GENB
YOUNG BIOVOICES
FOR A SUSTAINABLE
FUTURE

D4.1

Impact monitoring and assessment strategy

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Instrument	Coordination and Support Action
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OUR CONSORTIUM

APRE Agenzia per la Promozione della Ricerca Europea
btg biomass technology group
LOBA®
PEDAL CONSULTING
European Schoolnet
ZSI
aiju INSTITUTO TECNOLÓGICO DE PRODUCTO INFANTIL Y OCIO
Q-PLAN INTERNATIONAL
FVA NEW MEDIA RESEARCH
Hellenic Society for the Protection of Nature

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www.genb-project.eu info@genb-project.eu

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Author(s)	Alberto Badenes-Rocha (AIJU), Adrián Chacón (AIJU), Pablo Busó (AIJU), Clara Blasco-López (AIJU)

Contributors

NAME	ORGANISATION
Alberto Badenes-Rocha, Adrián Chacón, Pablo Busó, Clara Blasco-López	AIJU
Georgios Malliopoulos	Q-PLAN
Chiara Pocaterra, Flavia Fusconi, Laura Mentini	APRE
Jana Bielikova	PEDAL
Pietro Rigonat	LOBA

Peer Reviews

NAME	ORGANISATION
Georgios Malliopoulos	Q-PLAN
Chiara Pocaterra, Flavia Fusconi, Laura Mentini	APRE
Jana Bielikova	PEDAL
Flavia Fusconi	APRE

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2.0	08/10/2024	Chiara Pocaterra	Final revision

Table of Abbreviations and Acronyms

Abbreviation	Meaning
AIJU	ASOCIACIÓN DE INVESTIGACIÓN DE LA INDUSTRIA DEL JUGUETE CONEXAS Y AFINES
APRE	AGENZIA PER LA PROMOZIONE DELLA RICERCA EUROPEA
BIOBEC	H2020 project, GA No. 101023381, https://biobec.eu/
BIOBRIDGES	H2020 project, GA No. 792236, https://www.biobridges-project.eu/
BIOVOICES	H2020 project, GA No. 774331, https://www.biovoices.eu/
BIOWAYS	H2020 project, GA No. 720762, https://www.bioways.eu/
BLOOM	H2020 project, GA No. 773983, https://bloom-bioeconomy.eu/
BTG	B.T.G. BIOMASS TECHNOLOGY GROUP BV
DoA	Description of Action
D	Deliverable
Ec	Economic
En	Environmental
ES	Spain
EU	European Union
EUN	EUN PARTNERSHIP AISBL
FVA	FVA SAS DI LOUIS FERRINI & C
HSPN	Hellenic Society for the protection of nature
HE	Horizon Europe
KER	Key Exploitable Results
Kn	Knowledge
KIP	Key Impact Pathways
KPI	Key Performance Indicator
LAL	Learning Activation Lab
LOBA	GLOBAZ, S.A
M	Month
MOOC	Massive Open Online Course
N/A	Not applicable
PEDAL	Pedal Consulting SRO
PhD	Philosophie Doctor
QPLAN	Q-PLAN INTERNATIONAL ADVISORS PC
Sa	Satisfaction
Sc	Scientific
SDG	Sustainable Development Goal
So	Social
SO	Specific Objective
SOLO	Structure of Observed Learning Outcomes
SSH	Social Sciences and Humanities

Abbreviation	Meaning
T	Task
TBC	To Be Confirmed
TBD	To Be Developed
WP	Work Package
y.o	Years old
ZSI	ZENTRUM FUR SOZIALE INNOVATION GMBH

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1 Executive Summary

The presented deliverable aims to describe the impact monitoring and assessment strategy of the GenB project activities and outcomes in four dimensions: societal, scientific, economic and environmental.

The objective of this strategy is threefold. First, to define a global strategy to verify the quality and effectiveness of the GenB project initiatives in achieving the desired objectives regarding the spread of bioeconomy knowledge and participant satisfaction, with a special focus on measuring the educational impact of GenB. Second, providing insights into how well resources are being utilised and aiming to ensure the achievement of the Specific Objectives. Third, to create an easy and accessible resource to measure the performance and efficiency of processes and activities in terms of Key Performance Indicators (KPIs). As a result, this deliverable shows in detail which are the methodologies, methods, tools and materials, target groups and additional lines of action to perform the assessment and monitoring strategy.

Section 2 introduces the principles of the GenB project, specifying the particular purpose and scope of this deliverable, within its respective Task (T) and Work Package (WP). Then, Section 3 outlines the strategy to achieve of the expected impact by providing an overview of their global methodology, methods, tools and materials in each of the four dimensions analysed – societal, scientific, economic and environmental – as well as the target audience.

For measuring societal, scientific, and economic impact, the Key Impact Pathways (KIPs) assessment, proposed by Horizon Europe, are applied to evaluate the long-term benefits of the GenB project. KIPs have been adapted and tailored to this specific research context. Sections 4 to 6 detail the adaptations of KIPs for the GenB project, including methods, tools and materials, and target groups. Given GenB's emphasis on education, a comprehensive assessment of educational impact is planned in the framework of societal impact. This includes evaluating GenB activities and materials developed in WP2 and T1.4, respectively. An "Activities Assessment" methodology was designed to collect and analyse the change of knowledge – based on the self-assessment –, satisfaction, and appeal. Additionally, the impact of GenB materials will be assessed through "KERs Assessment," focusing on knowledge increase and satisfaction levels. Section 4.1, 4.2, 4.3 and 4.4 outlines the overall educational impact assessment methodology, among other information regarding societal impact.

Given the absence of bioeconomy scales for measuring impact, it is important to highlight the creation of ad-hoc items, specifically adapted to the context of the project, based on an extensive review of scientific literature to perform these measurements. To this end, two dimensions of interest are mainly considered: knowledge and satisfaction. This is due to the importance of these factors in ensuring the proper achievement of the actions that form the GenB methodology, and at the same time creating an exciting and valuable experience for users and making sure this value is perceived by them. Nevertheless, other relevant variables are proposed to be measured globally.

GenB aims to foster long-term environmental change by educating and empowering young people to advocate for sustainability, even if immediate impacts are not measurable. Despite this challenge, in Section 7, the European Union (EU) Consumer Footprint Calculator, which defines 16 indicators aligned with the European Commission's Product Environmental Footprint method. This tool is used qualitatively, assessing the impact of each variable based on feedback from GenB consortium. Additionally, the analysis of the alignment between KERs and the SDGs related to environmental issues is presented as a way to assess GenB's environmental impact. This approach provides insight into the project's contribution, even though it does not involve the development of new products or processes.

Finally, Section 8 and Section 9 show the methodology to monitoring of the fulfilment of the specific objectives. To this end, a global self-check table is presented, highlighting the advantage of being shared and edited by all members of the consortium, and serving to distribute the responsibility among all project members participating in each task. Three elements are considered to ensure the accomplishment of the objectives: 1) the Specific Objectives described in the Description of Action (DoA), 2) the Key Performance Indicators (KPIs) expressed in a quantitative way, and 3) the deadlines as agreed in the DoA.

KIPs and KPIs serve distinct but complementary roles in monitoring and evaluating impact. Combining both allows for a holistic evaluation framework that not only tracks the success of the project's implementation but also assesses the real-world impact of its outcomes. Since the GenB materials will be ready during the final phase of the project, the complete evaluation will be reflected in *D4.3 Impact Assessment - Second Period*. Meanwhile, *D4.2 Impact Assessment - First Period* will focus on presenting the status of activities through the KPIs outlined in the DoA, ensuring their proper implementation, and confirming that the activities are being successfully carried out without any deviations from the planned course.

2 Introduction

2.1 Background of the GenB project

GenB contributes to the implementation of the updated 2018 EU Bioeconomy Strategy and the European Green Deal priorities, and the achievement of a climate-neutral Europe by 2050 and the Sustainable Development Goals, involving the most relevant awareness and education EU funded projects and initiatives (Transition2Bio, BIObec, AllThings.Biopro, WaysTUP!, BIOSWITCH, BLOOM, BIOVOICES, BIOWAYS, LIFT, Biobridges, BioCannDo, EuBioNet), European and International school networks and experts in socio-economic science and humanities.

GenB overall objective is to make the Generation Bioeconomy (GenB), aware, sensitive and interested on environmental issues, sustainability and circularity. GenB will: 1) Co-create innovative approaches in cooperation with young people, parents, teachers and other formal and non-formal education professionals, to provide formats, materials and toolkits on the bioeconomy and bio-based sectors, through societal innovation (Common Ground Camp, Focus Groups and Living Labs); 2) Inspire & Inform young people, raising their awareness on sustainable and circular bioeconomy and bio-based sectors, including the promotion of bioeconomy careers; Educate young people to accelerate the transition towards a more sustainable and circular behaviours and lifestyles, teachers in teaching environmental issues and other multipliers to promote the bioeconomy to their target audiences; 3) Engage and Empower Bioeconomy Youth Ambassadors (GenB Ambassadors), the frontrunners in driving the change by attracting and influencing other young people; support them to Take a role creating opportunities to make their 'voices' heard and assume their role in the transition. 4) To maximise its impacts and ensure exploitation, replicability, and sustainability, GenB will: widely communicate and engage the society, create synergies with other projects and initiatives, consolidate the GenB educational model, and produce policy recommendations targeting Ministries of Education and other policy makers.

