667
Grand Total	**3.156976744**	**3.319767442**	**3.627906977**	**3.73255814**	**3.709302326**	**3.831395349**

Table 30. Importance attributed to different learning approaches to integrate into the curricula by respondents with various profiles.

	Stakeholder Groups	Countries	Whether they have expertise in bioeconomy	Age
Utilising a flexible modular approach	Not rated high by none, but among all stakeholders Policy Makers placed the most importance	Italy	Those experienced in bioeconomy rated higher	31-40
Adopting learner-centered approach (Tailor-made)	VET Organizations	Portugal	Those experienced in bioeconomy rated higher	41-50
Integrating informal learning	NGOs and marginalised groups		Those experienced in bioeconomy rated higher	31-40
Making adult learning and lifelong LLL programs more accessible	Active Communities and Cultural and Creative Industries	Slovakia	Those experienced in bioeconomy rated higher	31-40
Multidisciplinary approach	Research and Higher Education Organizations	Germany	Those experienced in bioeconomy rated higher	31-40
Promoting collaboration between academia, industry, and government	Business Organizations	Portugal	Those experienced in bioeconomy rated higher	31-40

Table 31. The categorization of responses provided to the open-ended question Q16: Another question asked: Is there any other item with regard to approaches in bioeconomy ET (with a focus on VET and LLL) that, in your opinion, is worthwhile mentioning?

Category	Detail	Answer provided	Country
Balancing theory and practice	Balancing theory and practice	Very concrete and operational.	IT
	Balancing theory and practice	Avoid excessive theory, the history of the bioeconomy and all the long premises that weigh down studies in Italy. Go concrete. Problems. Possible solutions. Technologies, Contacts. Procedures. Measurement of results. Requirements for the communicability of projects.	IT
	Connected to the real needs, theory and practice	More professional education, adapted to the needs of the labor market and, above all, to its relevance to society	PR
Building on already existing knowledge	Building on already existing knowledge	What's good is DO NOT DISTURB, you have the opportunity to IMPROVE it!	SK
	Building on already existing knowledge	Building on already existing knowledge	EST
	Building on already existing knowledge	Attention for already acquired knowledge in practice. The bioeconomy already has countless practical examples, but companies did not mention it very clearly. An important point is to build on the knowledge that has already been acquired.	NL
	Building on already existing knowledge		
	Building on already existing information - formal education	Formal level education should certainly take into account previous work and study experience, i.e. the continued application of VÕTA.	EST
Continuous learning	Continuous update	Continuous update	GR
Education at early ages	Education at early ages	Parent education	GR

Category	Detail	Answer provided	Country
Global vs. National perspective	A balance of a national and global perspective	The courses should provide a global vision, but at the same time the special features of Estonia should also be highlighted. Many trainers lack one or the other half of the total knowledge.	EST
Multidisciplinary/ Interdisciplinary	Multidisciplinary/ Interdisciplinary	Linking the different domains: design & technology and finance & economy and social	NL
	Multidisciplinary/ Interdisciplinary	A multidisciplinary approach can only rely on sufficient knowledge in these different disciplines. Learning from each other and learning through experience rather teaches us to copy without understanding why something is done that way. Learning from practice is undoubtedly essential, especially in applied education and bachelor's studies.	EST
	Multidisciplinary/ Interdisciplinary	Interdisciplinary and not just multidisciplinary approaches Approaches focused on experiential pedagogy	IT
New learning approaches	Integrating formal, non-formal, informal ET	The value connection of FORMAL - NON-FORMAL - INFORMAL education, which uses an innovative model based on education through a collaborative circular economy.	SL
	Holistic	continuing to explain the 'why' at various levels of abstraction is crucial. Many of the reasons for a switch to bioeconomy are not visible or tangible on a daily basis	NL
	New learning approaches	Implementation of teaching methods beyond the training modules, such as workshops and conferences that bring together specialists and professionals in the sector, in order to promote the updating of knowledge on the most recent advances in the area of bioeconomy, networking and discussion. Another example is the development of more practical training modules as part of programs to accelerate business ideas that can lead to start-ups.	PR
	New learning approaches	learning by doing	SK
	Regional innovation hubs	Make use of the: 1. facilitating role of the regional innovation hubs and associated program lines (Pioneering, SPARK Campus, 3D Makers zone), 2. aligns with the Human Capital Agenda (TKI Construction & Technology; TNO; Technology Coalition) 3. hybrid learning and development environments	NL
	New learning approaches	more synergy, open access, opportunities for failures for learners	SK
	New learning approaches	networking, good practices, community engagement	SK
Professional profiles	New learning approaches	work on the declination of professional profiles in terms of the bioeconomy in all sectors and for all EQF levels	IT
Skills/competences-oriented learning	Focus on the territories of competence	Focus on the territories of competence	IT
Training of Trainers	Training of Trainers	The training of trainers is very important, Estonia is still in the transition phase to a learner-centered approach, which is why learning motivation may decrease. In Estonia, there is also no possibility of modularity in terms of further training - it is not possible to link individual courses into a whole, there is also no legal framework for this, and if micro-qualifications are not included in the amendments to the Adult Education Act, then the possibility of modularity will only be offered to formal educational institutions, but even this is still in its infancy as of now and colleges and universities offer a relatively random selection of subjects that do not provide a complete micro degree.	EST
	Training of Trainers	Train practitioners in science communication, produce easy-to-digest information in several communication formats for different audiences, ages, educational levels etc.	GR
	quality of trainers	Certification of trainers would be necessary to distinguish a science-based approach from a belief-based approach. For example, from the belief that efficient agriculture is possible without precision breeding (CRISPR) or that efficient,	EST

Category	Detail	Answer provided	Country
		economical urban space is possible without administrative restrictions on urban sprawl.	
	Training of trainers	Developing the knowledge of trainers, greater integration of education with the public and private sector for the development of practical skills, mapping the needs of employers, continuous monitoring of upcoming EN and EU guidelines and rapid integration into in-service training in order to stay up-to-date and not later face the problem that everything is too late	EST
	Training of trainers	Ensure that trainers have real concrete and operational EXPERIENCE of what they talk about. Avoid employing people who only have theoretical experience (having READ the information they convey).	IT
	Training of trainers - educators	In my country, we have enough qualified people (with adequate university degrees, generational-wide) who will be happy to have a train-the-trainers course to implement practical application programs. They only need to be adequately paid for the job.	PR

10.3.2.2 Capacity of educational institutions and infrastructure

Table 32. The Relative Agreement Index of whether respondents believe "there is sufficient capacity of educational institutes/centers providing educational and training activities in the field of bioeconomy" according to which stakeholder group they belong to

	There is sufficient capacity of educational institutes/centers providing educational and training activities in the field of bioeconomy
Active Communities, Cultural and creative sectors	0.111111111
Business organisation	-0.428571429
Citizens & Wider Society	-0.679245283
NGOs & marginalised groups	-1
Other	0.473684211
Policy makers and administrations	-0.357142857
Research and higher educational organizations	0.333333333
Union/trade union	-1
Vocational education organizations	0.076923077
Grand Total	-0.255813953

Table 33. The Relative Agreement Index of whether respondents believe "there is sufficient capacity of educational institutes/centers providing educational and training activities in the field of bioeconomy" according to which country the respondents are based in.

	There is sufficient capacity of educational institutes/centers providing educational and training activities in the field of bioeconomy
Belgium	-1
Czech Republic	-0.926829268
Estonia	0.916666667
Germany	0.166666667
Greece	-0.409090909
Hungary	1
Italy	-0.6
Netherlands	0.545454545
Portugal	0.333333333
Russian Federation	3
Slovakia	-0.380952381
Spain	0
Grand Total	-0.255813953

Table 34. The Relative Agreement Index of whether respondents believe "there is sufficient capacity of educational institutes/centers providing educational and training activities in the field of bioeconomy" according to whether or not respondents have expertise in any of the bioeconomy sectors.

	There is sufficient capacity of educational institutes/centers providing educational and training activities in the field of bioeconomy
No	-0.379746835
Yes	-0.214285714
Grand Total	-0.255813953

Table 35. The Relative Agreement Index of whether respondents believe "there is sufficient capacity of educational institutes/centers providing educational and training activities in the field of bioeconomy" according to the age group of respondents.

	There is sufficient capacity of educational institutes/centers providing educational and training activities in the field of bioeconomy
<30	-0.888888889
>60	-0.375
31-40	-0.018867925
41-50	-0.163265306
51-60	-0.484848485
Grand Total	-0.255813953

Table 36. The Relative Agreement Index of whether respondents believe "there is sufficient capacity of educational institutes/centers providing educational and training activities in the field of bioeconomy" according to the highest level of education completed by the respondents.

	There is sufficient capacity of educational institutes/centers providing educational and training activities in the field of bioeconomy
Bachelor (Undergraduate)	-0.551724138
Master	-0.12
Other	-0.625
PhD	0
Primary education	-1.666666667
Secondary education/high school	-0.705882353
Grand Total	-0.255813953

Table 37. Categorization of how much the stakeholders agree with the statements below.

	Stakeholder Groups	Countries	Whether they have expertise in bioeconomy
There is a sufficient capacity of educational institutes/centers providing educational and training activities	- Research and Higher Education Organizations - VET	- Estonia, Netherlands, Portugal and Germany	
*There is **NOT** a sufficient capacity of educational institutes/centers providing educational and training activities*	- NGOs and marginalised groups - Citizens and Wider Society - Business Organizations - Policy Makers	Czech Republic Italy Greece Slovakia	Both groups that have and do not have expertise in bioeconomy

Table 38. The categorization of responses provided to the open-ended question Q18: Please indicate (if relevant) how capacity/quality of ET and training infrastructure can be improved in your region?

Category	Summary	Answer provided	Country
Accessibility, reach		Consider how are you going to make them accessible (technical means, availability) so that the greatest number of people from different condition (urban/rural; unemployed/employed but looking to learn more; ...) can opt for them. Take into account the different profiles (literacy) of those who could do them but, at some point and/or specific course, mix so that there can be beneficial interactions = transfer of skills and/or knowledge between groups of a priori very different stakeholders. Assess synchronous (live) or asynchronous (deferred) learning options/ platform or moodle to adapt the pace and intensity of learning to the personal/individual situation. *(website for several definitions and characteristics of service-learning: http://www.servicelearning.org/)*	Spain
		Education in the circular economy bio economy should be FREE.	GR

Category	Summary	Answer provided	Country
		Free of charge online lessons. Asynchronous education. Free of charge. Providing certification.	GR
		In order to reach citizens, these opportunities must be within everyone's reach. in addition to the world of education, research and training and the world of the most varied associations, the task of promoting and conveying these training opportunities should also be entrusted to the various sector bodies, trade unions, professional bodies, etc.	IT
		Easy access	PR
Communication /awareness raising	Communicating the importance to the public - Awareness raising	Communicating the importance of the field to the public in order to understand what the bioeconomy is, why we cannot continue with the current ways and what is the personal responsibility of individuals	EST
Diversifying / extending programs	More programs	Creation of new areas of education and training for adults	GR
	More programs	more educational seminars	GR
	More programs	more training programs	GR
Motivation raising	Increase the motivation towards bioeconomy	Lack of interest, lack of knowledge about the bioeconomy	GR
New approaches	Flexible approaches in teaching	To be asynchronous online education ONLY.	GR
	Flexibility approach - Prerequisites for bioeconomy ET	The presence/absence of basic education should be taken into account, i.e. entry into education should not be restricted or preferred	EST
	Holistic approach of governance - balancing short term and long term	Sustainability of goals and training activities. It is often project-based, and after the project, money and opportunities to further develop the direction disappear.	EST
	Innovativeness / hubs / spaces	Make use of the facilitating role of: 1. the regional innovation hubs and associated program lines (Pioneering, SPARK Campus, 3D Makers zone); 2. aligns with the Human Capital Agenda (TKI Construction & Technology; TNO; Technology Coalition)	NL
	Support with job placement / tutorship programs	Tutoring and accompaniment to job placement	IT
Organization of ET	Local organization of ET	provision of educational programs locally facilitating the participation of the local population in areas where the bioeconomy is applicable.	GR

10.3.2.3 Capacity of educators

Table 39. The Relative Agreement Index of whether respondents believe "The educators of bioeconomy are provided with sufficient opportunities to continuously update their knowledge and competence regarding bioeconomy" and if "There is a need to certify trainers/educators to ensure they are aligned with real needs of the bioeconomy sectors" according to which stakeholder group they belong to

	The educators of bioeconomy are provided with sufficient opportunities to continuously update their knowledge and competence regarding bioeconomy	There is a need to certify trainers/educators to ensure they are aligned with real needs of the bioeconomy sectors.
Active Communities, Cultural and creative sectors	-0.222222222	1.444444444
Business organisation	0.285714286	1.761904762

	The educators of bioeconomy are provided with sufficient opportunities to continuously update their knowledge and competence regarding bioeconomy	There is a need to certify trainers/educators to ensure they are aligned with real needs of the bioeconomy sectors.
Citizens & Wider Society	-0.547169811	1.113207547
NGOs & marginalised groups	-0.266666667	0.533333333
Other	0.368421053	1.157894737
Policy makers and administrations	-0.214285714	1.071428571
Research and higher educational organizations	0.208333333	1.541666667
Union/trade union	-1	-2
Vocational education organizations	-0.153846154	1.538461538
Grand Total	-0.11627907	1.244186047

Table 40. The Relative Agreement Index of whether respondents believe "The educators of bioeconomy are provided with sufficient opportunities to continuously update their knowledge and competence regarding bioeconomy" and if "There is a need to certify trainers/educators to ensure they are aligned with real needs of the bioeconomy sectors" according to which country the respondents are based in.

	The educators of bioeconomy are provided with sufficient opportunities to continuously update their knowledge and competence regarding bioeconomy	There is a need to certify trainers/educators to ensure they are aligned with real needs of the bioeconomy sectors.
Belgium	-1	-2
Czech Republic	-0.853658537	0.634146341
Estonia	0.75	0.666666667
Germany	1.333333333	0.833333333
Greece	-0.522727273	1.659090909
Hungary	3	-1
Italy	-0.333333333	1.466666667
Netherlands	1.636363636	2.454545455
Portugal	0.2	1.466666667
Russian Federation	1	-3
Slovakia	0.047619048	1.523809524
Spain	-2	0
Grand Total	-0.11627907	1.244186047

Table 41. The Relative Agreement Index of whether respondents believe "The educators of bioeconomy are provided with sufficient opportunities to continuously update their knowledge and competence regarding bioeconomy" and if "There is a need to certify trainers/educators to ensure they are aligned with real needs of the bioeconomy sectors" according to whether respondents have expertise in any of the bioeconomy sectors.

	The educators of bioeconomy are provided with sufficient opportunities to continuously update their knowledge and competence regarding bioeconomy	There is a need to certify trainers/educators to ensure they are aligned with real needs of the bioeconomy sectors.
No	-0.075949367	1.316455696

Yes	-0.238095238	1.130952381
Grand Total	-0.11627907	1.244186047

Table 42. The Relative Agreement Index of whether respondents believe "The educators of bioeconomy are provided with sufficient opportunities to continuously update their knowledge and competence regarding bioeconomy" and if "There is a need to certify trainers/educators to ensure they are aligned with real needs of the bioeconomy sectors" according to the respondents age group.

	The educators of bioeconomy are provided with sufficient opportunities to continuously update their knowledge and competence regarding bioeconomy	There is a need to certify trainers/educators to ensure they are aligned with real needs of the bioeconomy sectors.
<30	-0.722222222	1.5
>60	0.125	1.75
31-40	0.075471698	1.396226415
41-50	-0.12244898	1
51-60	-0.303030303	0.939393939
Grand Total	-0.11627907	1.244186047

Table 43. The Relative Agreement Index of whether respondents believe "The educators of bioeconomy are provided with sufficient opportunities to continuously update their knowledge and competence regarding bioeconomy" and if "There is a need to certify trainers/educators to ensure they are aligned with real needs of the bioeconomy sectors" according to the highest level of education they completed.

	The educators of bioeconomy are provided with sufficient opportunities to continuously update their knowledge and competence regarding bioeconomy	There is a need to certify trainers/educators to ensure they are aligned with real needs of the bioeconomy sectors.
Bachelor (Undergraduate)	-0.275862069	1.24137931
Master	0.106666667	1.48
Other	-0.625	1.5
PhD	-0.054054054	0.837837838
Primary education	-1	-1.666666667
Secondary education/high school	-0.764705882	1.411764706
Grand Total	-0.11627907	1.244186047

Table 44. Categorization of how much the stakeholders agree with the statements below.

	Stakeholder Groups	Countries	Whether they have expertise in bioeconomy	Age Group	Highest level of studies completed
Educators of bioeconomy are provided with sufficient opportunities to continuously update their knowledge	- Business Organisations - Research and Higher Education Organizations	- Netherlands - Germany - Estonia - Portugal - Slovakia		31-40, and over 60	Master's degree holders

	Stakeholder Groups	Countries	Whether they have expertise in bioeconomy	Age Group	Highest level of studies completed
*Educators of bioeconomy are **NOT** provided with sufficient opportunities to continuously update their knowledge*	- NGOs and marginalised groups - Citizens and Wider Society - Policy Makers - VET - Active Communities and Cultural and Creative Industries	- Czech Republic, Italy, Greece and Slovakia	- Both groups that have and do not have expertise in bioeconomy	Below 30 51-60	- Secondary education - Bachelor's degree holders - PhD holders

Table 45. Categorization of how much the stakeholders agree with the statements below.

	Stakeholder Groups	Countries	Whether they have expertise in bioeconomy	Age Group	Highest level of studies completed
There is a need for Educators need to be certified	Across all groups evaluated	Across all groups evaluated	Across all groups evaluated	Across all groups evaluated	Across all groups evaluated
There is NOT a need for Educators to be certified					

10.3.3 Effectiveness of Governance in Bioeconomy Education and Training

10.3.3.1 Monitoring and evaluation and quality assurance

i. The necessity of having a monitoring and evaluation system in bioeconomy; and whether or not there is already an effective system in place.

Table 46. The Relative Agreement index of whether respondents believe "it is essential to have a ME system of bioeconomy ET in place" and if "there is an effective ME system of bioeconomy ET in place in their regions", according to the stakeholder group they belong to

	It is essential to have a monitoring and evaluation system of bioeconomy education and training in place	There is an effective monitoring and evaluation system of bioeconomy education and training in place
Active Communities, Cultural and creative sectors	5.888888889	4.888888889
Business organisation	5.722222222	3.444444444
Citizens & Wider Society	5.078431373	3.647058824
NGOs & marginalised groups	5.571428571	4.785714286
Other	5.888888889	5.444444444
Policy makers and administrations	5	4.357142857
Research and higher educational organizations	4.956521739	4.086956522
Union/trade union	5	5
Vocational education organizations	5.166666667	4.666666667
(blank)	5.666666667	6.333333333
Grand Total	**5.319018405**	**4.245398773**

Table 47. The Relative Agreement index of whether respondents believe "it is essential to have a ME system of bioeconomy ET in place" and if "there is an effective ME system of bioeconomy ET in place in their regions", according to which countries the respondents are based in.

	It is essential to have a monitoring and evaluation system of bioeconomy education and training in place	There is an effective monitoring and evaluation system of bioeconomy education and training in place
Belgium	5	3
Czech Republic	4.853658537	3.390243902
Estonia	4.7	5.1
Germany	4.8	3.4
Greece	5.666666667	3.595238095
Hungary	5	1
Italy	5.571428571	5.428571429
Netherlands	5.727272727	6.272727273
Portugal	6.285714286	5.357142857
Russian Federation	2	6
Slovakia	5.157894737	4.368421053
Spain	3	2
(blank)	5.666666667	6.333333333

Grand Total	**5.319018405**	**4.245398773**

Table 48. The Relative Agreement index of whether respondents believe "it is essential to have a ME system of bioeconomy ET in place" and if "there is an effective ME system of bioeconomy ET in place in their regions", according to whether they have expertise in any of the bioeconomy sectors.

	It is essential to have a monitoring and evaluation system of bioeconomy education and training in place	There is an effective monitoring and evaluation system of bioeconomy education and training in place
No	5.405405405	4.378378378
Yes	5.2375	3.9625
(blank)	5.666666667	6.333333333
Grand Total	**5.319018405**	**4.245398773**

Table 49. The Relative Agreement index of whether respondents believe "it is essential to have a ME system of bioeconomy ET in place" and if "there is an effective ME system of bioeconomy ET in place in their regions", according to the age group of respondents.

	It is essential to have a monitoring and evaluation system of bioeconomy education and training in place	There is an effective monitoring and evaluation system of bioeconomy education and training in place
<30	5.333333333	4.666666667
>60	5.333333333	3.666666667
31-40	5.326530612	4.346938776
41-50	5.446808511	3.936170213
51-60	5.064516129	4.387096774
(blank)	5.666666667	6.333333333
Grand Total	**5.319018405**	**4.245398773**

Table 50. The Relative Agreement index of whether respondents believe "it is essential to have a ME system of bioeconomy ET in place" and if "there is an effective ME system of bioeconomy ET in place in their regions", according to the highest level of education they completed.

	It is essential to have a monitoring and evaluation system of bioeconomy education and training in place	There is an effective monitoring and evaluation system of bioeconomy education and training in place
Bachelor (Undergraduate)	5.678571429	4.928571429
Master	5.257142857	4.228571429
Other	5.25	4.75
PhD	5.285714286	3.8
Primary education	4	4
Secondary education/high school	5.25	3.5
(blank)	5.666666667	6.333333333
Grand Total	**5.319018405**	**4.245398773**

Table 51. Perceptions about ME systems in bioeconomy by respondents with various profiles (Those respondents that agreed the most with the two statements of "essentiality of having a ME system" and that "there is already an effective ME system in place in their region")

	Stakeholder Groups	Countries	Whether they have expertise in bioeconomy	Age	Highest level of studies completed
it is essential to have a ME system in place in bioeconomy ET.	Active Communities, Cultural and Creative Sectors and NGOs and Marginalised Groups	Rated highest by: Portugal and Netherlands Rated lowest by: Slovakia	Respondents that do not have expertise in bioeconomy	41-50	Bachelor's Degree holders
there is already an effective ME system in place in my region.	Active Communities, Cultural and Creative Sectors and VET organizations	Rated highest by: Netherlands, Portugal and Italy Rated lowest by: Germany and Greece	Respondents that do not have expertise in bioeconomy	<30	Bachelor's Degree holders

Table 52. The categorization of responses provided to the open-ended question Q20. Please indicate (if relevant) how the monitoring and evaluation system of bioeconomy ET can be improved in your region?

Category	Summary	Country	Detail
Quality ME system and decision-making	ME needed to impose scientifically based decision making	EST	Bioeconomic education tends to be led by people whose views on nature are extreme and for whom man is the most worthless animal on earth. let's give an example - golden rice. As a result of lobbying by Greenpeace and many other extreme environmental organizations, its use in Asia was delayed for 15 years - and EVERY year over 20,000 children went blind and died as a result. An essential component of environmental education must also be such scientifically based criticism of organizations' decisions and distancing from their unethical positions.
	Harmonization/cooperation of mechanisms. Already some mechanisms in place, cooperation among those functioning ones and not inventing the wheel	EST	In Estonia, there is the Estonian Education Quality Agency, which focuses on controlling the quality of different levels of education. If you start creating a regulatory framework, then they have different competencies and there are already tried models, so you should not start inventing the bike, but look for opportunities for cooperation.
	Need to explain in more detail, the connection with green agreements	EST	It should also be explained in more detail what is the connection with green agreements?
The efforts need to be accompanied by	Need for a national roadmap for bioeconomy	GR	There is no national roadmap for the Bioeconomy in Greece. This needs to change.
	European regulations related to packaging, pollutants and fertilizers.	PR	European regulations related to packaging, pollutants and fertilizers.
Quality ME system and decision-making	360 thinking of possible impact s of ME. The accreditation system will create negative reflections on society	GR	The accreditation system will create negative reflections on society
What needs to be monitored and evaluated	A similar system of valuation and assessment of traditional training and alternative, hybrid and modular training. Open Badge system and Skills passports	NL	A similar system of valuation and assessment of traditional training and alternative, hybrid and modular training. Open Badge system and Skills passports
	validation of life-long learning outcomes	SK	validation of life-long learning outcomes

10.3.3.2 Financing

Table 53. Relative Index of "how sufficient the respondents find the funding opportunities in bioeconomy ET, according to which stakeholder group they belong to

	How sufficient is the funding opportunities in bioeconomy ET
Active Communities, Cultural and creative sectors	1.111111111
Business organisation	1
Citizens & Wider Society	0.745098039
NGOs & marginalised groups	0.285714286
Other	0.444444444
Policy makers and administrations	1.071428571
Research and higher educational organizations	1.260869565
Union/trade union	1
Vocational education organizations	0.666666667
(blank)	1.333333333
Grand Total	0.828220859

Table 54. Relative Index of "how sufficient the respondents find the funding opportunities in bioeconomy ET, according to which country the respondents are based in.

	How sufficient is the funding opportunities in bioeconomy ET
Belgium	2
Czech Republic	0.902439024
Estonia	0.3
Germany	1.4
Greece	0.785714286
Hungary	0
Italy	1
Netherlands	1.545454545
Portugal	0.5
Russian Federation	-1
Slovakia	0.684210526
Spain	-1
(blank)	1.333333333
Grand Total	**0.828220859**

Table 55. Relative Index of "how sufficient the respondents find the funding opportunities in bioeconomy ET, according to whether the respondents have expertise in bioeconomy.

	How sufficient is the funding opportunities in bioeconomy ET
No	0.864864865
Yes	0.7625
(blank)	1.333333333

	How sufficient is the funding opportunities in bioeconomy ET
Grand Total	**0.828220859**

Table 56. Relative Index of "how sufficient the respondents find the funding opportunities in bioeconomy ET, according to their age group.

	How sufficient is the funding opportunities in bioeconomy ET
<30	0.444444444
>60	0.666666667
31-40	0.93877551
41-50	1.212765957
51-60	0.322580645
(blank)	1.333333333
Grand Total	**0.828220859**

Table 57. Relative Index of "how sufficient the respondents find the funding opportunities in bioeconomy ET, according to the highest level of education they completed.