2.2 WP4 Objectives

The primary objective of WP4 focuses on 1) assessing the impact of the GenB project through robust monitoring and evaluation, 2) developing an educational model for sustainable and circular bioeconomy, and 3) providing policy recommendations to Ministries of Education. It involves creating effective assessment strategies, educational guidelines, and policy advice to enhance the project's outcomes and integration into educational systems by:

- To maximise the impacts of GenB activities, contents and tools (T4.1), objective directly linked with this deliverable.
- To facilitate exchange of good practices among education communities (national and European) and to transform the GenB education model into stakeholder-oriented actionable knowledge (T4.2)
- To support the modernisation of the governance by making information and knowledge available and accessible to policy makers (T4.3)

2.3 T4.1 Objectives

In particular, T4.1 Impact monitoring and assessment is devoted to configuring a sound impact monitoring and assessment strategy. Reliable impact indicators such as SSH indicators are to be included, to monitor and assess the impact of the proposed GenB materials and activities for each of the six interconnected actions of the GenB methodology (Co-create, Inspire & Inform, Educate, Engage, Empower and Take a role). The strategy also provides advice and guidance for fine-tuning, improvements, or corrective actions.

2.4 Structure of the deliverable 4.1

This deliverable is structured as follows:

- Section 1 introduces the executive summary.
- Section 2 presents the introduction.
- Section 3 provides a general explanation of the strategy designed to assess the impact in four dimensions.
- Section 4 to 7 detail the methodologies developed to measure societal, economic, scientific and environmental impacts, respectively. Each section presents the approach for capturing these impacts in a comprehensive manner.
- Section 8 presents the methodology to evaluate the achievement of the Specific Objectives (SOs) in the GenB project.
- Section 9 outlines the methodology employed for monitoring the fulfilment of the SOs and KPIs.
- Section 10 presents the conclusions.
- Section 11 lists the references used for defining the monitoring and impact assessment processes of the GenB project.
- Appendices 1 to 11 include the questionnaire templates and registration forms designed for these purposes.

2.5 Scope of the deliverable 4.1

The objective of this deliverable is to outline the impact monitoring and assessment strategy of the GenB project activities and outcomes. More specifically, this deliverable intends to:

1. Establish the GenB KIPs that can be of use to evaluate the impact in the short-, medium- and long-term of the project's actions. These KIPs will be grouped in three dimensions according to their field of action.
2. Present the methodology to be followed in order to find out the levels of understanding and satisfaction, derived in the target groups, of the proposed activities (workshops, social media campaigns, Massive Open Online Courses (MOOC), etc.) and toolkits in the project.
3. Present and describe the tool(s) prepared to monitor and acknowledge the achievement of the SOs and KPIs established, for the different WP and T, in the project proposal. The achievement of the project's KPIs will enable the measurement of the KIPs.

4. Define additional KPIs or reliable impact indicators to verify the effectiveness of the GenB project activities in fostering each of the six interconnected actions of the GenB methodology (Co-create, Inspire & inform, Educate, Engage, Empower and Take a role) in global terms, taking as a reference the Specific Objectives (SO) of the project.

Since the GenB toolkits will be ready during the final phase of the project, the complete evaluation will be reflected in *D4.3 Impact Assessment - Second Period*. Meanwhile, *D4.2 Impact Assessment - First Period* will focus on analysing the status of activities towards theirs expected impact.

3 Global strategy for assessing the expected impact

3.1 Overview of the methodology

The GenB project intends to evaluate its impact across four dimensions: societal, economic, scientific, and environmental. For this purpose, various methodologies have been designed – “KIPs Assessment”, “Activities Assessment”, “KERs Assessment”, and "Consumer Footprint Calculator" – and are briefly introduced below.

For measuring **societal, scientific, and economic impact**, the KIPs assessment – proposed by the Horizon Europe (HE)[1] – will be applied, following the approach outlined in the "KIPs Assessment". KIPs are designed to measure the long-term impact of the project, i.e., the significant changes or benefits that the project generates in society, the economy, and/or the science. They focus on the long-term added value produced by the project and how it contributes to major societal or strategic challenges. The KIPs have been adapted to this particular research context and based on them, implications and recommendations will be developed. Based on the feasibility of the results and the contribution of this project, each KIP in the three dimensions –scientific, societal and economic– are adapted to the context. Sections 4 to 6 outline the societal, scientific, and economic KIPs impacts, detailing their adaptation to the GenB project. These sections also present the methods, tools and materials, as well as the intended target group within the GenB project.

Specifically for social impact and given that the GenB project has a core focus on raising awareness, inspiration and education in the field of bioeconomy, a detailed assessment of the educational impact is planned. For this purpose, both the GenB activities – framed its development in Work Package 2 – and GenB materials – framed its development in T1.4 – within the project are considered.

For measuring the educational impact of the activities implemented in non-formal or informal settings, a non-formal methodology for "Activities Assessment" (Section 4.3) has been designed, where the increased knowledge – based on the self-assessment –, satisfaction and appeal of the GenB activities are analysed.

On the other hand, for measuring the impact of the GenB materials, these have been categorised under the project’s Key Exploitable Results (KERs). This assessment will follow an extended evaluation approach. For this purpose, a methodology for measuring “KERs Assessment" (Section 4.4) has been developed, focusing on analysing the increased knowledge and satisfaction level generated by the GenB materials. Section 4 and following sections outline the educational impact assessment methodology.

[1] Evidence Framework on monitoring and evaluation of Horizon Europe and Action Project (Grant Agreement No: 824603) https://research-and-innovation.ec.europa.eu/strategy/support-policy-making/shaping-eu-research-and-innovation-policy/evaluation-impact-assessment-and-monitoring/horizon-europe-programme-analysis_en

To measure the **environmental impact**, the "Consumer Footprint Calculator" will be used to identify qualitatively which environmental indicators included in the calculator are addressed by the GenB project, along with the extent of their influence. Additionally, the alignment of the key exploitable results (KERs) developed in GenB with the Sustainable Development Goals (SDGs) will be evaluated. Further details are provided in Section 7.

An overall overview of the expected impact assessment configuration is shown in Figure 1.

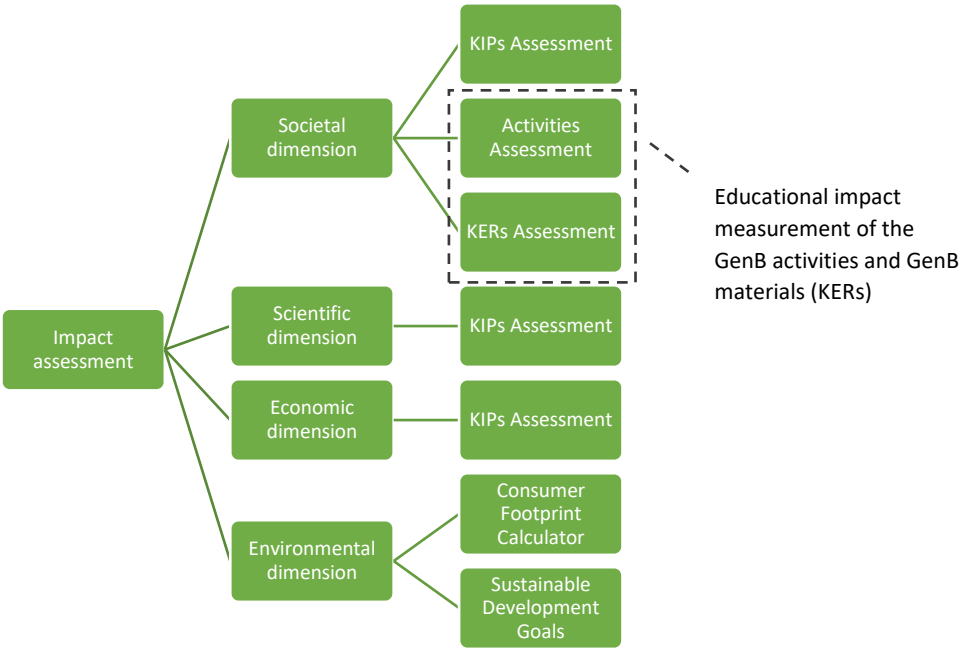

Figure 1. Overview of the expected impact assessment configuration.

In summary, the impact of the GenB project will be measured as follows: 1) the societal dimension will be assessed through "KIPs Assessment" methodology and the customised methodologies "Activities Assessment" and "KERs Assessment", 2) the scientific and 3) economic dimensions will both be measured through "KIPs Assessment" methodology, and 4) the environmental dimension will be evaluated through an expert analysis by employing the "Consumer Footprint Calculator" tool and the SDGs. Table 1 below gathers an overview of the expected impact assessment strategy.

Since the GenB toolkits will be ready during the final phase of the project, the complete evaluation of the toolkits will be reflected in *D4.3 Impact Assessment - Second Period*. Meanwhile, *D4.2 Impact Assessment - First Period*.

Dimension	Methodology	Objective	Tools and materials	Target audience	Partner responsible for data collection	Data source	Timing
Societal	KIPs Assessment	Verify the alignment of GenB project results with EU policies (KIP's)	Survey. Questionnaire – "Societal impact assessment through KIP's" (Appendix 3)	GenB consortium	AIJU	No context needed	M28
	Activities Assessment	Analyse the change of knowledge – based on the self-assessment –, satisfaction and appeal of the GenB activities	Survey. Questionnaire – "Societal – educational impact assessment through GenB activities". Two versions: Reduced and Full (Appendix 4)	Pre- and early school children (4–8 y.o.) Elementary school children (9–13 y.o.) High school students (14–19 y.o.) Teachers Multipliers GenB Ambassadors Other relevant participants	GenB consortium	Various, provided by GenB activities	M6-M28
		Evaluate the perceived change of knowledge – based on the self-assessment –, satisfaction and appeal of the GenB activities	Observation. Semi-structured informal interview	GenB consortium	AIJU	Online meeting	M28
	KERs Assessment	Analyse the level of change of knowledge and satisfaction	Survey. Questionnaire – "Societal – educational impact assessment through GenB materials (KERs)" (Appendix 5) Survey II.	Pre- and early school children (4–8 y.o.) Elementary school children (9–13 y.o.) High school students (14–19 y.o.)	AIJU PEDAL	Educational institutions, within the framework of school interventions	M25-M28
				Participants in the MOOC	EUN	MOOC delivery platform	TBC

Dimension	Methodology	Objective	Tools and materials	Target audience	Partner responsible for data collection	Data source	Timing
			Questionnaire – educational impact assessment through MOOC" (Appendix 6)				
		Evaluate the perceived change of knowledge and satisfaction	Observation. Semi-structured informal interview	GenB consortium	AIJU	Online meeting	M28
Scientific	KIPs Assessment	Verify the alignment of GenB project results with EU policies (KIP's)	Survey. Questionnaire – "Scientific impact assessment through KIP's" (Appendix 7)	GenB consortium	AIJU	No context needed	M28
Economic	KIPs Assessment	Verify the alignment of GenB project results with EU policies (KIP's)	Survey. Questionnaire – "Economic impact assessment through KIP's" (Appendix 8)	GenB consortium	AIJU	No context needed	M28
Environment	Consumer Footprint Calculation	Identify the indicators included in the calculator are addressed by the GenB project and determine the alignment of the SDGs with the GenB KERs.	Expert analysis method. Calculator – "Consumer Footprint Calculator" and SDGs analysis	GenB consortium	AIJU	No context needed	M28

Table 1. Overview of the expected impact assessment strategy

3.2 Overview of the methods, tools and materials

In order to take into account the perspectives of the different interest groups –three targets of young people, teachers, multipliers, GenB Ambassadors, among others possible– and obtain data of a varied nature that allow in-depth understanding of the impressions of all the stakeholders involved in the project, a hybrid methodology will be used with respect to data collection techniques. Different tools will be combined, such as online questionnaires, interviews and direct observation techniques. In order to guide partners in the application of the questionnaire in a standardized and harmonized way, specific guidelines will be developed by AIJU in combination with personal assistance.

3.2.1 Societal dimension

For part of the social dimension, a **"KIPs Assessment" methodology** has been designed. A specific questionnaire titled *"Societal impact assessment through KIP's"* (see Appendix 3) has been developed for this purpose. This questionnaire will be completed by the GenB consortium towards the end of the project, at Month (M) 28.

A significant aspect of societal impact measurement is evaluating the educational impact, which involves assessing the activities and materials within the GenB project. To accomplish this, the societal KIPs assessment (Section 4.1) is complemented by analysing the educational impact through two customised methodologies, "Activities Assessment" methodology, and "KERs Assessment" methodology designed to evaluate the effects of the WP2 activities and the WP1-T1.4 materials, respectively within the project. The goal is to measure - in terms of knowledge and satisfaction - the educational gain that GenB materials and GenB activities generate. To achieve this, two methods have been designed for this:

1. **"Activities Assessment" methodology**, for the measurement of the GenB activities impact implemented in non-formal or informal education settings. To this end, a lite educational assessment (like non-formal assessment approach) has been designed for the GenB events. A questionnaire titled *"Societal – educational impact assessment through GenB activities"* (see Appendix 4) has been developed to be completed by young people, teachers, multipliers, GenB Ambassadors and/or another relevant participant during GenB activates. This questionnaire has two versions: the reduced version and the full version. At a minimum, the reduced version will be applied during activities, with additional questions from the full version included as the event permits. It is planned for M6 to M28. Additionally, the GenB consortium will collect perceptions from events using observational techniques. Their feedback will be shared to be analysed during an online meeting, following a semi-structured interview format.
2. "**KERs Assessment" methodology**, for the measurement of the GenB materials impact implemented in formal settings. This involves assessing the impact of certain KERs developed in the project. To this end, an extended educational assessment has been designed for school interventions and to conduct during the delivery of the MOOC. A questionnaire titled *"Societal – educational impact assessment through GenB materials (KERs)"* (see Appendix 5) has been created for this purpose. In the case of school

interventions, it will be completed by students aged 4-8, 9-13, and 14-19 years old and teachers during an educational evaluation in at least two schools, scheduled for M25-M28. In the case of the delivery of the MOOC (see Appendix 6), it will be completed by participants in this capacity. Additionally, the GenB consortium will collect perceptions from events using observational techniques. Their feedback will be shared to be analysed during an online meeting, following a semi-structured interview format.

3.2.2 Scientific dimension

For the scientific dimension, a **"KIPs Assessment"** methodology has been designed. A specific questionnaire titled *"Scientific impact assessment through KPIs"* (see Appendix 7) has been developed for this purpose. This questionnaire will be completed by the GenB consortium towards the end of the project, at M28.

3.2.3 Economic dimension

For the economic dimension, a **"KIPs Assessment"** methodology has been designed. A specific questionnaire titled *"Economic impact assessment through KPIs"* (see Appendix 8) has been developed for this purpose. This questionnaire will be completed by the GenB consortium towards the end of the project, at M28.

3.2.4 Environmental dimension

For the environmental dimension, the European Union (EU) **Consumer Footprint Calculator**, which defines 16 indicators aligned with the European Commission's Product Environmental Footprint method. This tool will be implemented qualitatively by addressing an expert analysis by GenB consortium towards the end of the project, at M28. A specific registration form titled *"Registration form for the environmental impact assessment through the Consumer Footprint Calculator* has been developed for this purpose (since the questionnaire has been realised on a SharePoint excel, the Consortium cannot give the access to the general public according to the project privacy policy). Additionally, the analysis of the **alignment between KERs and the SDGs** (within the Societal assessment through KIPs) related to environmental issues is presented to assess GenB's environmental impact.

3.3 Overview of the target audience

Regarding the target audience, the following groups have been identified:

- The **three target groups of young people** (Pre- and early school children, Elementary school children, and High school studentswill be involved in assessing societal impact through both "Activities Assessment" and "KERs Assessment".
- **Teachers, multipliers, GenB Ambassadors**, and other relevant participants will contribute to measuring societal impact via "Activities Assessment".
- **Participants in the MOOC** will be involved in assessing societal impact through "KERs Assessment".

- The **GenB consortium** will evaluate the societal, scientific, and economic impacts using "KIPs Assessment". Additionally, they will provide feedback on the engagement and appeal of GenB activities in the framework of "Activities Assessment" and they will assess the Environmental impact through thee Consumer Footprint Calculator.

Table 2 outlines a general overview of the types of participants, as well as the methodologies employed for each impact assessment and the context in which the data sources are produced.

Target audience	KIPs Assessment (So., Sc., and Ec. Impacts)	Activities Assessment (So. Impact)	KERs Assessment (So. Impact)	Consumer Footprint Calculator (En. Impact)
Pre- and early school children (4–8 years old), Elementary school children (9–13 years old), and High school students (14–19 years old)	N/A	Various, provided by GenB activities	Educational institutions, within the framework of school interventions	N/A
Teachers, multipliers, GenB Ambassadors, and other relevant participants	N/A	Various, provided by GenB activities	N/A	N/A
Participants in the MOOC	N/A	N/A	MOOC capacity	N/A
GenB consortium	No context needed	Online meeting	Online meeting	No context needed

Table 2. Overview of the target audience with the employed methodology and data source context

Sections 4.1.3, 4.3.2, and 4.4.2 provide detailed descriptions of the target audience for the social dimension, while Section 5.4 focuses on the scientific dimension, Section 6.4 on the economic dimension, and Section 7.3 on the environmental dimension.

4 Societal impact

An essential pillar of the GenB project is related to its impact on different spheres of society. GenB project seeks to promote behavioural and socioeconomic change thanks to raising awareness, inspiring, educating about bioeconomy, as well as engaging and empowering various target groups training in terms of bioeconomy to take initiative. This, which will ultimately result in a greater awareness of the importance of the environment and the power of the new generations to lead the change towards sustainability and circularity in consumption. For this purpose, three types of measurement will be carried out across different methodologies:

1) "KIPs Assessment" methodology
2) "Activities Assessment" methodology
3) "KERs Assessment" methodology

GenB project has a strong focus on education, so a detailed assessment of the educational impact is required. For this reason, the need of 2) and 3) complementary methodologies arises to analyse the social dimension of the impact by assessing the impact of the GenB activities – framed its development in WP2 – and the impact of GenB materials – framed its development in *Task 1.4 – Toolkits for young people, teachers and other multipliers.*

Section 4.1 and Section 4.2 introduces the societal KIPs adapted to the project framework, while Section 4.3 describes in detail both the "Activities Assessment" methodology and "KERs Assessment" methodologies designed to evaluate the activities and materials developed within the GenB project.

4.1 Societal KIPs Assessment

Key Impact Pathways are a methodology used to evaluate and measure the impact of research and innovation projects. These indicators help identify and analyse the direct and indirect effects of a project in various domains, such as science, economy, and society. They provide valuable information on how a project's outcomes contribute to scientific advancement, sustainable economic growth, and societal well-being, facilitating strategic decision-making and future planning. Figure 2 shows the societal impact KIPs defined by Horizon Europe.