	How sufficient is the funding opportunities in bioeconomy ET
Bachelor (Undergraduate)	1.071428571
Master	0.828571429
Other	0.875
PhD	0.657142857
Primary education	1.333333333
Secondary education/high school	0.5625
(blank)	1.333333333
Grand Total	**0.828220859**

Table 58. Perceptions about the sufficiency of funding opportunities for bioeconomy ET (those that gave the highest and the lowest ratings)

	Stakeholder Groups	Countries	Whether they have expertise in bioeconomy	Age	Highest level of studies completed
How would you rate the sufficiency of funding opportunities for bioeconomy ET in your region?	The most sufficient: Policy Makers The least sufficient: NGOs and marginalised groups	The most sufficient: Netherlands The least sufficient: Estonia	The most sufficient: That do not have expertise. The least sufficient: No expertise	The most sufficient: 41-50 The least sufficient: 51-60	The most sufficient: Primary education The least sufficient: PhD

Table 59. The categorization of responses provided to the open-ended question Q22. Please indicate below the main areas/educational levels or aspects where

better/improved financing is needed in your region in terms of bioeconomy education and training.

Category	Summary	Country	Answers provided
Accessibility - offering more courses/modules	We need to make Bioeconomy known to ordinary citizens, as well as companies.	PR	We need to make Bioeconomy known to ordinary citizens, as well as companies.
Balancing theory and practice	Practical professional teaching, giving priority to sustainability, regardless of the subject of training. Practical teaching in areas necessary for society, both present and, above all, future.	PR	Practical professional teaching, giving priority to sustainability, regardless of the subject of training. Practical teaching in areas necessary for society, both present and, above all, future.
Communication/ Awareness	Showcase of successful examples and pitching to angel/Impact investors.	GR	
	Dissemination and awareness	PR	Dissemination and awareness
	Community engagement	SK	life-long learning and community engagement in learning activities definitely needs extra support
Designing of curriculums	Bioeconomy should be an integral part of the entire curriculum, which is not yet sufficiently the case.	NL	The bioeconomy should be an integral part of the entire curriculum, which is not yet sufficiently the case. Too often as a separate piece, choice.
Education as a whole	I believe all of them. The only sustainability subject really supported and promoted here is recycling and waste separation, little bit of compost promotion.	SK	I believe all of them. The only sustainability subject really supported and promoted here is recycling and waste separation, little bit of compost promotion.
	Funding available to industry needs, education is neglected	Russian Fed.	Currently funding is absent outside of industry needs, this is a global catastrophe in making
	We can say of the sector in which we operate - the cultural and creative one - that in our Region it receives support only in the fields of music and live entertainment in general. If there is no minimum support, let alone education and training for the bioeconomy!	IT	We can say of the sector in which we operate - the cultural and creative one - that in our Region it receives support only in the fields of music and live entertainment in general. If there is no minimum support, let alone education and training for the bioeconomy!
	Funding available to industry needs, education is neglected	Russian Fed.	Currently funding is absent outside of industry needs, this is a global catastrophe in making
To education in general	We can say of the sector in which we operate - the cultural and creative one - that in our Region it receives support only in the fields of music and live entertainment in general. If there is no minimum support, let alone education and training for the bioeconomy!	IT	We can say of the sector in which we operate - the cultural and creative one - that in our Region it receives support only in the fields of music and live entertainment in general. If there is no minimum support, let alone education and training for the bioeconomy!
Educational Levels	All educational levels	GR	AT ALL LEVELS OF EDUCATION
	All educational levels	GR	Education of policy and government officials. Courses in public schools at all levels. Showcase of successful examples and pitching to angel/impact investors, etc.
	policy and government officials	GR	
	Higher education	PR	higher education and vocational/professional education
	VET/professional education	PR	
	VET/professional education/continuing education	IT	Vocational education and training
	ALL - Kindergartens, up to undergraduate studies with a broader focus.	EST	Kindergartens, up to undergraduate studies with a broader focus.

Category	Summary	Country	Answers provided
	VET/professional education/continuing education in modules	EST	Vocational education, continuing education - in modules.
	Secondary education	GR	Secondary education
	ALL	SK	all levels, sectors, types of education and educational institutions are financially undersized
	Higher education and LLL	GR	Higher education is important so that you can provide high-level education in many subjects, but education in its informal form is also crucial. Lifelong education will give the opportunity to workers to be trained in areas of the bioeconomy and to channel the knowledge in the areas where they are active.
	Adult education	GR	Adult education
	Pre-school / Basic education	GR	Education for the bioeconomy should start at the lowest educational level. Pre-school and basic education students, being more receptive to learning, should have the opportunity to hear and learn through experiential actions in the field of bio-economy and sustainable development.
	Post-graduate courses	GR	Post-graduate courses
	Adult learning		More training programs for the employed and the unemployed to learn about the bioeconomy
	Primary education	GR	Primary education
	Municipal high school.	GR	Municipal high school.
	Adult training structures.	GR	Adult training structures.
	Courses for students from grade 9: project weeks at schools, cooperation with companies and scientific institutions in the bioeconomy in the region;	DE	Courses for students from grade 9: project weeks at schools, cooperation with companies and scientific institutions in the bioeconomy in the region;
	Levels outside of formal: Educational levels: I'd say out of the "academia" and outside formal learning is where improved, that is, sensible, SMART, etc financing is needed, be it for informal learning and/or the general public.	Spain	Educational levels: I'd say out of the "academia" and outside formal learning is where improved, that is, sensible, SMART, etc financing is needed, be it for informal learning and/or the general public.
	LLL	SK	
Educational Institutions		DE	Educational Institutions

Category	Summary	Country	Answers provided
Effective use of resources	Effective use of resources	Spain	I would say that both money, and a sensible and precise, use of it is the crux of the matter. Spain does not stand out precisely for the % of gross domestic product that it devotes to education, research and development: both the national and regional governments suffer from short-termism and their horizon (plans, attempts, successes/failures) usually coincides with the electoral one (every 4 years). This is a long, well-paced, team-oriented relay race that very few prepare for in Spain because they prefer the potential glory of 100ms solo. Spain (2022 Gov. budgets): €5,023 thousand, 1.09% of the total Spanish budget, while the previous year, in which 1.07% of the budget was dedicated, was €4,893 thousand. In Portugal the situation is a bit better (March 2023 data): 4.94% of GDP and distributed mainly in infant and primary education (30.5%), secondary education and vocational training (29.9%) and university education (18.4%).
Extracurricular activities	2) Workshops, field visits, etc. that are part of university level courses.		2) Workshops, field visits, etc. that are part of university level courses.
	Secondary schools (excursions, project work, etc.)	DE	Secondary schools (excursions, project work, etc.)
Specific programs/skills / topics	architectural and urban planning, cultural planning, service and civic design, planning of participatory processes	IT	architectural and urban planning, cultural planning, service and civic design, planning of participatory processes
	Circular economy, green revolution, design of sustainable services and products, sustainable production in agriculture and forestry, environmental management/environmental audit	EST	Circular economy, green revolution, design of sustainable services and products, sustainable production in agriculture and forestry, environmental management/environmental audit
	AGRI-NUTRITION, SMART FARMING, NEW PRODUCTS	GR	AGRI-NUTRITION, SMART FARMING, NEW PRODUCTS
	retraining of target audiences, entrepreneurial mindset, adaptability and sustainability competences, etc.	SK	
	Through the rural development program, "Young Farmers" program	GR	Through the rural development program, "Young Farmers" program
	European programs that are related to education in bioeconomy	GR	There are several fundings for European programs related to bioeconomy but not related to education in bioeconomy
		CZ	It is necessary to expand education to include general computer skills.
	expansion of micro programs also at formal school institutions	SK	
	development of competence for life, entrepreneurship and also the so-called hard competences in the field of bioeconomy	SK	

Category	Summary	Country	Answers provided
	CTESP levels in a wide range of bioeconomy fields (blue, agriculture, farm, etc)	PR	CTESP levels in a wide range of bioeconomy fields (blue, agriculture, farm, etc)
	Areas: agriculture, forestry, fisheries and aquaculture, industry (chemical, pharma/biotech industry), health/medical research related, particularly.	Spain	Areas: agriculture, forestry, fisheries and aquaculture, industry (chemical, pharma/biotech industry), health/medical research related, particularly.
	understanding climate change and its impacts (science-based and/or citizen-science and/or hands-on approach)	PR	understanding climate change and its impacts (science-based and/or citizen-science and/or hands-on approach)
	understanding the sustainability concept (all angles: environment, social/cultural, health, economic)	PR	understanding the sustainability concept (all angles: environment, social/cultural, health, economic)
	understanding why safeguarding biodiversity is important for Bioeconomy	PR	understanding why safeguarding biodiversity is important for Bioeconomy
	sustainable food processing	PR	sustainable food processing
	how to measure food loss and waste and reduce it	PR	how to measure food loss and waste and reduce it
	the balance between agriculture and natural habitats	SK	the balance between agriculture and natural habitats, leaving the banks of the Danube intact in a defined area
Training for trainers	Training for trainers	IT	Training for trainers
	training of trainers	SK	training of trainers, retraining of target audiences, entrepreneurial mindset, adaptability and sustainability competences, etc.
	Support for educators	SK	Support for educators, expansion of micro programs also at formal school institutions, development of competence for life, entrepreneurship and also the so-called hard competences in the field of bioeconomy
Professionals /companies / sectors	Manufacturers, installers, or companies that apply specific procedures effectively and successfully.	IT	
	Cultural & Creative Industries (CCIs)	GR	Cultural & Creative Industries (CCIs)
	Agriculture	GR	Agriculture
	The whole sector	GR	The whole sector
	All working civil servants.	GR	All working civil servants.
	All bank employees.	GR	All bank employees.
	There is a lack of specialists, due to underfunding of the subject	EST	In addition to financial opportunities, a big drawback is the lack of top specialists (which is also due to the underfunding of the subject).
	Employees in agricultural businesses	DE	As far as I know, there is no educational support for employees in agricultural businesses
Learning spaces	Countryside/rural spaces for ET	SK	The main area for education is the countryside.
	regional innovation hubs that have an essential linking function for innovation & human capital in relation to companies & governments & educational institutions	NL	Financing for:
	lifelong development for the network of professionals linked to the regional innovation hubs	NL	regional innovation hubs that have an essential linking function for innovation & human capital in relation to companies & governments & educational institutions

Category	Summary	Country	Answers provided
Funding for voluntary actions	funding of voluntary actions	GR	funding of voluntary actions
Different models of governance	Supporting the green transformation of the vocational education we provide.	SK	Supporting the green transformation of the vocational education we provide.
	Inclusiveness and industrial	IT	models of inclusiveness and industrial models
Knowledge and approaches	Knowledge of resources, valorisation techniques, inspiring examples, systems thinking, interdisciplinarity.	EST	Knowledge of resources (in Estonia, Europe and globally), valorisation technologies, enrichment with examples (inspiration). Systemic thinking, interdisciplinarity.
Monitoring and Evaluation	Monitoring and Evaluation	SK	Monitoring and evaluation of education and training
Practical experiences/internships	Company experiences (by making contributions to the host company which invests time and resources in following people).	IT	Company experiences (by making contributions to the host company which invests time and resources in following people). Manufacturers, installers, or companies that apply specific procedures effectively and successfully.
Partnerships	Connecting actors providing education	SK	connecting actors providing education, introducing new types and forms of education and education focused on individuals and their needs
	Between industry and education	PR	Partnerships/synergies between industries and education
	Educational levels - harmonization among that	NL	lifelong development for the network of professionals linked to the regional innovation hubs
	linkage and coordination between the various educational areas and alternative educational areas	NL	linkage and coordination between the various educational areas and alternative educational areas

10.3.3.3 Regulatory frameworks in bioeconomy

Table 60. The calculation of the Relative Importance, by using the Relative Importance Index, to explore how different types of topics are rated, with regard to the regulatory framework of bioeconomy ET.