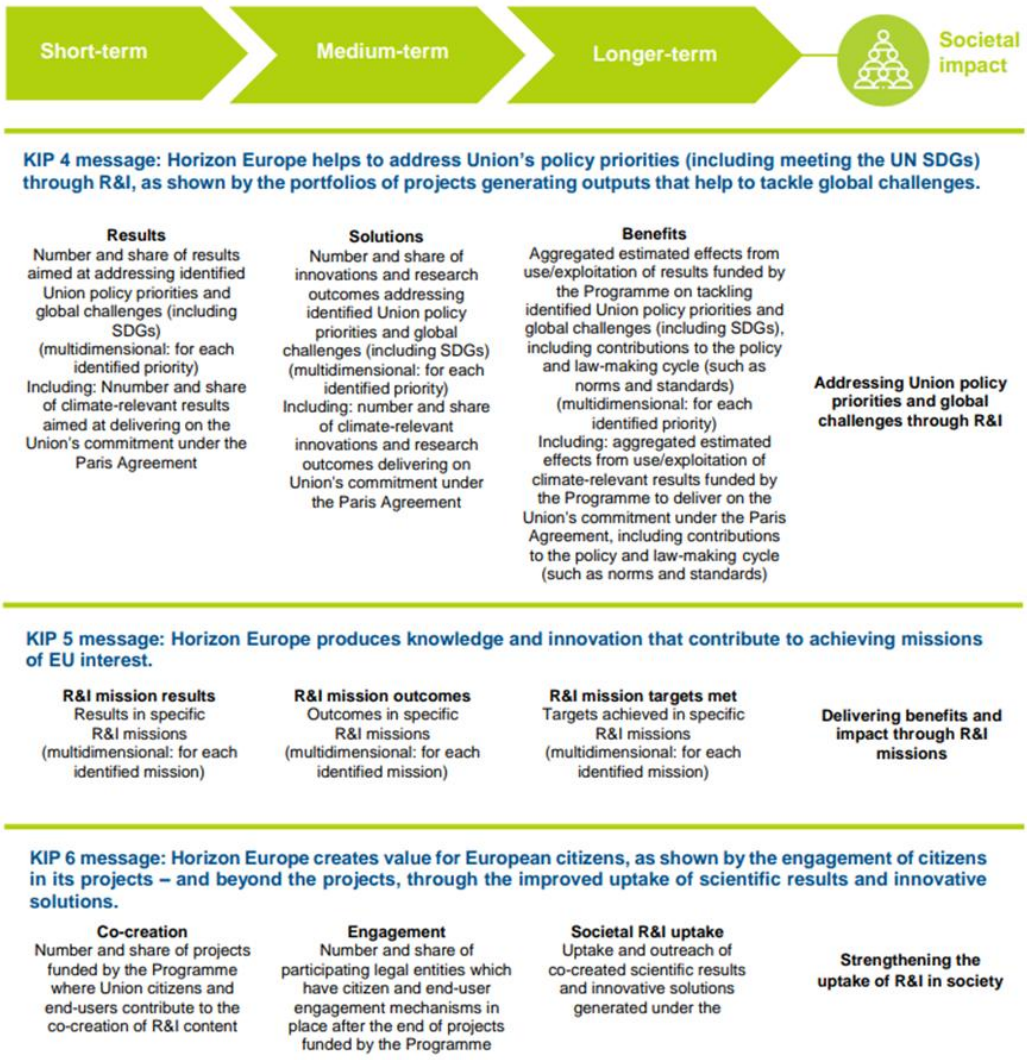

Figure 2. KIPs of societal impact proposed by Horizon Europe

4.1.1 Methodology

The methodology focuses on adapting the societal KPIs to the GenB project framework, converting them into clear and measurable metrics that will form the basis of a questionnaire. This questionnaire, distributed among the GenB consortium by the end of the project, ensures the effective collection of relevant data on societal impact.

The questionnaire guideline is provided in Appendix 3. This evaluation related to the KIPs will complement the methodology used to measure the impact of the GenB activities and the KERs developed within the framework of the GenB project.

The correlation between societal KPIs and the measurable metrics in questions form are gathered in Table 3.

SOCIETAL IMPACT	
Item	KIP in HE
1. Total number of educational materials: Please list the educational materials generated by the project and classify them according to the EU policy priorities they address.	KIP 4 – Addressing Union Policy Priorities and global challenges through R&I - Results
2. Of the educational materials generated, indicate the percentage specifically designed to address EU policy priorities.	
3. % of educational materials addressing EU policy priorities:	
4. % of educational materials addressing EU policy priorities: % of materials related to SDGs:	
5. What methods has your project used to ensure that the educational materials developed are aligned with EU policy priorities and the SDGs?	KIP 4 – Addressing Union Policy Priorities and Global Challenges through R&I - Solutions
6. What challenges has your project faced in attempting to align educational materials with EU policy priorities and the SDGs?	
7. How has your project addressed these challenges?	
8. Which stakeholders or audiences have been the main beneficiaries of the educational materials developed?	KIP 6 – Strengthening the Uptake of R&I in Society - Engagement
9. How many innovations or research outcomes has the project generated to date?	KIP 5 – Delivering Benefits and Impact through R&I Missions - R&I Mission Outcomes
10. What recommendations do you have for improving the alignment of educational materials in future projects with EU policy priorities and the SDGs?	KIP 4 – Addressing Union Policy Priorities and Global Challenges through R&I - Solutions
11. Are EU citizens and/or end-users involved in the co-creation of R&D&I content in your project?	KIP 6 – Strengthening the Uptake of R&I in Society - Co-Creation
12. Has your entity developed any mechanism for citizen and end-user participation after the completion of the Horizon Europe-funded project?	KIP 6 – Strengthening the Uptake of R&I in Society - Engagement

Table 3. GenB Societal KPIs Assessment: adaptation of metrics

4.1.2 Tools and materials

As explained above, a questionnaire titled *"Societal impact assessment through KIP's"* has been developed for the assessment of the KIP societal impact.

The named questionnaire is a detailed survey focused on assessing the societal impact of the GenB project by evaluating the alignment of its educational outputs and innovations with EU

policy priorities and SDGs, and by identifying the extent of citizen and end-user engagement in the project's research, development, and innovation processes.

The questionnaire uses both qualitative and quantitative approaches. It requests a list of educational materials and innovations. It also asks for a percentage breakdown of materials targeting these goals, as well as narrative descriptions of challenges, solutions, and stakeholder engagement.

The questionnaire contains 12 questions, of which 10 are open-ended and 2 are dichotomous. Some of these questions include multiple sub-questions.

The questionnaire addresses all the impacts proposed by the European Commission. Therefore, some may not have a direct relation to GenB, or it may be too early to obtain a response since these indicators pertain to the long term. To facilitate the compilation of this information, we will inform GenB consortium at the beginning of the questionnaire that they have the option to respond with "Not applicable" for any impacts they believe are not related to the project.

To collect feedback from partners, the questionnaire will be provided in Word format. It will be sent to the GenB consortium towards the end of the project, in M28. The partner AIJU will be responsible for administering the questionnaire, collecting the data, processing it, and preparing the results report. This feedback will be documented in *D4.3 Impact Assessment - Second Period.*

4.2 Preface to Activities Assessment and KERs Assessment

4.2.1 Formal and non-formal assessment

According to the European Commission's definition of formal learning[2], the learning derived from the activities and materials of the GenB project is classified as non-formal learning. Given the heterogeneity of the activities proposed in GenB, where varying contexts, durations, target audiences, and other factors are present, a formal evaluation during the activities and events mainly framed within WP2 – *Inspire, Inform and Educate* and *WP3 – Engage, Empower & Take a role* is not feasible.

Therefore, a non-formal assessment approach naturally aligns with the project's needs. This will be conducted during GenB activities, following an ad hoc methodology titled "Activities Assessment," which will employ an evaluation approach but with questions based on scientific scales and literature review. Table 4 provides an overview of the relationship between the methodologies, validation approaches, validation scopes, and environments.

[2] "Formal learning takes place in the education and training system, in universities and in the High level arts, music and dance education institutions and leads to a certification or a vocational qualification, which can be obtained also through an apprenticeship. Non-formal learning is an intentionally chosen learning that takes place outside the formal education and training system. It takes place in any organisation with educational and training purposes, also in voluntary bodies, national civil service organizations, organisations of the private social sector or enterprises" (europa.eu).

Methodology	"Activities Assessment"	"KERs Assessment"
Validation Approach	Non-formal validation	Most formal validation possible
Validation Scope	Lite evaluation assessment	Extended educational assessment
Environment	Uncontrolled	Controlled

Table 4. Overview of the formal and non-formal assessment

However, to ensure a more formal evaluation in a controlled environment that isolates the effects of other variables, enabling us to measure the increase in bioeconomy knowledge and appeal attributable to the GenB project, a methodology has been developed to enable the most formal evaluation possible. That will be applied to the GenB KERs, which are the ones which will have an educational impact after project conclusion. This will be carried out in two controlled environments (school interventions and the delivery of the MOOC) and will follow an extended evaluation approach. The developed methodology is called the "KERs Assessment" methodology.

As shown in Figure 3, the "Activities Assessment" will follow an evaluation approach, while the "KER's Assessment" will adopt an extended evaluation approach. These methodologies will define the research objectives, focusing on measuring the project's impact across four dimensions: societal, scientific, economic, and environmental, as well as the measurement scales to be applied. The methods, tools and materials will vary in each type of evaluation to align with their specific characteristics. This is further detailed in Section 4.3 and 4.4, respectively.

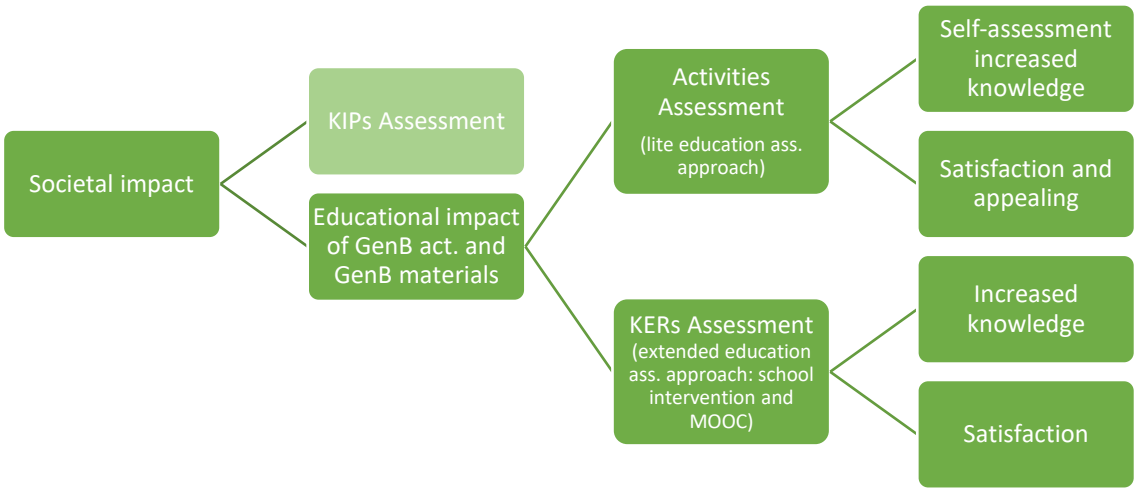

Figure 3. Relationship between educational assessments of societal impact, methodological approach, and measurement variables

Both methodologies aim to capture the dimensions of **knowledge** and **satisfaction**, with their analysis detailed in Section 4.2.2.

4.2.2 Study dimensions: knowledge and satisfaction

There are series of measurement scales to make sure that the educational objectives of each of the tasks and linked activities have been accomplished. When designing and selecting measurement items, a norm is proposed to ensure that the dimensions related to co-create, inspire & inform, educate, engage and empower, and take a role, have been aligned with the proposed KPIs and achieved through their consecution. In this way, it will be ensured that appropriate Social Sciences and Humanities (SSH) that have been considered when evaluating the performance of the activities.

Two key dimensions have been selected as central to the measurement of educational impact within the broader societal impact: knowledge and satisfaction. Consequently, these results provide valuable insights into the appeal of the content as well as the proposed sessions. Knowledge and satisfaction are considered key elements in assessing the effectiveness of each GenB activity within WP2, and consequently, the GenB toolkits developed in WP1-T1.4. The analysis of the knowledge and satisfaction dimensions aims to assess the effectiveness in: 1) transmitting ideas and notions about bioeconomy, following an informative approach, to the target groups, and 2) creating an enjoyable environment where the acquisition of knowledge is perceived as useful by the target audience.

1. Methodology

In order to conduct a comprehensive impact assessment focused on the impact analysis of the knowledge and satisfaction dimension regarding bioeconomy, the steps shown in Figure 4 were taken:

Figure 4. Process for developing scales to measure knowledge and satisfaction in the bioeconomy sector

Systematic review of academic literature

A systematic review of academic literature related to the subject of study was conducted using academic and scientific databases and search engines such as Scopus, Web of Science, and Google Scholar. The keywords used were *"BIOECONOMY SCALE," "BIOECONOMY LEARNING," "MEASURE," "BIOECONOMY IMPACT," "IMPACT ASSESSMENT," "SCALE,"* and *"LEARNING"*. Additionally, a review of various impact deliverables from projects within the H2020 programme and other European project calls, conducted through a search on CORDIS[3] - was carried out.

[3] CORDIS provides information on all EU-supported R&D activities, including programs (Horizon Europe, H2020 and older), projects, results, publications. Source: https://cordis.europa.eu/

Rezaei (2015)[4] developed the Best-Worst Method (BWM), a multi-criteria decision-making (MCDM) method designed to evaluate alternatives based on decision criteria. It involves pairwise comparisons of the best and worst criteria to optimize decision-making.

Some scientific articles, such as *"Social sustainability assessments in the biobased economy: Towards a systemic approach*[5]*"* utilise methods like the Best-Worst Method (BWM) to evaluate impacts, particularly in contexts involving companies. This methodology is particularly useful when performing analyses like the four general iterative steps of Social Life Cycle Analysis (SLCA), which considers all life cycle phases of the biobased economy. SLCA assesses various social and economic dimensions throughout the production and consumption processes of bio-based products, making it highly relevant for industrial and corporate settings.

However, the BWM and SLCA approaches are less suited for educational contexts, where the focus is on teaching bioeconomy principles and fostering behaviour changes. These methods are designed to address complex decision-making challenges within companies, considering large-scale impacts, rather than focusing on the educational and behavioural shifts typically targeted in academic environments. For education, other evaluation tools or scales that assess attitude shifts or learning outcomes would be more appropriate.

Given the absence of scales specifically designed to evaluate the field of bioeconomy in an educational context, the research concluded that existing tools were insufficient and must be adapted from the fields of science and technology. This gap in scientific literature was further confirmed by the Faculty of Education at the University of Valencia.

Analysis of available scales

A search and selection of potentially adaptable similar scales has been done. A total of 12 scales were reviewed across various scientific articles and publications. Of these, 4 were selected for adaptation to analyse the educational impact of the GenB activities and materials - The Learning Activation Lab[6], Nkhoma et, al (2017)[7], Mason (2019)[8] -Sulitest tool and, Badau & Badau (2018)[9].

It can be stated that 4 other scales have been indirectly applied, as the contributions of their authors formed the basis for constructing the selected scientific measurement scales.

[4] Rezaei, J. (2015). "Best-worst multi-criteria decision-making method." Omega, 53: 49-57. doi: 10.1016/j.omega.2014.11.009

[5] Rafiaani, P., Kuppens, T., Van Dael, M., Azadi, H., Lebailly, P., & Van Passel, S. (2018). Social sustainability assessments in the biobased economy: Towards a systemic approach. Renewable and Sustainable Energy Reviews, 82(3), 1839-1853. https://doi.org/10.1016/j.rser.2017.06.118

[6] Learning Activation Lab http://activationlab.org/tools/

[7] Nkhoma, M. Z., Lam, T. K., Sriratanaviriyakul, N., Richardson, J., Kam, B., & Lau, K. H. (2017). Unpacking the revised Bloom's taxonomy: developing case-based learning activities. *Education+ Training*, *59*(3), 250-264.

[8] Mason, A. (2019). *Sulitest®: A mixed-method, pilot study of assessment impacts on undergraduate sustainability-related learning and motivation*.

[9] Badau, D., & Badau, A. (2018). The motric, educational, recreational and satisfaction impact of adventure education activities in the urban tourism environment. Sustainability, 10(6), 2106.

Specifically, the scales of Biggs & Collis (1982)[10] – SOLO Taxonomy, Fu, Su & Yu (2009)[11] – EGameFlow, Anderson & Krathwohl (2001)[12] – Bloom's Taxonomyand, Addison & Tollefson (2022)[13] – Fink's Taxonomy of Significant Learning laid the groundwork for the development of the chosen scales. Table 5 shows the relationship.

Author(s)	Studies on which they are based directly (Author and tool/scale)
The Learning Activation Lab	None
Nkhoma et, al (2017)	Biggs & Collis (1982) – SOLO Taxonomy Fu, Su & Yu (2009) - EGameFlow Anderson & Krathwohl (2001) – Bloom's Taxonomy Addison & Tollefson (2022) – Fink's Taxonomy of Significant Learning
Mason (2019)	None
Badau & Badau (2018)	None

Table 5. Foundational studies and frameworks that underpin the tools or scales used by the selected authors.

Additionally, the scales by DeVellis & Thorpe (2021)[14], Lovelace & Brickman (2013)[15], as well as Velayutham, Aldridge & Fraser (2011)[16] and Rezaei (2015)[4] were consulted. Although not directly applied, they contributed to shaping the overall approach to measuring the dimensions of knowledge and satisfaction.

[10] Biggs, J. B., & Collis, K. F. (1982). The psychological structure of creative writing. Australian Journal of Education, 26(1), 59-70.

[11] Fu, F.-L., Su, R.-C., & Yu, S.-C. (2009). EGameFlow: A scale to measure learners' enjoyment of e-learning games. Computers & Education, 52(1), 101–112. https://doi.org/10.1016/j.compedu.2008.07.004.

[12] Anderson, L., & Krathwohl, D. E. (2001). A Taxonomy for learning teaching and assessing: A revision of Bloom's taxonomy of educational objectives [Abridged]. New York: Addison Wesley Longman, Inc.

[13] Addison, B. P., & Tollefson, T. (2022). Fink's Taxonomy of Significant Learning.

[14] DeVellis, R. F. & Thorpe, C. T. (2021). Scale development: Theory and applications. Sage publications.

[15] Lovelace, M., & Brickman, P. (2013). Best practices for measuring students' attitudes toward learning science. *CBE life sciences education*, *12*(4), 606–617. https://doi.org/10.1187/cbe.12-11-0197

[16] Velayutham, S., Aldridge, J., & Fraser, B. (2011). Development and Validation of an Instrument to Measure Students' Motivation and Self-Regulation in Science Learning. International Journal of Science Education, 33(15), 2159–2179. https://doi.org/10.1080/09500693.2010.541529

Figure 5 shows an overview of the analysis of available scales.