	Ensure transparency and accountability in administrative procedures	Simplify administrative procedures and burden	Improve privacy regulations	Balance short-term priorities with long-term perspectives in bioeconomy education and training	To incentivize (e.g. through tax benefits) innovative and sustainable education and training systems in bioeconomy	To put in place mechanisms/programs to raise awareness about the bioeconomy education and training	To put in place a sufficient accreditation system for bioeconomy education and training
I don't know/No opinion	0	0	0	0	0	0	0
Not at all important	0	0	-4	-2	-2	0	-2
Slightly important	8	50	16	5	4	3	6
Moderately important	26	28	46	28	28	20	40
Important	168	138	177	147	141	126	159
Very important	168	0	128	212	184	240	172

	Ensure transparency and accountability in administrative procedures	Simplify administrative procedures and burden	Improve privacy regulations	Balance short-term priorities with long-term perspectives in bioeconomy education and training	To incentivize (e.g. through tax benefits) innovative and sustainable education and training systems in bioeconomy	To put in place mechanisms/programs to raise awareness about the bioeconomy education and training	To put in place a sufficient accreditation system for bioeconomy education and training
Absolutely essential	110	215	70	145	200	220	145
TOTAL INDEX VALUE	480	431	433	535	555	609	520
MEAN INDEX	3	2.69375	2.70625	3.34375	3.46875	3.80625	3.25

Table 61. The Calculation of the Relative Importance Index of how respondents rate topics with regard to regulatory frameworks and administrative procedures in the bioeconomy ET, according to the stakeholder group they belong to

	Ensure transparency and accountability in administrative procedures	Simplify administrative procedures and burden	Improve privacy regulations	Balance short-term priorities with long-term perspectives in bioeconomy education and training	To incentivize (e.g. through tax benefits) innovative and sustainable education and training systems in bioeconomy	To put in place mechanisms/programs to raise awareness about the bioeconomy education and training
Active Communities, Cultural and creative sectors	3.666666667	3.888888889	3.333333333	4.111111111	4	3.888888889
Business organisation	3	3.722222222	2.777777778	3.388888889	3.555555556	3.888888889
Citizens & Wider Society	2.607843137	3.725490196	2.764705882	3.254901961	3.31372549	3.509803922
NGOs & marginalised groups	3.142857143	3.571428571	2.714285714	3.785714286	3.857142857	3.857142857
Other	2.555555556	3.388888889	2.277777778	2.888888889	3.777777778	3.833333333
Policy makers and administrations	3.428571429	3.357142857	2.714285714	3	3.285714286	4
Research and higher educational organizations	3.608695652	3.739130435	2.695652174	3.347826087	3.173913043	4.043478261
Union/trade union	3	5	3	3	5	5
Vocational education organizations	3	3.333333333	2.5	3.666666667	3.333333333	4
(blank)	1.666666667	2.666666667	2.333333333	2	2.333333333	3.333333333
Grand Total	**2.975460123**	**3.613496933**	**2.699386503**	**3.319018405**	**3.447852761**	**3.797546012**

Table 62. The Calculation of the Relative Importance Index of how respondents rate topics with regard to regulatory frameworks and administrative procedures in the bioeconomy ET, according to the country the respondents are based in.

	Ensure transparency and accountability in administrative procedures	Simplify administrative procedures and burden	Improve privacy regulations	Balance short-term priorities with long-term perspectives in bioeconomy education and training	To incentivize (e.g. through tax benefits) innovative and sustainable education and training systems in bioeconomy	To put in place mechanisms/programs to raise awareness about the bioeconomy education and training	To put in place a sufficient accreditation system for bioeconomy education and training
Belgium	3	3	3	3	2	3	3
Czech Republic	2.43902439	3.634146341	3.024390244	3.024390244	3.292682927	3.219512195	2.731707317
Estonia	2.5	2.8	1.4	3.8	1.8	3.3	2.4
Germany	2.4	3.4	2	2.8	2.6	4.2	2.8

	Ensure transparency and accountability in administrative procedures	Simplify administrative procedures and burden	Improve privacy regulations	Balance short-term priorities with long-term perspectives in bioeconomy education and training	To incentivize (e.g. through tax benefits) innovative and sustainable education and training systems in bioeconomy	To put in place mechanisms/programs to raise awareness about the bioeconomy education and training	To put in place a sufficient accreditation system for bioeconomy education and training
Greece	3.285714286	3.714285714	3.047619048	3.595238095	3.785714286	4.142857143	3.80952381
Hungary	1	2	1	-1	4	5	4
Italy	3.714285714	3.928571429	2.928571429	3.642857143	3.928571429	4.357142857	4.071428571
Netherlands	2.454545455	3.090909091	1.636363636	2.454545455	2.909090909	4.090909091	2.727272727
Portugal	3.571428571	4	3.142857143	3.785714286	4.285714286	4	3.642857143
Russian Federation	4	2	1	1	1	2	1
Slovakia	3.421052632	4	2.473684211	3.631578947	3.842105263	3.789473684	3.157894737
Spain	3	3	2	5	3	5	4
(blank)	1.666666667	2.666666667	2.333333333	2	2.333333333	3.333333333	1.666666667
Grand Total	**2.975460123**	**3.613496933**	**2.699386503**	**3.319018405**	**3.447852761**	**3.797546012**	**3.220858896**

Table 63. The Calculation of the Relative Importance Index of how respondents rate topics with regard to regulatory frameworks and administrative procedures in the bioeconomy ET, according whether the respondents have expertise in bioeconomy.

	Ensure transparency and accountability in administrative procedures	Simplify administrative procedures and burden	Improve privacy regulations	Balance short-term priorities with long-term perspectives in bioeconomy education and training	To incentivize (e.g. through tax benefits) innovative and sustainable education and training systems in bioeconomy	To put in place mechanisms/programs to raise awareness about the bioeconomy education and training	To put in place a sufficient accreditation system for bioeconomy education and training
No	3.013513514	3.621621622	2.972972973	3.324324324	3.432432432	3.635135135	3.364864865
Yes	2.975	3.675	2.4875	3.375	3.5375	4	3.175
(blank)	1.666666667	2.666666667	2.333333333	2	2.333333333	3.333333333	1.666666667
Grand Total	**2.975460123**	**3.613496933**	**2.699386503**	**3.319018405**	**3.447852761**	**3.797546012**	**3.220858896**

Table 64. The Calculation of the Relative Importance Index of how respondents rate topics with regard to regulatory frameworks and administrative procedures in the bioeconomy ET, according to the age group of the respondents

	Ensure transparency and accountability in administrative procedures	Simplify administrative procedures and burden	Improve privacy regulations	Balance short-term priorities with long-term perspectives in bioeconomy education and training	To incentivize (e.g. through tax benefits) innovative and sustainable education and training systems in bioeconomy	To put in place mechanisms/programs to raise awareness about the bioeconomy education and training	To put in place a sufficient accreditation system for bioeconomy education and training
<30	3.333333333	3.888888889	2.833333333	3.333333333	3.444444444	4.111111111	3.888888889
>60	2.733333333	3.733333333	3.266666667	3.866666667	3.266666667	3.333333333	2.8
31-40	3.12244898	3.673469388	2.632653061	3.673469388	3.775510204	3.897959184	3.367346939
41-50	3	3.553191489	2.638297872	3.14893617	3.382978723	3.744680851	3.276595745
51-60	2.741935484	3.483870968	2.580645161	2.870967742	3.225806452	3.806451613	2.870967742

	Ensure transparency and accountability in administrative procedures	Simplify administrative procedures and burden	Improve privacy regulations	Balance short-term priorities with long-term perspectives in bioeconomy education and training	To incentivize (e.g. through tax benefits) innovative and sustainable education and training systems in bioeconomy	To put in place mechanisms/programs to raise awareness about the bioeconomy education and training	To put in place a sufficient accreditation system for bioeconomy education and training
(blank)	1.666666667	2.666666667	2.333333333	2	2.333333333	3.333333333	1.666666667
Grand Total	**2.975460123**	**3.613496933**	**2.699386503**	**3.319018405**	**3.447852761**	**3.797546012**	**3.220858896**

Table 65. The Calculation of the Relative Importance Index of how respondents rate topics with regard to regulatory frameworks and administrative procedures in the bioeconomy ET, according to the highest level of education the respondents have completed.

	Ensure transparency and accountability in administrative procedures	Simplify administrative procedures and burden	Improve privacy regulations	Balance short-term priorities with long-term perspectives in bioeconomy education and training	To incentivize (e.g. through tax benefits) innovative and sustainable education and training systems in bioeconomy	To put in place mechanisms/programs to raise awareness about the bioeconomy education and training	To put in place a sufficient accreditation system for bioeconomy education and training
Bachelor (Undergraduate)	3.392857143	3.821428571	2.821428571	3.321428571	3.464285714	3.642857143	3.428571429
Master	2.885714286	3.371428571	2.485714286	3.314285714	3.371428571	3.828571429	3.342857143
Other	4	4.125	3.375	3.125	4.125	4.125	3.375
PhD	3.142857143	3.685714286	2.514285714	3.542857143	3.428571429	3.942857143	3.057142857
Primary education	4	4.666666667	4.666666667	3.333333333	3.666666667	2.333333333	1.666666667
Secondary education/high school	1.8125	3.875	3.1875	3.1875	3.625	3.8125	3.1875
(blank)	1.666666667	2.666666667	2.333333333	2	2.333333333	3.333333333	1.666666667
Grand Total	**2.975460123**	**3.613496933**	**2.699386503**	**3.319018405**	**3.447852761**	**3.797546012**	**3.220858896**

Table 66. Importance attributed to different topics regarding regulatory framework and administrative procedures in bioeconomy ET.

	Stakeholder Groups	Countries	Whether they have expertise in bioeconomy	Age
Ensure transparency and accountability in administrative procedures.	Active Communities, Cultural and Creative Industries, Research and Higher Education Organizations	Italy		All age groups except over 60
Simplify administrative procedures and burden.	Active Communities, Cultural and Creative Industries, Research and Higher Education Organizations	Italy	The most important for those with expertise in bioeconomy	All age groups except over 60
Improve privacy regulations	Active Communities, Cultural and Creative Industries	Greece and Portugal		All age groups except over 60

	Stakeholder Groups	Countries	Whether they have expertise in bioeconomy	Age
Balance short-term priorities with long-term perspectives	Active Communities, Cultural and Creative Industries	Italy		Over 60
To incentivize innovative and sustainable ET systems in bioeconomy	NGOs and marginalised groups	Italy		All age groups except over 60
To put in place mechanisms/programs to raise awareness about the bioeconomy ET.	Research and higher education organizations	Italy	The most important for those with no expertise in bioeconomy	All age groups except over 60
To put in place a sufficient accreditation system for bioeconomy ET		Italy		All age groups except over 60

ii. Harmonization of policies and policy coherence in bioeconomy education and training

Table 67. The calculation of the Relative Importance, by using the Relative Importance Index, to explore which actions in terms of harmonization policies and policy coherence are most important/needed in bioeconomy ET.

	Harmonize policies/governance mechanisms throughout all educational levels	Harmonize governance mechanisms across different regions (and the EU)	Enhance coordination of policies/governance mechanisms across education and training in different bioeconomy sectors	Strengthen the coordination among the member states to harmonize policies in vocational education and life-long learning	Set up a unified certification scheme valid through EU for vocational education and life-long learning	Put in place a unified accreditation system across different regions (and the EU)	Put in place a unified integrated qualification framework across different regions (and the EU)
I don't know /No opinion	0	0	0	0	0	0	0
Strongly disagree	-6	-3	0	-6	-3	-6	-9
Disagree	-10	-4	-8	-6	-10	-8	-6
Neither agree nor disagree	0	0	0	0	0	0	0
Somewhat agree	33	40	36	39	36	32	34
Agree	130	106	130	124	120	138	142
Strongly agree	96	105	102	93	105	75	78
TOTAL INDEX VALUE	243	244	260	244	248	231	239

INDEX MEAN	1.51875	1.525	1.625	1.525	1.55	1.44375	1.49375

Table 68. The Calculation of the Relative Importance Index of how the respondents rate different topics regarding harmonization of policies and policy coherence in bioeconomy ET, according to which stakeholder group the respondents belong to

	Harmonize policies/governance mechanisms throughout all educational levels	Harmonize governance mechanisms across different regions (and the EU)	Enhance coordination of policies/governance mechanisms across education and training in different bioeconomy sectors	Strengthen the coordination among the member states to harmonize policies in vocational education and life-long learning	Set up a unified certification scheme valid through EU for vocational education and life-long learning	Put in place a unified accreditation system across different regions (and the EU)	Put in place a unified integrated qualification framework across different regions (and the EU)
Active Communities, Cultural and creative sectors	1.333333333	1.666666667	1.666666667	1.555555556	2.222222222	1.777777778	1.888888889
Business organisation	1.611111111	1.444444444	1.666666667	1.444444444	1.888888889	1.888888889	1.666666667
Citizens & Wider Society	1.37254902	1.411764706	1.411764706	1.392156863	1.254901961	1.274509804	1.37254902
NGOs & marginalised groups	2.071428571	2.142857143	2.071428571	1.928571429	1.785714286	1.785714286	2
Other	1.555555556	1.888888889	2	1.722222222	1.611111111	1.666666667	1.611111111
Policy makers and administrations	1.928571429	1.571428571	1.857142857	1.5	1.357142857	1.357142857	1.428571429
Research and higher educational organizations	1.652173913	1.695652174	1.652173913	1.173913043	1.869565217	1.52173913	1.434782609
Union/trade union	2	2	2	2	2	2	2
Vocational education organizations	1.916666667	2	2.166666667	2.166666667	2	2.166666667	2.083333333
(blank)	3	2.666666667	2.666666667	2.666666667	2.333333333	2	2
Grand Total	**1.63803681**	**1.668711656**	**1.73006135**	**1.552147239**	**1.63803681**	**1.582822086**	**1.595092025**

Table 69. The Calculation of the Relative Importance Index of how the respondents rate different topics regarding harmonization of policies and policy coherence in bioeconomy ET, according to which country the respondents are based in.