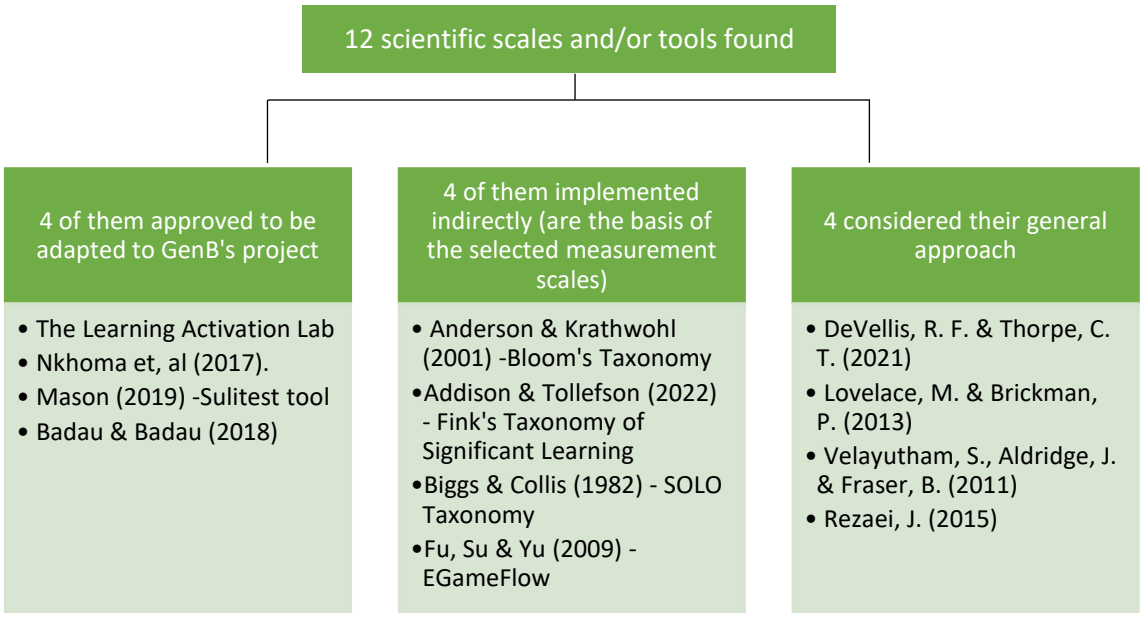

Figure 5. Scientific scales and/or tools to be adapted to the bioeconomy context

Table 6 shows a list of the four selected tools and/or scales, including their authors and the corresponding dimensions of study which applies: knowledge (Kn.) and/or satisfaction (Sa.).

Author(s)	Tool / Scale utilised	Analysis dimension of application
The Learning Activation Lab	Science Learning Activation – Values Science Learning Activation – Fascination Science Learning Activation – Competency Beliefs STEM Learning Activation – Values STEM Learning - Activation – Fascination STEM Learning Activation – Competency Beliefs	Kn.
Nkhoma et, al (2017)	Knowledge improvement is measured	Kn.
Mason (2019)	Sulitest tool	Kn.
Badau & Badau (2018)	Satisfaction of bioeconomy	Sa.
The Learning Activation Lab	Engagement Survey	Sa.

Kn.: knowledge dimension; Sa.: satisfaction dimension

Table 6. List of authors and scales used for developing scales to measure knowledge and satisfaction in the bioeconomy sector.

The subsections titled *Measurement of the knowledge dimension in the GenB project* and *Measurement of the satisfaction dimension in the GenB project* within in the present Section 4.2.2 provide the adaptation of the selected scientific measurement scales to the bioeconomy field within the context of the GenB project. Additionally, a detailed explanation of the

theoretical framework of the tools and/or scales from the four approved scales and the four scales implemented indirectly is included in Appendix 1 (regarding the measurement of the knowledge dimension) and Appendix 2 (concerning the measurement of the satisfaction dimension).

2. Measurement of the knowledge dimension in the GenB project

To derive an accurate measurement of the knowledge of bioeconomy and its related dimensions resulting from the project's activities, three sources have been considered:

1. The Learning Activation Lab
2. Nkoma et al 2017
3. Mason (2019) – Sulitest tool

An explanation of each theoretical framework of these tools and taxonomies is included in Appendix 1 as well as the ones which influenced in the used scales (previously referred to as scales implemented indirectly, serving as the basis for the selected measurement scales).

The Learning Activation Lab

The adaptation of the knowledge scales proposed by The Learning Activation Lab (LAL) for the field of bioeconomy within the context of the GenB project is detailed below in Table 7. The items will be measured using a 5-point Likert scale with different codes.

Item No.	Item adaptation	Original Scale
Item 1	"How important is it for you to learn about bioeconomy"	STEM Learning Activation – **Values** *Chen, Cannady, Schunn & Dorph (2017)*
Item 2	"Bioeconomists think about how to make things work better. How important is it for you to think like this?"	
Item 3	"Bioeconomy is the most important thing in the world for me to learn."	
Item 4	"I think bioeconomists are the most important people in the world."	SCIENCE Learning Activation – **Values** *Chung, Cannady, Schunn, Dorph & Bathgate (2016)*
Item 5	"Knowing bioeconomy is important for:"	
Item 6	"I think bioeconomy ideas are valuable"	
Item 7	Bioeconomy makes the world a better place to live.	STEAM & SCIENCE Learning Activation – **Values** *Chen, Cannady, Schunn & Dorph (2017)* *Chung, Cannady, Schunn, Dorph & Bathgate (2016)*
Item 8	Knowing bioeconomy is important for being a good citizen	
Item 9	"I think bioeconomy is more important to know than anything else"	
Item 10	"Knowing bioeconomy helps me understand how the world works."	
Item 11	"Thinking like a bioeconomist will help me do well in:"	
Item 12	"I wonder about how bioeconomy works: "	

Item No.	Item adaptation	Original Scale
Item 13	"In general, when I work in class/ study/ practice on bioeconomy:"	SCIENCE Learning Activation – **Fascination** *Chung, Cannady, Schunn, Dorph & Bathgate (2016)*
Item 14	"In general, I find bioeconomy:"	
Item 15	"After a bioeconomy activity is over, I look for more information about bioeconomy"	
Item 16	"I want to read everything I can find about bioeconomy"	
Item 17	"I want to know everything about bioeconomy"	
Item 18	"I want to know how to do everything that bioeconomists do"	
Item 19	"I want to know how to do everything related with my favourite theme on bioeconomy (biomaterials, bioenergy, farming, etc.)"	
Item 20	"I talk about how bioeconomy works with friends or family"	STEM Learning Activation – **Fascination** Chen, Cannady, Schunn & Dorph (2017)
Item 21	"I love bioeconomy!"	
Item 22	"Bioeconomy makes me feel excited"	
Item 23	"I need to know how bioeconomy works."	STEAM & SCIENCE Learning Activation – **Fascination** *Chung, Cannady, Schunn, Dorph & Bathgate (2016)* Chen, Cannady, Schunn & Dorph (2017)
Item 24	"After a really interesting bioeconomy activity is over, I can't stop thinking about it"	
Item 25	"If I went to a bioeconomy museum, I could figure out what is being show in:"	SCIENCE Learning Activation – **Competency Beliefs** *Chung, Cannady, Schunn, Dorph & Vincent-Ruz (2016)*
Item 26	"I think I am very good at: Coming up with questions about bioeconomy."	
Item 27	"I think I am very good at: Doing bioeconomy experiments."	
Item 28	"I can do (I am able to follow) the bioeconomy activities I get in class: "	STEAM & SCIENCE Learning Activation – **Competency Beliefs** *Chen, Cannady, Schunn & Dorph (2017)* *Chung, Cannady, Schunn, Dorph & Vincent-Ruz (2016)*
Item 29	"If I went to a bioeconomy museum, I could figure out what is being show in:"	
Item 30	"I can understand bioeconomy information on websites for mi kids of my age:"	
Item 31	"If I did my own project in an after-school bioeconomy club, it would be (how you will feel?)"	
Item 32	"I think I am very good at: Figuring out how to fix a bioeconomy activity that didn't work (experiments, problems, discussions, etc.)"	

Table 7. Adapted Items from Learning Activation Lab for measuring GenB participant knowledge

Nkhoma et al., 2017

As previously said, it is important to note that the theoretical frameworks proposed by Bloom's Taxonomy, Fink's Taxonomy of Significant Learning, and SOLO Taxonomy do not have defined scales. It is Nkhoma (2017) who, by interpreting these theoretical frameworks, propose a scale. Therefore, these three theoretical frameworks are also considered indirectly.

The adaptation of the knowledge scales proposed by Nkhoma et al, (2017) for the field of bioeconomy within the context of the GenB project is detailed below in Table 8. The items will be measured using 5-point Likert scale (*totally disagree* to *totally agree*).

Item No.	Item adaptation	Original Scale
Item 1	"The activity increases my knowledge (about bioeconomy)"	Change of knowledge – based on the self-assessment – is measured *Nkhoma et, al (2017)*
Item 2	"I catch the basic ideas of the knowledge taught (about bioeconomy)"	
Item 3	"I try to apply the knowledge learned (about bioeconomy) in the activity"	
Item 4	*"The activity motivates me to integrate the knowledge taught (about bioeconomy)"*	

Table 8. Adapted Items from Nkoma et al, (2017) for measuring GenB participant knowledge

Sulitest tool

The adaptation of the knowledge scales proposed by the Sulitest tool for the field of bioeconomy within the context of the GenB project is detailed below in Table 9. The items will be measured using a 7-point Likert scale (*totally disagree* to *totally agree*).

Item No.	Item adaptation	Original Scale
Item 1	"The knowledge I gained from GenB Activities help me to see sustainable opportunities around me"	Sulitest tool *Mason (2019)*
Item 2	"I learned a great deal by completing the GenB activities "	
Item 3	"The GenB content help me to reflect on my sustainability knowledge"	
Item 4	"The GenB activities help me to understand how my knowledge of sustainability compared to other children of my same age of my country"	
Item 5	"The GenB activities help me to understand how my knowledge of sustainability compared to other children of my same age of my ages globally"	
Item 6	"The GenB activities motivated me to share sustainability-related information with others that I know"	
Item 7	"The GenB activities motivated me to seek additional sustainability information from others that I know"	
Item 8	"I will likely retake the GenB activity voluntarily in the future to see if I have improved my sustainability related knowledge"	

Table 9. Adapted Items from Mason (2019) for measuring GenB participant knowledge

3. Measurement of the satisfaction dimension in the GenB project

To derive an accurate measurement of the satisfaction of bioeconomy and its related dimensions as a result of the project's activities, three sources have been considered:

A. Learning Activation Lab[Errore. Il segnalibro non è definito.]
B. Badau & Badau (2018)

An explanation of each theoretical framework of these tools and taxonomies is included in Appendix 2.

The Learning Activation Lab

The adaptation of the satisfaction scales proposed by the Learning Activation Lab for the field of bioeconomy within the context of the GenB project is detailed below in Table 10. Specifically, the Engagement in Science Learning Activities instrument created by Chung, Cannady, Schunn, Dorph & Bathgate (2016)[17].

The items will be measured using a 4-point Likert scale (*NO!* to *YES!*).

Errore. Il segnalibro non è definito. Table 10Item No.	Item adaptation	Original Scale
Item 1	"During this activity/MOOC/Material (game, etc.): I felt bored."	SUCCESSES – **Engagement Survey** *Chung, Cannady, Schunn, Dorph & Bathgate (2016)*
Item 2	"During this activity/MOOC/Material (game, etc.): I felt happy. "	
Item 3	"During this activity/MOOC/Material (game, etc.): I felt excited."	
Item 4	"During this activity/MOOC/Material (game, etc.): I was daydreaming a lot"	
Item 5	"During this activity/MOOC/Material (game, etc.): I was focused on the things we were learning most of the time."	
Item 6	"During this activity/MOOC/Material (game, etc.): I was busy doing other tasks"	
Item 7	"During this activity/MOOC/Material (game, etc.): I talked to others about stuff not related to what we were learning"	
Item 8	"During this activity/MOOC/Material (game, etc.): Time went by quickly"	

[17] Chung, J., Cannady, M. A., Schunn, C., Dorph, R., & Bathgate, M., (2016) Measures Technical Brief: Engagement in Science Learning Activities. Retrieved from: http://www.activationlab.org/wp-content/uploads/2016/02/Engagement-Report-3.1-20160331.pdf

Table 10. Adapted Items from Learning Activation Lab for measuring GenB participant satisfaction

Badau & Badau (2018)

The adaptation of the satisfaction scale proposed by the Badau & Badau (2018)**Errore. Il segnalibro non è definito.** for the field of bioeconomy within the context of the GenB project is detailed below in Table 11. The items will be measured using a 5-point Likert scale (*totally disagree* to *totally agree*).

In order to measure participants' satisfaction with the activity and based on the scale by Badau & Badau (2018) adapted to this research context, three items are included in the questionnaire related to each educational activity in which participants have taken part in. Table 11 shows the items defined.

Item No.	Item adaptation	Original Scale
Item 1	"How do you appreciate the attractiveness of this activity (i.e., if it was fun, entertaining, etc.)?"	Satisfaction *Badau & Badau (2018)*
Item 2	"How do you rate your recommendation of the activity for different age categories?"	
Item 3	"How do you rate your satisfaction in this activity?"	

Table 11. Adapted Items from Badau & Badau (2018) for measuring GenB participant satisfaction

4.3 Activities Assessment

4.3.1 Methods, tools and materials

The objective of "Activities Assessment" is to evaluate both knowledge acquisition and participant satisfaction. The questions will be aimed to identify how the aspects of knowledge and satisfaction, are addressed through the different activities, and which aspects can be improved in order to maximise the accomplishment of the GenB educational model purposes.

The activities scheduled in the GenB project are extensive and vary in format, as will be detailed in *D2.1 Implementation Plan* for WP2 (its implementation and progress will be shown in *D2.2 Report on Inspire and Inform and Educate Activities – First Period* and *D2.3 Report on Inspire and Inform and Educate Activities – Second Period*). Examples of these activities include hands-on activities, the use of GenB toolkits (e.g., quizzes, games), and teacher training through the MOOC developed as part of T1.4.

It should be noted that, due to the varying contexts, durations, target audiences, and other factors, it has been decided to conduct an educational impact assessment using a lite approach during the GenB activities —i.e., Activities Assessment, while and an extensive approach will be applied in controlled —i.e., during planned school interventions and the delivery of the MOOC (for the extended approach, see KERs Assessment in Section 4.4). This decision arises from the challenge of establishing a controlled environment that ensures the collection of participant feedback with the necessary quality.

To facilitate this, a questionnaire titled *"Societal – educational impact assessment through GenB activities"* (see Appendix 4) has been developed.

1. Questionnaire structure

"Societal – educational impact assessment through GenB activities" questionnaire gathers a lite approach of measuring the educational impact.

This objective can be achieved through two distinct versions of the assessment. For this purpose, *"Societal – educational impact assessment through GenB activities"* questionnaire is divided into two parts:

1. the Reduced version (Part 1), and
2. the Full version (Part 1 and 2).

The **Reduced version** of the questionnaire serves as the basic and minimum assessment conducted during GenB activities, ensuring essential insights are gathered. On the other hand, the **Full version** consists on the Reduced version and additional section (Part 2). It is added when the characteristics of the activity (e.g., space, time, nature of the activity) allows for a more in-depth evaluation. It is important to note that the Full version is based on *"Societal – educational impact assessment through GenB materials (KERs)"* questionnaire, which gives it a more formal and structured approach, providing a comprehensive assessment aligned with more rigorous standards.

2. Questionnaire administration

"Societal – educational impact assessment through GenB activities" questionnaire will be administrated to the target audience **immediately at the end of the events.** The partners of the GenB consortium who carry out GenB activities will be responsible for administering the questionnaire to the participants.

3. Scientific measurement scales

Regarding the scientific measurement scales, the **Reduced version** consists of:

1. Knowledge (Kn.): Evaluated through the change of knowledge – based on the self-assessment –, using the GenB adapted items from Nkoma et al. (2017) to measure participant knowledge.
2. Satisfaction (Sa.): Assessed through participant satisfaction and the appeal of activities, using the GenB adapted items from Badau & Badau (2018) to measure participant satisfaction.

The **Full version** includes:

1. The content of the Reduced version
2. Knowledge (Kn.): Further assessed to measure the increase in knowledge gained through the event, using the GenB adapted items from:
   - Sulitest tool outlined by Mason (2019)
   - The Learning Activation Lab – Science Learning Activation – Values
   - The Learning Activation Lab – Science Learning Activation – Competency Belief
   - The Learning Activation Lab – Science Learning Activation – Fascination
   - The Learning Activation Lab – STEM Learning Activation – Values
   - The Learning Activation Lab – STEM Learning Activation – Competency Belief
   - The Learning Activation Lab – STEM Learning Activation – Fascination
3. Satisfaction (Sa.): Evaluated through the measurement of the overall satisfaction with the activities, using the GenB adapted items from:
   - The Learning Activation Lab – Successes – Engagement Survey

Figure 6 shows an overview of the structure, objectives and scales employed in GenB activities assessment questionnaire to assess both knowledge gain and participant satisfaction.

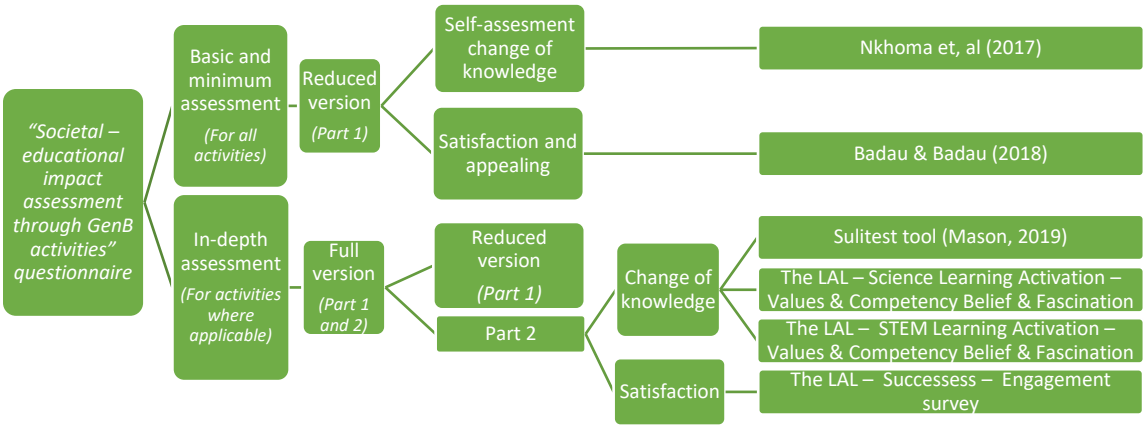

Figure 6. Overview of the structure, objectives and scales employed in GenB activities assessment questionnaire

4. Procedure for adapting and implementing the questionnaire for each GenB activity

A different questionnaire will be designed and programmed for each of the activities, serving as the basis the *"Societal – Educational Impact Assessment through GenB Activities"* questionnaire. The following outlines the steps for customising the named questionnaire for each event, as well as the procedures for its implementation.