	Harmonize policies/governance mechanisms throughout all educational levels	Harmonize governance mechanisms across different regions (and the EU)	Enhance coordination of policies/governance mechanisms across education and training in different bioeconomy sectors	Strengthen the coordination among the member states to harmonize policies in vocational education and life-long learning	Set up a unified certification scheme valid through EU for vocational education and life-long learning	Put in place a unified accreditation system across different regions (and the EU)	Put in place a unified integrated qualification framework across different regions (and the EU)
Belgium	-1	-1	1	1	1	1	1
Czech Republic	1.170731707	1.12195122	1.268292683	1.12195122	1.12195122	0.975609756	0.951219512
Estonia	1.9	1.4	1.6	1.8	1.6	1.5	1.4
Germany	1	0.4	0.4	0	0.8	0.6	0.8
Greece	1.833333333	2.071428571	1.976190476	1.952380952	1.785714286	1.857142857	1.928571429
Hungary	3	3	3	-1	1	-1	-1
Italy	1.642857143	1.785714286	1.857142857	1.714285714	2	1.714285714	1.785714286
Netherlands	2.272727273	2.454545455	2.545454545	1.545454545	1.909090909	2.181818182	2

	Harmonize policies/governance mechanisms throughout all educational levels	Harmonize governance mechanisms across different regions (and the EU)	Enhance coordination of policies/governance mechanisms across education and training in different bioeconomy sectors	Strengthen the coordination among the member states to harmonize policies in vocational education and life-long learning	Set up a unified certification scheme valid through EU for vocational education and life-long learning	Put in place a unified accreditation system across different regions (and the EU)	Put in place a unified integrated qualification framework across different regions (and the EU)
Portugal	1.785714286	2	2.214285714	1.928571429	2.214285714	2.285714286	2.071428571
Russian Federation	-3	2	-2	-2	3	3	3
Slovakia	1.947368421	1.684210526	1.684210526	1.684210526	1.684210526	1.631578947	1.842105263
Spain	0	-1	2	1	2	2	2
(blank)	3	2.666666667	2.666666667	2.666666667	2.333333333	2	2
Grand Total	**1.63803681**	**1.668711656**	**1.73006135**	**1.552147239**	**1.63803681**	**1.582822086**	**1.595092025**

Table 70. The Calculation of the Relative Importance Index of how the respondents rate different topics regarding harmonization of policies and policy coherence in bioeconomy ET, according to whether the respondents have experience in any of the bioeconomy sectors.

	Harmonize policies/governance mechanisms throughout all educational levels	Harmonize governance mechanisms across different regions (and the EU)	Enhance coordination of policies/governance mechanisms across education and training in different bioeconomy sectors	Strengthen the coordination among the member states to harmonize policies in vocational education and life-long learning	Set up a unified certification scheme valid through EU for vocational education and life-long learning	Put in place a unified accreditation system across different regions (and the EU)	Put in place a unified integrated qualification framework across different regions (and the EU)
No	1.635135135	1.662162162	1.648648649	1.486486486	1.554054054	1.513513514	1.486486486
Yes	1.6125	1.675	1.8125	1.6	1.7625	1.6625	1.7
(blank)	3	2.666666667	2.666666667	2.666666667	2.333333333	2	2
Grand Total	**1.63803681**	**1.668711656**	**1.73006135**	**1.552147239**	**1.63803681**	**1.582822086**	**1.595092025**

Table 71. The Calculation of the Relative Importance Index of how the respondents rate different topics regarding harmonization of policies and policy coherence in bioeconomy ET, according to the age group the respondents belong to

	Harmonize policies/governance mechanisms throughout all educational levels	Harmonize governance mechanisms across different regions (and the EU)	Enhance coordination of policies/governance mechanisms across education and training in different bioeconomy sectors	Strengthen the coordination among the member states to harmonize policies in vocational education and life-long learning	Set up a unified certification scheme valid through EU for vocational education and life-long learning	Put in place a unified accreditation system across different regions (and the EU)	Put in place a unified integrated qualification framework across different regions (and the EU)
<30	1.277777778	1.888888889	1.444444444	1.666666667	2.055555556	2	1.833333333
>60	2	1.8	1.866666667	1.866666667	1.733333333	1.666666667	1.6
31-40	1.755102041	1.693877551	1.87755102	1.428571429	1.591836735	1.530612245	1.632653061
41-50	1.510638298	1.510638298	1.595744681	1.531914894	1.680851064	1.638297872	1.680851064
51-60	1.548387097	1.580645161	1.709677419	1.451612903	1.290322581	1.258064516	1.225806452
(blank)	3	2.666666667	2.666666667	2.666666667	2.333333333	2	2

Grand Total	**1.63803681**	**1.668711656**	**1.73006135**	**1.552147239**	**1.63803681**	**1.582822086**	**1.595092025**

Table 72. The Calculation of the Relative Importance Index of how the respondents rate different topics regarding harmonization of policies and policy coherence in bioeconomy ET, according to the highest level of education completed by the respondents.

	Harmonize policies/governance mechanisms throughout all educational levels	Harmonize governance mechanisms across different regions (and the EU)	Enhance coordination of policies/governance mechanisms across education and training in different bioeconomy sectors	Strengthen the coordination among the member states to harmonize policies in vocational education and life-long learning	Set up a unified certification scheme valid through EU for vocational education and life-long learning	Put in place a unified accreditation system across different regions (and the EU)	Put in place a unified integrated qualification framework across different regions (and the EU)
Bachelor (Undergraduate)	1.178571429	1.607142857	1.428571429	1.392857143	1.5	1.357142857	1.214285714
Master	1.742857143	1.714285714	1.728571429	1.571428571	1.671428571	1.728571429	1.8
Other	1.75	1.5	2	1.25	1.125	1	1.375
PhD	1.6	1.6	1.8	1.628571429	1.714285714	1.514285714	1.457142857
Primary education	1.333333333	1	1.333333333	0.333333333	0.666666667	1	0.666666667
Secondary education/high school	1.8125	1.75	1.875	1.75	1.875	1.8125	1.875
(blank)	3	2.666666667	2.666666667	2.666666667	2.333333333	2	2
Grand Total	**1.63803681**	**1.668711656**	**1.73006135**	**1.552147239**	**1.63803681**	**1.582822086**	**1.595092025**

Table 73. Importance attributed to different topics regarding harmonizing policies and policy coherence in bioeconomy ET (those that placed the highest importance)

	Stakeholder Groups	Countries	Whether they have expertise in bioeconomy	Age
Harmonize policies/governance mechanisms throughout all educational levels.	NGOs and marginalised groups	Netherlands	All topics rated higher by those who have expertise in bioeconomy	
Harmonize governance mechanisms across different regions (and the EU)	NGOs and marginalised groups	Netherlands	All topics rated higher by those who have expertise in bioeconomy	
Enhance coordination of policies/governance mechanisms across education and training in different bioeconomy sectors	Active Communities, Cultural and Creative Industries	Netherlands	All topics rated higher by those who have expertise in bioeconomy	31-40 51-60 Over 60
Strengthen the coordination among the member states to harmonize policies in vocational education and life-long learning.	VET organizations	Greece	All topics rated higher by those who have expertise in bioeconomy	
Set up a unified certification scheme valid through EU for vocational education and life-long learning.	Active Communities, Cultural and Creative sectors	Portugal	All topics rated higher by those who have expertise in bioeconomy	Below 30 41-50

Put in place a unified integrated qualification framework across different regions (and the EU)	VET organizations	Portugal	All topics rated higher by those who have expertise in bioeconomy	

Table 74. The categorization of responses provided to the open-ended question Q26. Is there any item with regard to harmonization of policies in bioeconomy ET that, in your opinion is worthwhile mentioning.

Category	Summary	Country	Detail
Collaboration/cooperation between educational levels	Collaboration and exchange of feedback between secondary schools and universities needed	EST	In Estonia, the organizers of secondary education in general do not ask universities for feedback that some changes in the organization of education have brought about.
Focusing on what already exists and works	How do new standards affect the existing ones? We need to keep an eye on that.	EST	If a new standard were to be created, how much would it differ from existing environmental standards or training standards? Unfortunately, it remains a bit confusing for me whether the questions only concern the bioeconomy and the need for increased bioeconomy awareness or the harmonization of school (quality) management systems.
	Rather focus on supplementing the existing one than developing new regulations/systems.	EST	I do not think that all of the above should be done separately in the field of bioeconomy. There is a professional qualification framework, etc. Rather focus on supplementing the existing one than developing new regulations/systems. What is good for all is good for none. First, clarify what already works in vocational and adult education in general.
	The result of education is not a certified person, but a person who knows what soil, water and air are for.	CZ	The result of education is not a certified person, but a person who knows what soil, water and air are for.
	Education should solve problems, not create new ones	GR	Education should solve problems, not create extra headache for the hard-working citizen and not create extra prerequisites to participate in EU processes
The qualities/characteristics of the system to be created	Design the system so that it is adaptive. Develop while doing. Create a design and get started - use the monitor & evaluate & improve mechanism to detect improvement steps and use them in a new loop.	NL	Design the system so that it is adaptive. Develop while doing. Create a design and get started - use the monitor & evaluate & improve mechanism to detect improvement steps and use them in a new loop.
	There is a need for differentiation and even positive discrimination, more than a unified or standard system	PR	I have no firm opinion regarding the establishment of unified or standardized systems, due to a lack of specialized knowledge in the matter. And because situations occur to me in which there may be a need for differentiation or even positive discrimination.
	ME of educational levels. validation of life-long learning outcomes	SK	validation of life-long learning outcomes

10.3.4 Collaborations and Stakeholder engagement

10.3.4.1 Partnerships and Multi-stakeholder collaborations

Table 75. The calculation of the Relative Importance, by using the Relative Importance Index, to explore how different types of topics are rated, with regard to partnerships or multi-stakeholder collaborations of bioeconomy ET (Distribution of responses, %)

	Facilitating the exchange of good practices of bioeconomy ET between different regions	Strengthening the collaboration of educational institutions and other organisations/entities	Strengthening the collaboration between ET providers	Establishing bridges between different levels of bioeconomy education	Supporting educational institutions to pursue international cooperation	Enhancing public-private partnerships	Promotion of public dialogues to increase the understanding of bioeconomy	Putting in place necessary feedback mechanisms that allow stakeholders to voice their needs and opinions	Setting platforms (e.g. permanent table) with diverse stakeholders
I don't know/No opinion	0	0	0	0	0	0	0	0	0
Not at all important	0	-3	-1	-2	0	-3	-3	0	-5
Slightly important	6	1	2	3	6	5	3	3	5
Moderately important	14	10	20	16	18	18	22	26	42
Important	120	102	99	102	99	135	126	132	144
Very important	220	216	236	228	252	156	208	192	152
Absolutely essential	230	285	240	235	205	235	195	195	155
TOTAL INDEX VALUE	590	611	596	582	580	546	551	548	493
MEAN INDEX VALUE	3.831168831	3.967532468	3.87012987	3.779220779	3.766233766	3.545454545	3.57792208	3.55844156	3.2012987

Table 76. How to respondents rate the importance of selected topics with regard to partnerships or multi-stakeholder collaborations in bioeconomy ET, according to the stakeholder group they belong to

	Facilitating the exchange of good practices of bioeconomy education between different regions	Strengthening the collaboration of educational institutions and other organisations/entities	Strengthening the collaboration between education and training providers	Establishing bridges between different levels of bioeconomy education	Supporting educational institutions to pursue international cooperation	Enhancing public-private partnerships	Promotion of public dialogues to increase the understanding of bioeconomy	Putting in place necessary feedback mechanisms that allow stakeholders to voice their needs and opinions	Setting platforms (e.g. permanent table) with diverse stakeholders
Active Communities, Cultural and creative sectors	4.444444444	4.222222222	4.222222222	4.333333333	4.111111111	4.333333333	4.222222222	4.111111111	4.111111111
Business organisation	4.176470588	4.411764706	4.117647059	4.294117647	4.352941176	3.529411765	3.588235294	3.764705882	3.588235294

	Facilitating the exchange of good practices of bioeconomy education between different regions	Strengthening the collaboration of educational institutions and other organisations/entities	Strengthening the collaboration between education and training providers	Establishing bridges between different levels of bioeconomy education	Supporting educational institutions to pursue international cooperation	Enhancing public-private partnerships	Promotion of public dialogues to increase the understanding of bioeconomy	Putting in place necessary feedback mechanisms that allow stakeholders to voice their needs and opinions	Setting platforms (e.g. permanent table) with diverse stakeholders
Citizens & Wider Society	3.5	3.64	3.66	3.44	3.42	3.4	3.14	3.28	2.58
NGOs & marginalised groups	4.166666667	4.583333333	4	3.833333333	4.083333333	3.5	4.5	4.166666667	3.833333333
Other	3.882352941	3.941176471	3.647058824	3.823529412	3.588235294	3.058823529	3.176470588	3.352941176	3.352941176
Policy makers and administrations	3.692307692	3.692307692	4	3.769230769	3.615384615	3.461538462	3.846153846	3.461538462	2.923076923
Research and higher educational organizations	3.956521739	4.086956522	4.130434783	4	4.043478261	3.956521739	3.956521739	3.782608696	3.652173913
Union/trade union	4	4	4	3	4	4	5	4	5
Vocational education organizations	3.75	4	3.666666667	3.583333333	3.666666667	3.583333333	3.416666667	3.333333333	3
(blank)	3	4	2	2	0	2.5	3	3.5	1.5
Grand Total	3.820512821	3.967948718	3.846153846	3.756410256	3.717948718	3.532051282	3.570512821	3.557692308	3.179487179

Table 77. How to respondents rate the importance of selected topics with regard to partnerships or multi-stakeholder collaborations in bioeconomy ET, according to which country they are based in

	Facilitating the exchange of good practices of bioeconomy education between different regions	Strengthening the collaboration of educational institutions and other organisations, entities	Strengthening the collaboration between education and training providers	Establishing bridges between different levels of bioeconomy education	Supporting educational institutions to pursue international cooperation	Enhancing public-private partnerships	Promotion of public dialogues to increase the understanding of bioeconomy	Putting in place necessary feedback mechanisms that allow stakeholders to voice their needs and opinions	Setting platforms (e.g. permanent table) with diverse stakeholder
Belgium	3	3	3	3	3	3	3	3	3
Czech Republic	3.219512195	3.463414634	3.536585366	3.12195122	3.365853659	3.12195122	2.87804878	2.853658537	2.17073170
Estonia	3.777777778	3.888888889	3.333333333	3.111111111	3.555555556	3.777777778	3.333333333	3.111111111	2.77777777
Germany	4.25	4.25	3.75	4	3.75	3.25	4	2.75	3.75
Greece	4.025641026	3.948717949	4	4.076923077	3.897435897	3.58974359	4.102564103	3.820512821	3.53846153
Hungary	2	5	5	2	2	5	4	4	3
Italy	4.071428571	4.357142857	4.357142857	4.285714286	4.214285714	3.928571429	3.928571429	4.428571429	4
Netherlands	3.909090909	4.181818182	4.181818182	3.909090909	3.636363636	3.727272727	3.363636364	3.272727273	3.54545454
Portugal	4.307692308	4.692307692	4	4.307692308	4	3.538461538	3.461538462	4	3.76923076
Russian Federation	5	-1	3	5	5	1	5	2	2
Slovakia	4.157894737	4.368421053	4.052631579	4.105263158	4.105263158	4.052631579	3.894736842	4.157894737	3.73684210
Spain	5	5	3	4	4	3	4	5	3
(blank)	3	4	2	2	0	2.5	3	3.5	1.5
Grand Total	3.820512821	3.967948718	3.846153846	3.756410256	3.717948718	3.532051282	3.570512821	3.557692308	3.17948717

Table 78. How to respondents rate the importance of selected topics with regard to partnerships or multi-stakeholder collaborations in bioeconomy ET, according to whether the respondents have expertise in any of the bioeconomy sectors

	Facilitating the exchange of good practices of bioeconomy education between different regions	Strengthening the collaboration of educational institutions and other organisations, entities	Strengthening the collaboration between education and training providers	Establishing bridges between different levels of bioeconomy education	Supporting educational institutions to pursue international cooperation	Enhancing public-private partnerships	Promotion of public dialogues to increase the understanding of bioeconomy	Putting in place necessary feedback mechanisms that allow stakeholders to voice their needs and opinions	Setting platforms (e.g. permanent table) with diverse stakeholders
No	3.625	3.861111111	3.666666667	3.597222222	3.555555556	3.222222222	3.291666667	3.319444444	2.791666667
Yes	4.078947368	4.105263158	4.118421053	4.039473684	4.039473684	3.894736842	3.868421053	3.828947368	3.592105263
(blank)	3	4	2	2	0	2.5	3	3.5	1.5
Grand Total	3.820512821	3.967948718	3.846153846	3.756410256	3.717948718	3.532051282	3.570512821	3.557692308	3.179487179

Table 79. How to respondents rate the importance of selected topics with regard to partnerships or multi-stakeholder collaborations in bioeconomy ET, according to the age group of respondents

	Facilitating the exchange of good practices of bioeconomy education between different regions	Strengthening the collaboration of educational institutions and other organisations/entities	Strengthening the collaboration between education and training providers	Establishing bridges between different levels of bioeconomy education	Supporting educational institutions to pursue international cooperation	Enhancing public-private partnerships	Promotion of public dialogues to increase the understanding of bioeconomy	Putting in place necessary feedback mechanisms that allow stakeholders to voice their needs and opinions	Setting platforms (e.g. permanent table) with diverse stakeholders
<30	3.882352941	3.823529412	3.470588235	4	3.647058824	3.529411765	3.705882353	3.588235294	3.470588235
>60	3.8	3.866666667	3.733333333	3.933333333	3.933333333	3.8	3.266666667	3.4	3.066666667
31-40	4.14893617	4.319148936	4.234042553	4.106382979	4.127659574	3.914893617	3.893617021	3.957446809	3.531914894
41-50	3.727272727	4.045454545	3.909090909	3.636363636	3.727272727	3.522727273	3.704545455	3.636363636	3.204545455
51-60	3.483870968	3.451612903	3.548387097	3.290322581	3.258064516	2.903225806	3	2.903225806	2.612903226
(blank)	3	4	2	2	0	2.5	3	3.5	1.5
Grand Total	3.820512821	3.967948718	3.846153846	3.756410256	3.717948718	3.532051282	3.570512821	3.557692308	3.179487179

Table 80. How to respondents rate the importance of selected topics with regard to partnerships or multi-stakeholder collaborations in bioeconomy ET, according to the highest level of education the respondents have completed

	Facilitating the exchange of good practices of bioeconomy education between different regions	Strengthening the collaboration of educational institutions and other organisations, entities	Strengthening the collaboration between education and training providers	Establishing bridges between different levels of bioeconomy education	Supporting educational institutions to pursue international cooperation	Enhancing public-private partnerships	Promotion of public dialogues to increase the understanding of bioeconomy	Putting in place necessary feedback mechanisms that allow stakeholders to voice their needs and opinions	Setting platform (e.g. permane table) wi diverse stakehol
Bachelor (Undergraduate)	3.75	4.071428571	3.928571429	3.928571429	3.785714286	3.25	3.392857143	3.678571429	3.14285
Master	3.96969697	3.939393939	3.803030303	3.803030303	3.848484848	3.439393939	3.621212121	3.454545455	3.33333
Other	3.625	4.25	3.75	3.625	3.5	3.5	4.125	3.75	3
PhD	4.151515152	4.151515152	4.151515152	4	3.848484848	4.090909091	3.96969697	3.939393939	3.57575
Primary education	2	3.333333333	3.333333333	1.333333333	2	2.666666667	1.666666667	2.666666667	0.66666
Secondary education/high school	3.1875	3.5	3.625	3.5	3.6875	3.5625	3	3.0625	2
(blank)	3	4	2	2	0	2.5	3	3.5	
Grand Total	3.820512821	3.967948718	3.846153846	3.756410256	3.717948718	3.532051282	3.570512821	3.557692308	3.17948

Table 81. How to respondents rate the importance of selected topics with regard to partnerships or multi-stakeholder collaborations in bioeconomy ET (those respondents that agreed the most with the statements)

	Stakeholder Groups	Countries	Whether they have expertise in bioeconomy	Age
Facilitating the exchange of good practices of bioeconomy education between different regions	Active Communities, Cultural and Creative Industries	Portugal	More important for those that are experienced in bioeconomy	More important for those between 31-40
Strengthening the collaboration of educational institutions and other organisations/entities (e.g. industry, NGOs)	NGOs and marginalised groups	Portugal	More important for those that are experienced in bioeconomy	More important for those between 31-40
Strengthening the collaboration between education and training providers	Active Communities, Cultural and Creative Industries	Greece and Italy	More important for those that are experienced in bioeconomy	More important for those between 31-40
Establishing bridges between different levels of bioeconomy education	Active Communities, Cultural and Creative Industries	Italy	More important for those that are experienced in bioeconomy	More important for those between 31-40

	Stakeholder Groups	Countries	Whether they have expertise in bioeconomy	Age
Supporting educational institutions to pursue international cooperation	Active Communities, Cultural and Creative Industries	Italy	More important for those that are experienced in bioeconomy	More important for those between 31-40
Enhancing PPP	Active Communities, Cultural and Creative Industries	Slovakia	More important for those that are experienced in bioeconomy	More important for those between 31-40
Promotion of public dialogues to increase the understanding of bioeconomy (and bioeconomy education)	Active Communities, Cultural and Creative Industries	Greece	More important for those that are experienced in bioeconomy	More important for those between 31-40
Putting in place necessary feedback mechanisms that allow stakeholders to voice their needs and opinions.	Active Communities, Cultural and Creative Industries	Italy	More important for those that are experienced in bioeconomy	More important for those between 31-40
Setting platforms (e.g. permanent table) with diverse stakeholders	Active Communities, Cultural and Creative Industries	Portugal	More important for those that are experienced in bioeconomy	More important for those between 31-40

Table 82. The categorization of responses provided to the open-ended question Q28. Please indicate what are, in your opinion, important steps to be taken or topics to be improved in terms of multi-stakeholder collaborations in bioeconomy ET in your region?

Category	Summary	Summary	Country	Answer provided
Collaboration with actors in the field	VET to cooperate with entrepreneurs and other partners	Establishing digital platforms to do that	EST	It seems important for vocational schools to cooperate with entrepreneurs and other partners to obtain inputs and share experiences, and this part is constantly being developed. Rather than making use of existing networks rather than creating a new one, the necessity of creating a new (digital) platform should also be carefully considered, whether its management and use require significant additional time from employees. There are already many different networks.
	Dialogue with companies	Keeping in mind local needs vs. EU needs	EST	Dialogue with companies, local need vs internal EU need.
	Cooperation with institutions	cooperation with the institutes of ELGO DIMITRAS, formerly ETHIAGE.	GR	cooperation with the institutes of ELGO DIMITRAS, formerly ETHIAGE.
	Collaborations with industry, and others		PR	By approaching the industry, in order to develop training content aligned with the reality of the sector in terms of the needs and challenges of the bioeconomy in the national territory.

Category	Summary	Summary	Country	Answer provided
	Dialogue between different institutions		EST	Dialogue between the sector and educational institutions, problem-based approach, provision of places for internships, co-supervision.
			EST	In the workshops of vocational schools, maybe group work or brainstorming sessions could be organized on the topics of how the new effects of the bioeconomy can shape their work in the future?
			GR	Promoting collaborations between different fields and specialties
			Spain	Do not make the mistake of approaching this from a condescending superiority, be it academic and/or urban. Avoid biases (exaggerated but real example: assume that city = progress and countryside/rural = backwardness). Carry out a search to identify those natural bioeconomists who, without knowing of the existence of the word bioeconomy, practice it on a daily basis; This is to learn from them and integrate their knowledge. With the Galicia - North Portugal Euroregion in mind, I identify managers of neighbouring forest communities (to cite just one example) who can give lessons to many in governance, sustainable management, etc. and are appreciated and sought after as case studies and/or for project pilots.
			IT	involve third sector entities
			NL	Include in the training processes stakeholders who belong to the third sector, and especially to the world of NGOs
Inclusivity aspects		Inclusivity aspects	GR	education of minorities, people with mobility problems
		Inclusivity aspects	GR	Education of those involved in primary production
Taking action	Focusing on needs of stakeholders	This way learning will not fall behind of new EU guidelines	EST	It is important to highlight the needs of stakeholders more so that learning in educational institutions does not fall behind the times and is rather forward-looking (faster implementation of EU and EN guidelines)
	Taking action	Takin action is important so that not all time is spent on discussion, coordination, reporting etc.	EST	care must be taken to ensure that all available time is not spent on discussion, coordination, reporting, touring and exchanging experiences.
New approaches to collaboration	Collaborative circular economy	Apply the COLLABORATIVE circular economy.	SK	Apply the COLLABORATIVE circular economy.
Better organization	better organization and better information	better organization and better information	GR	better organization and better information
Multi-collaboration platforms	Keeping the discussion open and ongoing	Through free events and daily happening	GR	Free events and daily happenings, to become the talk of the town.

Category	Summary	Summary	Country	Answer provided
	Multi-stakeholder collaboration platforms through independent regional innovation hubs	Organize multi-stakeholder collaborations on substantive lines through independent regional innovation hubs (Pioneering, Building, 3D Makers Zone Haarlem, SPARK Campus). This prevents each individual educational institution from switching with separate stakeholders - sub-optimal, energy waste and irritation among stakeholders.	NL	Organize multi-stakeholder collaborations on substantive lines through independent regional innovation hubs (Pioneering, Building, 3D Makers Zone Haarlem, SPARK Campus). This prevents each individual educational institution from switching with separate stakeholders - sub-optimal, energy waste and irritation among stakeholders.
Collaboration among bioeconomy ET providers	Collaboration of actors offering education in the field of bioeconomy	alignment between the contents provided by different actors in bio-economy education. collaboration of actors offering education in the field of bioeconomy on different projects stakeholders' meetings to coordinate the potential common ground actions to be taken	SK	alignment between the contents provided by different actors in bio-economy education. collaboration of actors offering education in the field of bioeconomy on different projects stakeholders' meetings to coordinate the potential common ground actions to be taken
Internalisation		More internationalisation	EST	Internationality in both teaching and practice, because there are limited opportunities in a small country and there is not enough competence in all new fields.
		Internalisation	EST	Curricula between universities (they can also be international, where one semester is studied in one country and the other in another country, for example), which make it possible to better ensure multidisciplinary.
Cooperation, technology transfer		Cooperation, technology transfer	IT	Development cooperation, technology transfer
Providing incentives to stakeholders to be involved		Providing incentives to stakeholders to be involved	PR	Are there incentives of any kind for an SME holder? (busy running her/his business on a daily basis?) Are there indicators to verify if collaboration between stakeholders is really effective/productive? leading to measurable results?
Support by policy making		Support by policy making	SK	I believe it would help to give a louder voice, linked with policies. Plus, having a really pro trainers who are deep within the field, doing good work. Plenty of low-quality trainings and courses are offered, discouraging people from attending them again.

10.3.4.2 Multi-stakeholder decision and curriculum-making

Table 83. The Relative Importance Index of how respondents rate the importance of integrating different stakeholders into decision and curriculum making processes in the bioeconomy ET, according to the stakeholder group they belong to

	Entrepreneurs	Local communities/wider society	Vocational education and training and Life-long learners	Bioeconomy professionals/workers of bioeconomy sectors	Professionals in cultural and creative industries
Active Communities, Cultural and creative sectors	3.444444444	4.111111111	3.777777778	4.111111111	3.888888889
Business organisation	4.058823529	3.764705882	3.529411765	4.588235294	2.941176471
Citizens & Wider Society	2.9	3.02	2.72	4.04	2.48
NGOs & marginalised groups	3.75	4.166666667	3.916666667	4.5	4
Other	3.823529412	3.647058824	3.705882353	4.176470588	3.411764706
Policy makers and administrations	4.153846154	3.769230769	3	3.692307692	2.769230769
Research and higher educational organizations	4.043478261	3.739130435	3.652173913	4.260869565	3.217391304
Union/trade union	5	5	4	5	2
Vocational education organizations	3.583333333	3.166666667	3.25	3.916666667	3.166666667
(blank)	4	3.5	3.5	4	2
Grand Total	**3.576923077**	**3.519230769**	**3.288461538**	**4.153846154**	**3.006410256**

Table 84. The Relative Importance Index of how respondents rate the importance of integrating different stakeholders into decision and curriculum making processes in the bioeconomy ET, according to which country the respondents are based in.

	Entrepreneurs	Local communities/wider society	Vocational education and training and Life-long learners	Bioeconomy professionals/workers of bioeconomy sectors	Professionals in cultural and creative industries
Belgium	2	3	4	2	3
Czech Republic	2.707317073	2.804878049	2.414634146	4	2.341463415
Estonia	3.777777778	3.111111111	2.888888889	4.222222222	1.888888889
Germany	4.75	2.5	3	4.75	2.25
Greece	3.846153846	3.923076923	3.487179487	4.179487179	3.435897436
Hungary	5	4	4	4	2
Italy	4.285714286	4.071428571	4.214285714	4.428571429	3.785714286
Netherlands	4.272727273	3.363636364	3.727272727	4.090909091	3.090909091
Portugal	3.769230769	3.923076923	3.538461538	4.076923077	3.076923077
Russian Federation	-1	5	4	5	4
Slovakia	3.684210526	3.894736842	3.684210526	4.210526316	3.578947368
Spain	4	5	5	5	5
(blank)	4	3.5	3.5	4	2
Grand Total	**3.576923077**	**3.519230769**	**3.288461538**	**4.153846154**	**3.006410256**

Table 85. The Relative Importance Index of how respondents rate the importance of integrating different stakeholders into decision and curriculum making processes in the bioeconomy ET, according to whether the respondents have expertise in any of the bioeconomy sectors.

	Entrepreneurs	Local communities/wider society	Vocational education and training and Life-long learners	Bioeconomy professionals/workers of bioeconomy sectors	Professionals in cultural and creative industries
No	3.166666667	3.208333333	2.833333333	4	2.736111111
Yes	3.960526316	3.855263158	3.723684211	4.355263158	3.289473684
(blank)	4	3.5	3.5	4	2
Grand Total	**3.576923077**	**3.519230769**	**3.288461538**	**4.153846154**	**3.006410256**

Table 86. The Relative Importance Index of how respondents rate the importance of integrating different stakeholders into decision and curriculum making processes in the bioeconomy ET, according to the age group of respondents.

	Entrepreneurs	Local communities/wider society	Vocational education and training and Life-long learners	Bioeconomy professionals/workers of bioeconomy sectors	Professionals in cultural and creative industries
<30	3.235294118	3.705882353	3.470588235	4.352941176	2.882352941
>60	3.866666667	3.2	3.666666667	4.466666667	3.133333333
31-40	3.553191489	3.468085106	3.234042553	4.340425532	3.042553191
41-50	3.772727273	3.863636364	3.386363636	4	3.272727273
51-60	3.35483871	3.161290323	2.935483871	3.838709677	2.64516129
(blank)	4	3.5	3.5	4	2
Grand Total	**3.576923077**	**3.519230769**	**3.288461538**	**4.153846154**	**3.006410256**

Table 87. The Relative Importance Index of how respondents rate the importance of integrating different stakeholders into decision and curriculum making processes in the bioeconomy ET, according to the highest level of education completed by the respondents.

	Entrepreneurs	Local communities/wider society	Vocational education and training and Life-long learners	Bioeconomy professionals/workers of bioeconomy sectors	Professionals in cultural and creative industries
Bachelor (Undergraduate)	3.285714286	3.392857143	3.071428571	4.071428571	2.964285714
Master	3.53030303	3.484848485	3.363636364	4.121212121	3.075757576
Other	4.125	3.75	3.375	4.25	3.875
PhD	4.121212121	3.939393939	3.484848485	4.151515152	3.060606061
Primary education	3.666666667	4	3.333333333	5	3.333333333
Secondary education/high school	2.8125	2.8125	2.875	4.25	2.3125
(blank)	4	3.5	3.5	4	2
Grand Total	**3.576923077**	**3.519230769**	**3.288461538**	**4.153846154**	**3.006410256**

Table 88. Perceptions about the importance of integrating selected stakeholders in decision and curriculum-making processes in bioeconomy ET (those that gave the highest ratings)

	Stakeholder Groups	Countries	Whether they have expertise in bioeconomy	Age	Highest level of studies completed
Entrepreneurs	Policy makers Research and higher education organizations	The most sufficient: Netherlands The least sufficient: Estonia	Rated higher by those that have experience in bioeconomy	>60	PhD holders
Local communities/wider society	NGOs and marginalised groups	Germany	Rated higher by those that have experience in bioeconomy	<30	PhD holders
VET and LLL learners	NGOs and marginalised groups	Italy	Rated higher by those that have experience in bioeconomy	>60	PhD holders
Bioeconomy professionals/workers of bioeconomy sectors	Business organizations	Italy	Rated higher by those that have experience in bioeconomy	>60	Secondary education/high school
Professionals in cultural and creative industries	Communities and Cultural and Creative Industries	Italy	Rated higher by those that have experience in bioeconomy	41-50	PhD holders

Table 89. The categorization of responses provided to the open-ended question Q30. Please indicate which other stakeholders (if any) should be integrated in decision-making processes in ET of bioeconomy; and in which ways multi-stakeholder decision-making can be facilitated or supported?

Stakeholder type	Answer provided	Country
Policy/decision makers	Public sector, policy makers	EST
	What would cultural economy professionals contribute to the creation of an educational opportunity? With marketing slogans? When drawing up the plan, the parties are the "customer" employer, a student (who has recently completed a similar plan) and a lecturer-specialist. A league with many parties makes the stakes of these important decision-makers too small. Communities could be involved, but their only possible representatives would be relatively extreme conservative interest groups who do not see the wider picture and are mainly based on NIMB's ideology.	EST
	Policy makers and local governments and representatives of educational institutions could also be involved in decision-making processes. The process is supported by a systematic, knowledge-based approach and its conscious step-by-step implementation - e.g. a good theoretical basis would be provided by Klijn, E. H., and J. Koppenjan. 2016. Governance Networks in the Public Sector if you want to implement network-based governance in the field.	EST
	Self-government, OTAs A' and B' grade, bodies responsible for local development, use of resources, employment, lifelong learning and entrepreneurship: Creation of a	GR

Stakeholder type	Answer provided	Country
	committee with interested parties / Recommendations to higher public bodies for the formulation and financing of programs.	
	municipalities	
	policy makers, environmental managers and kindergarten and school children (the latter for the purpose of shaping the future)	EST
Creative industries	designers, planners, craftsmen	IT
Planners		
Entrepreneurs	Entrepreneurs: manufacturers of measurement systems and systems; entrepreneurs who DO NOT greenwash, but truly create virtuous processes.	IT
Educational institutions	Kindergartens and schools.	EST
Academia	The QUINTUPLE HELIX model for educational collaboration.	SK
	Involving: Professors / chairs, Lecturers, Practitioners - they: - Developing on current and future social issues & long-term programs - Linking education to (practical) research - the fixed components of development; - Linking education/training institutes to companies/organizations	NL
Industry		
Civil Society		
	Civil society organizations: the bioeconomy is part of a transition, which is why it is important to also involve civil society organizations in education to increase and improve support.	NL
Environmental institutions/ professionals		
	Environmental professionals	IT
	Focus groups and dedicated living labs	
	Environmental and social sustainability activists. Academy.	PR
Living labs		
Practitioners		
Teachers to provide basic knowledge	Should some of the basic topics also be included in basic education? In connection with the development of pre-vocational education?	EST
Kids and young people		
	kids and young people, allowing them to meet, and establish collaborations/partnerships, fundraising for their ideas	
	Elementary/middle/high school students. There must be a win-win for all participants. For 10 years only education and awareness should be provided. Disincentive to entrepreneurs when they are proactive in this area.	GR

10.3.4.3 Social inclusion and inclusion of marginalised groups

Table 90. The Relative Agreement Index of how respondents agree with the statements of whether "there is a need to increase the inclusion of marginalized groups in bioeconomy ET" and if there is a need to "prioritise the needs and voice of marginalised groups when making strategic decisions, according to the stakeholder group the respondents belong to

	Increase the inclusion of marginalized groups in bioeconomy education and training	Prioritise the needs and voice of marginalized groups when making strategic decisions (e.g. curriculum making, policy-making)
Active Communities, Cultural and creative sectors	4.111111111	4
Business organisation	3.470588235	3.117647059
Citizens & Wider Society	2.48	2.18
NGOs & marginalised groups	3.666666667	3.583333333
Other	3.294117647	3.058823529
Policy makers and administrations	2.692307692	2.692307692
Research and higher educational organizations	3.434782609	2.869565217
Union/trade union	4	5
Vocational education organizations	2.916666667	2.916666667
(blank)	2	1
Grand Total	**3.057692308**	**2.794871795**

Table 91. The Relative Agreement Index of how respondents agree with the statements of whether "there is a need to increase the inclusion of marginalized groups in bioeconomy ET" and if there is a need to "prioritise the needs and voice of marginalised groups when making strategic decisions, according to the country the respondents are based in.

	Average of Increase the inclusion of marginalized groups in bioeconomy education and training	Average of Prioritise the needs and voice of marginalized groups when making strategic decisions (e.g. curriculum making, policy-making)
Belgium	3	4
Czech Republic	2.43902439	2.219512195
Estonia	1.666666667	1.555555556
Germany	3.25	2.75
Greece	3.435897436	3.102564103
Hungary	3	-1
Italy	4	4.142857143
Netherlands	3.272727273	2.545454545
Portugal	3.538461538	3.538461538
Russian Federation	1	1
Slovakia	3.263157895	3
Spain	4	4
(blank)	2	1
Grand Total	**3.057692308**	**2.794871795**

Table 92. The Relative Agreement Index of how respondents agree with the statements of whether "there is a need to increase the inclusion of marginalized groups in bioeconomy ET" and if there is a need to "prioritise the needs and voice of marginalised groups when making strategic decisions, according to whether the respondents have expertise in any of the bioeconomy sectors.

	Average of Increase the inclusion of marginalized groups in bioeconomy education and training	Average of Prioritise the needs and voice of marginalized groups when making strategic decisions (e.g., curriculum making, policy-making)
No	2.833333333	2.611111111
Yes	3.289473684	2.986842105
(blank)	2	1
Grand Total	**3.057692308**	**2.794871795**

Table 93. The Relative Agreement Index of how respondents agree with the statements of whether "there is a need to increase the inclusion of marginalized groups in bioeconomy ET" and if there is a need to "prioritise the needs and voice of marginalised groups when making strategic decisions, according to the age group the respondents belong to

	Average of Increase the inclusion of marginalized groups in bioeconomy education and training	Average of Prioritise the needs and voice of marginalized groups when making. strategic decisions (e.g. curriculum making, policy-making)
<30	3.176470588	2.647058824
>60	3.066666667	3
31-40	3.255319149	2.936170213
41-50	3.181818182	2.863636364
51-60	2.580645161	2.580645161
(blank)	2	1
Grand Total	**3.057692308**	**2.794871795**

Table 94. The Relative Agreement Index of how respondents agree with the statements of whether "there is a need to increase the inclusion of marginalized groups in bioeconomy ET" and if there is a need to "prioritise the needs and voice of marginalised groups when making strategic decisions, according to which educational level the respondents have completed.

	Average of Increase the inclusion of marginalized groups in bioeconomy education and training	Average of Prioritise the needs and voice of marginalized groups when making strategic decisions (e.g. curriculum making, policy-making)
Bachelor (Undergraduate)	3	3.107142857
Master	3	2.575757576
Other	3.75	3.5
PhD	3.424242424	3.03030303
Primary education	2	2.666666667
Secondary education/high school	2.625	2.5625
(blank)	2	1
Grand Total	**3.057692308**	**2.794871795**

Table 95. Importance attributed to increasing inclusion of marginalized groups into bioeconomy ET; and prioritising their needs and voice when making strategic decisions.

	Stakeholder Groups	Countries	Whether they have expertise in bioeconomy	Age
Increasing the inclusion of marginalized groups in bioeconomy ET	Active Communities, Cultural and Creative Industries	Italy	Those who have expertise in bioeconomy	31-40
Prioritising the needs and voices of marginalized groups when making strategic decisions	NGOs and marginalised groups	Italy	Those who have expertise in bioeconomy expertise in bioeconomy	> 60

Table 96. The categorization of responses provided to the open-ended question Q32. Please indicate what are the key topics or issues to be discussed or addressed with regard to the inclusion of marginalised groups in bioeconomy ET; and what can be some steps to be taken in order to facilitate this process?

Category	Answer provided	
Identifying abilities	Carefully identify and enhance the person's real abilities, in order to obtain excellent job placement.	IT
Discussion with related public authorities	Discussion with the Ministry of Labor / General Secretariat for Combating Poverty, responsible for social protection, social cohesion, integration and solidarity	GR
Just wages	Marginalized groups are sufficiently represented, but their retention is made impossible due to lack of wages	Russian Fed.
Frugal innovation	Twofold: 1. Innovation / development of the bioeconomy should have the primary goal / precondition to have this available for vulnerable groups / disadvantaged groups / minorities, now and in the future - frugal innovation https://www.icfi.nl/home https:/ /www.unicef.org/innovation/frugal 2. Facilitate participation in this development by organizing a different and better approach to / for / with these target groups - orientation & guidance & preconditions & financing	NL
New approaches for inclusion		NL
Be inclusive operation-wise	key issues and topics are pretty much the same in this case as in general in the society (equity, gender issues, LGBTQI+, minorities, migrants, etc.); be inclusive topic and operation-wise too	SK
Better governance	It is often striking that, as in many places in our society, it is mainly people at managerial levels who determine the discussion and therefore also the content. This creates a difference between the inventors and those who are confronted with it on a daily basis, which needs to be paid attention to.	NL

10.3.4.4 Linking cultural and creative industries with the bioeconomy ET

Table 97. The Relative Agreement Index of how respondents agree with the statements below with regard to linking cultural and creative industries with bioeconomy ET, according to the stakeholder group they belong to

	I know of examples/cases where cultural and creative industries offer possibilities for the bioeconomy	In the work that I do, there are examples/cases where cultural and creative industries offer possibilities for the bioeconomy	I am unaware of the connection between cultural and creative industries and the bioeconomy	I would like to learn more about the possible uses of cultural and creative industries for bioeconomy, if it was offered as a course/teaching activity	In my opinion, establishing links to, and collaborations with cultural and creative industries offer possibilities for the development, innovativeness and sustainability of bioeconomy
Active Communities, Cultural and creative sectors	1.222222222	1.444444444	-0.333333333	1.888888889	1.666666667
Business organisation	0.882352941	0.529411765	-0.529411765	1.529411765	1.705882353
Citizens & Wider Society	-0.38	-0.64	0.54	0.7	0.48
NGOs & marginalised groups	1.75	1.916666667	0	2.166666667	2.166666667
Other	1.294117647	0.823529412	-0.470588235	1.764705882	1.705882353
Policy makers and administrations	0.153846154	0.076923077	0.076923077	0.923076923	1.769230769
Research and higher educational organizations	1.043478261	0.782608696	-1.130434783	1.086956522	1.826086957
Union/trade union	2	3	2	2	2
Vocational education organizations	0.333333333	0.583333333	1	2.25	1.75
(blank)	2.5	2.5	-1.5	1	1
Grand Total	**0.557692308**	**0.391025641**	**-0.044871795**	**1.294871795**	**1.365384615**

Table 98. The Relative Agreement Index of how respondents agree with the statements below with regard to linking cultural and creative industries with bioeconomy ET, according to the country in which the stakeholders are based in.

	I know of examples/cases where cultural and creative industries offer possibilities for the bioeconomy	In the work that I do, there are examples/cases where cultural and creative industries offer possibilities for the bioeconomy	I am unaware of the connection between cultural and creative industries and the bioeconomy	I would like to learn more about the possible uses of cultural and creative industries for bioeconomy, if it was offered as a course/teaching activity	In my opinion, establishing links to, and collaborations with cultural and creative industries offer possibilities for the development, innovativeness and sustainability of bioeconomy
Belgium	1	0	0	2	3
Czech Republic	-0.87804878	-1.317073171	1	0.414634146	-0.097560976
Estonia	0.444444444	0.666666667	-0.666666667	1.333333333	1.888888889
Germany	0.5	0.5	1.25	0.5	0.75
Greece	0.846153846	0.666666667	-0.128205128	1.641025641	1.769230769
Hungary	-1	2	-3	2	3
Italy	0.857142857	0.714285714	-0.357142857	2.285714286	2.214285714
Netherlands	1.727272727	2.363636364	-1.636363636	1.090909091	2
Portugal	1.769230769	0.846153846	-0.153846154	1.846153846	1.846153846
Russian Federation	1	-1	-3	-3	3

	I know of examples/cases where cultural and creative industries offer possibilities for the bioeconomy	In the work that I do, there are examples/cases where cultural and creative industries offer possibilities for the bioeconomy	I am unaware of the connection between cultural and creative industries and the bioeconomy	I would like to learn more about the possible uses of cultural and creative industries for bioeconomy, if it was offered as a course/teaching activity	In my opinion, establishing links to, and collaborations with cultural and creative industries offer possibilities for the development, innovativeness and sustainability of bioeconomy
Slovakia	1.157894737	1.421052632	-0.315789474	1.842105263	2
Spain	2	1	-2	1	2
(blank)	2.5	2.5	-1.5	1	1
Grand Total	**0.557692308**	**0.391025641**	**-0.044871795**	**1.294871795**	**1.365384615**

Table 99. The Relative Agreement Index of how respondents agree with the statements below with regard to linking cultural and creative industries with bioeconomy ET, according to whether the respondents have expertise in any of the bioeconomy sectors.

	I know of examples/cases where cultural and creative industries offer possibilities for the bioeconomy	In the work that I do, there are examples/cases where cultural and creative industries offer possibilities for the bioeconomy	I am unaware of the connection between cultural and creative industries and the bioeconomy	I would like to learn more about the possible uses of cultural and creative industries for bioeconomy, if it was offered as a course/teaching activity	In my opinion, establishing links to, and collaborations with cultural and creative industries offer possibilities for the development, innovativeness and sustainability of bioeconomy
No	0.069444444	-0.194444444	0.486111111	1.111111111	0.986111111
Yes	0.973684211	0.855263158	-0.552631579	1.513157895	1.802631579
(blank)	2.5	2.5	-1.5	1	1
Grand Total	**0.557692308**	**0.391025641**	**-0.044871795**	**1.294871795**	**1.365384615**

Table 100. The Relative Agreement Index of how respondents agree with the statements below with regard to linking cultural and creative industries with bioeconomy ET, according to the age of the respondents.

	I know of examples/cases where cultural and creative industries offer possibilities for the bioeconomy	In the work that I do, there are examples/cases where cultural and creative industries offer possibilities for the bioeconomy	I am unaware of the connection between cultural and creative industries and the bioeconomy	I would like to learn more about the possible uses of cultural and creative industries for bioeconomy, if it was offered as a course/teaching activity	In my opinion, establishing links to, and collaborations with cultural and creative industries offer possibilities for the development, innovativeness and sustainability of bioeconomy
<30	1.235294118	0.588235294	0.470588235	1.294117647	1.470588235
>60	0.733333333	0.266666667	-0.666666667	1.266666667	1.2
31-40	0.638297872	0.574468085	-0.212765957	1.510638298	1.489361702
41-50	0.340909091	0.409090909	-0.181818182	1.454545455	1.522727273
51-60	0.161290323	-0.096774194	0.516129032	0.774193548	1
(blank)	2.5	2.5	-1.5	1	1
Grand Total	0.557692308	0.391025641	-0.044871795	1.294871795	1.365384615

Table 101. The Relative Agreement Index of how respondents agree with the statements below with regard to linking cultural and creative industries with bioeconomy ET, according to the highest level of education the respondents have completed.

	I know of examples/cases where cultural and creative industries offer possibilities for the bioeconomy	In the work that I do, there are examples/cases where cultural and creative industries offer possibilities for the bioeconomy	I am unaware of the connection between cultural and creative industries and the bioeconomy	I would like to learn more about the possible uses of cultural and creative industries for bioeconomy, if it was offered as a course/teaching activity	In my opinion, establishing links to, and collaborations with cultural and creative industries offer possibilities for the development, innovativeness and sustainability of bioeconomy
Bachelor (Undergraduate)	0.607142857	0.142857143	0.107142857	1.571428571	1.178571429
Master	0.651515152	0.742424242	-0.303030303	1.287878788	1.454545455
Other	1.25	1.25	0.25	1.25	1.75
PhD	0.848484848	0.454545455	-0.606060606	1.454545455	1.909090909
Primary education	-1	-2.666666667	2.333333333	-2.666666667	-1.333333333
Secondary education/high school	-0.8125	-0.875	1.5	1.3125	0.5625
(blank)	2.5	2.5	-1.5	1	1
Grand Total	0.557692308	0.391025641	-0.044871795	1.294871795	1.365384615

Table 102. Rating the familiarity of respondents to the topic; perception towards this topic offering possibilities for the development of innovativeness and sustainability of bioeconomy; and their willingness to learn more on the topic (those that placed the highest importance)

	Stakeholder Groups	**Countries**	**Whether they have expertise in bioeconomy**	**Age**
I know of examples/cases where cultural and creative industries offer possibilities for the bioeconomy	NGOs and marginalised groups	Netherlands, Portugal	Those who are experienced in bioeconomy	<30
In the work that I do, there are examples/cases where cultural and creative industries offer possibilities for the bioeconomy	NGOs and marginalised groups	Netherlands	Those who are experienced in bioeconomy	<30
I am unaware of the connection between cultural and creative industries and the bioeconomy	Citizens and wider society	Germany	Those who are NOT experienced in bioeconomy	51-60
I would like to learn more about the possible uses of cultural and creative industries for bioeconomy, if it was offered as a course/teaching activity	NGOs and marginalised groups	Italy	Those who are experienced in bioeconomy	31-40
In my opinion, establishing links to, and collaborations with cultural and creative industries offer possibilities for the development, innovativeness and sustainability of bioeconomy.	NGOs and marginalised groups	Italy	Those who are experienced in bioeconomy	41-50

Table 103. The categorization of responses provided to the open-ended question Q34. Please discuss/explain if you have any suggestions on how to integrate culture or art in bioeconomy education and training:

Answers provided by respondents	Countries
Art remains one of the most valuable methods of spreading awareness to needs of science. However, art community has become highly antiscientific. This should be penalized.	Russian Federation
Bioeconomy is also a different culture than the fossil economy. You can partly explain this through art history (how we built and produced in the past), what has changed due to the opportunities created by the development of fossil raw materials, where did things go wrong and how do you pick things up again. by focusing on the bioeconomy in the current era.	Netherlands
Culture forms the basis for development - the combination & facilitation & cultivation of the different aspects (history, music, poetry, visual arts, architecture, etc.) provides a necessary and more diverse and more layered view and development of the world. The purely technocratic and/or capitalist approach is mono-functional and leads to impoverishment of the field of vision and development. Culture (art is part of culture) and nature - in combination with technology/economy - should form the basis of our development and thus bioeconomy education/training.	Slovakia
Cultural economy is a business like any other, if as a result of this activity something is produced and residues are created, and bioeconomy innovation reaches the field of culture, then rather the involvement takes place through the business sector, there is no need to highlight it separately.	Estonia
Art is a way through which humans can make complex stories/concepts visible. It is perhaps just as relevant a form of expression as a written article, book, etc	Netherlands
Make professionals (of science/art/humanities), educators and pedagogues get closer and know each other in workshops, forums, etc., to better understand the reality/starting point* and the challenges**. *(which I recognize will be different in each country (sometimes between regions of the same country) ** From this knowledge and cross-fertilization between areas and sensitivities, propose a possible roadmap.	Spain
For example, a study program between universities, where the Academy of Arts and TalTech material technology could open opportunities for students to use bioresources in the creation of materials and their use in the creation/design of products, e.g. seaweed lamp dome, fish skin dress, etc.	Portugal
Well, I don't know - if the cultural economy thinks it is necessary to create a temporary container garden on the Town Hall Square, what is its carbon footprint?	Estonia
I look at systemic and empirical approach	Estonia
Festivals of the mind and of philosophy could be centered on this theme. The kids could be made to work in the theatre.	Italy
Efforts to create innovations do not lead to a better life or a shorter path to it.	Slovakia
The use of visual arts combined with educational material and local information is very important and will help to create resonance and understanding.	Greece
Inter-university curricula, interdisciplinary hackathons, etc	Estonia
Integrate subjects or guest lectures into creative training and involve the purchasing department that purchases work materials	Netherlands
Integrating bioeconomy courses into schools	Greece
With interactive games and role-playing games and with relevant educational visits to cultural sites	Greece

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@biogovnet
info@biogov.net www.biogov.net