1. Analysis of the model questionnaire script. The questions will be adapted to fit the event's characteristics.
2. Elaboration of questions with a formal approach. A formal assessment questions will be included from *"Societal – educational impact assessment through GenB materials (KERs)"*, if the event permits it.
3. Design of the online questionnaire. The questionnaire – English version – will be created using the Gandia Quest 4 design tool.
4. Review of the questionnaire. The partner responsible for the activity will review the questionnaire to ensure it meets the objectives and functions correctly. Corrections will be made if necessary.
5. Design of the questionnaire in the respondents' language.
6. Generation of the link and/or QR code, to be sent to the partner responsible of the activity.

Data collection formats

To ensure maximum flexibility and accessibility of collecting feedback from intended respondents (see Section 4.4), the questionnaire will be available in different formats and timeframes for administration, given that the target audience will not always be reachable for

the first option, a personal online questionnaire (for which a digital version of the questionnaire will be used). Proposed alternatives are:

a) printed questionnaire to be filled in directly in person where the focal activity takes place,
b) online platforms for live questionnaires such as Kahoot or Quizizz.

The suitability of the format will be agreed upon between the partner responsible for conducting the activity and AIJU, as the partner responsible for data collection. Once decided, the questionnaire will be designed in the preferred format.

Data analysis

After the questionnaire is implemented, the collected data will be processed and analysed using Gandia Barbwin. Data will try to be collected in the shortest possible time after the focal activities have been carried out. The partner AIJU will be responsible for administering the questionnaire, collecting the data, processing it, and preparing the results report. This feedback will be documented in *D4.3 Impact Assessment - Second Period.*

5. *Qualitative feedback from partners*

On the other hand, the GenB consortium will qualitatively evaluate the activities in the events—specifically the perceived change of knowledge, satisfaction and appeal of the GenB activities in participants—using direct observation techniques. An online meeting will be held with at least one representative from each partner, during which AIJU, as the responsible partner, will conduct a semi-structured informal interview to gather partners' impressions on how they assess the educational impact of the activities. The partner AIJU will be responsible for collecting the data, processing it, and preparing the results report too. This feedback will be documented in *D4.3 Impact Assessment - Second Period.*

4.3.2 Target group and data source

For calculating the Activities Assessment impact within the societal impact, the questionnaire title *"Societal – educational impact assessment through GenB activities"* (Appendix 4) will be distributed among the participants in the GenB activities. They are expected to include the three target groups of young people, teachers, multipliers, GenB Ambassadors, and/or other relevant stakeholders. Additionally, a qualitative evaluation through a semi-structured informal interview among the GenB consortium will be carried out. An overview of this distribution is provided in Table 12. The target groups are detailed below.

Dimension	Measurement method	Target audience	Tools and materials	Data source
Societal	Activities Assessment	Pre- and early school children (4–8 y.o.) Elementary school children (9–13 y.o.) High school students (14–19 y.o.) Teachers Multipliers	Survey. Questionnaire – "Societal – educational impact assessment through GenB	Various, provided by GenB activities

Dimension	Measurement method	Target audience	Tools and materials	Data source
		GenB Ambassadors Other relevant participants	activities" (Appendix 4)	
		GenB consortium	Semi-structured informal interview	Online meeting

Table 12. Relationship between measurement methods, target audience, methods, tools, materials and data source in Activities Assessment

1. GenB consortium

Additionally, the activities will undergo qualitative evaluation by the GenB consortium. An online meeting will be convened with at least one representative from each partner, during which AIJU, as the responsible partner, will conduct a semi-structured informal interview. The objective is to cover the same dimensions of interest for participants (e.g., knowledge, satisfaction and others), but from the perspective of the partners, who are mostly in charge of performing the activities and accomplishing the objectives. Therefore, whether the proposed activities in the GenB project are perceived as consistent with the principles set in the grant agreement will be internally measured. A designated representative from each entity will be responsible for completing the questionnaire. Consequently, a sample of 10 responses will be obtained towards the end of the project, at M28.

4.4 KERs Assessment

4.4.1 Methods, tools and materials

The objective of "KERs Assessment" is to evaluate the exploitable results from GenB, assessing their capacity to enhance knowledge that will endure over time and remain accessible to society after the project's completion, offering a comprehensive understanding of the bioeconomy.

Given the varying contexts, durations, target audiences, and other factors, two types of impact assessment - Lite evaluation assessment and Extended educational assessment- has been adopted.. This educational assessment has a greater scientific rigor and it will focus on measuring the effectiveness of some of the project's exploitable outcomes (e.g., game and gamified experiences, etc.). To facilitate this, a questionnaire titled *"Societal – educational impact assessment through GenB materials (KERs)"* (see Appendix 5) has been developed.

1. Questionnaire structure

"Societal – educational impact assessment through GenB materials (KERs)" questionnaire gathers an extended approach of measuring the educational impact using adapted scientific measurement scales. It consists of:

1) scientific measurement scales, and

2) GenB project-related materials (quizzes based on validated scientific content) as a tool to measure the level of increased knowledge in the bioeconomy field.

The procedure of the assessment is divided into three distinct parts, which coincide with the parts into which the questionnaires are structured:

1. the **Pre-evaluation** (Phase 1),
2. the **Immediate Post-evaluation** (Phase 2), and
3. the **Follow-up evaluation** (Phase 3).

2. Questionnaire administration

Three questionnaires are utilised to measure in the most formal way the educational impact during schools' interventions and during the delivery of the MOOC:

- Phase 1. Pre-evaluation. *"Societal – educational impact assessment through GenB materials (KERs)"* questionnaire (Appendix 5A)
- Phase 2. Immediate Post-evaluation. Questionnaire to measure "Activities Assessment", i.e., *"Societal – educational impact assessment through GenB activities"* full version questionnaire (Appendix 5B)
- Phase 3. Follow-up evaluation. *"Societal – educational impact assessment through GenB materials (KERs)"* questionnaire (Appendix 5C)

These questionnaires will be administrated to the target audience in a general way as follows. The Pre-evaluation phase of the questionnaire will be provided **before the start of the activity** and serves to register the level of knowledge before using the selected project's exploitable outcomes (GenB materials). The Immediate Post-evaluation phase of the questionnaire will be provided **at the end of the activity** and serves to register the level of satisfaction before using the selected project's exploitable outcomes (GenB materials). The Follow-up evaluation phase of the questionnaire will be administered **after using the materials** to measure the increase in students' knowledge. To ensure this comparison, the Follow-up part evaluation is the same questionnaire as the Pre-evaluation part. AIJU, PEDAL and EUN partners of the GenB consortium will be the ones responsible for administering the questionnaire to the participants in the different contexts.

It is important to highlight that the items are specifically adapted to each context of use in order to gather the perceptions and needs of the MOOC participants, thus ensuring that the evaluation is relevant to their educational role.

3. Questionnaire administration in educational institutions

Specifically, the flow of applying the "KERs assessment" methodology will be as follows. The Pre-evaluation phase questionnaire will be administered to the three target groups of young people before using the selected GenB materials to be formally evaluated (for more on these materials, see Section 4.4.1, subsection 7. *Selection of GenB materials (KERs) to be evaluated most formally*). In other words, the target audience will first respond to the GenB Quizzes. Next, the young participants will test the selected materials (i.e., *game or gamified educational experience*

and the *Role-play game on bioeconomy jobs at school*) in educational institutions. Upon completing the game-based learning sessions, they will answer The Immediate Post-evaluation questionnaire, which measures knowledge and satisfaction through scientific scales. Lastly, they will retake the Quizzes (The Pre-evaluation phase questionnaire) to assess any knowledge changes regarding bioeconomy after the gameplay. Table 13 shows the explained procedure for implementing the questionnaire.

Part No.	Item adaptation	Tools and materials	Timing	Dimension of application
1	Pre-evaluation	Survey. Questionnaire – "Societal – educational impact assessment through GenB materials (KERs)" (Appendix 5A)	Before the activity	Kn. through conducting quizzes as a tool to measure self-perception of knowledge change (not through scientific scales).
2	Immediate Post-evaluation	Survey. Questionnaire – "Societal – educational impact assessment through GenB activities" (Appendix 5B)	At the end of the activity	Kn. through scientific scales Sa. through scientific scales
3	Follow-up evaluation	Survey. Questionnaire – "Societal – educational impact assessment through GenB materials (KERs)" (Appendix 5C)	After the activity	Kn. through conducting quizzes as a tool to measure self-perception of knowledge change (not through scientific scales)."

Table 13. Characteristics of the procedure for conducting the "KERs Assessment"

The partners AIJU and PEDAL will be responsible for conducting these assessments in their respective countries (Spain and Slovakia). AIJU will handle questionnaire administration, data collection, processing, and preparation of the results report. This feedback will be documented in *D4.3 Impact Assessment - Second Period*.

4. Questionnaire administration in delivering the MOOC

Specifically, the flow of applying the "KERs assessment" methodology will be as follows. The Pre-evaluation phase questionnaire will be administered to the MOOC participants before starting Module 1 of the MOOC course. In other words, the target audience will first respond to the GenB Quizzes. Next, the participants will test the selected material (i.e., the MOOC itself, which will also serve as the tool being evaluated). Once they complete Module 3 of the training, they will answer the Immediate Post-Evaluation questionnaire, which measures knowledge and satisfaction through scientific scales. Lastly, at the end of Module 4 they will retake the Quizzes (The Pre-evaluation phase questionnaire) to assess any knowledge changes regarding bioeconomy after the delivery of the MOOC. Table 14 shows the explained procedure for implementing the questionnaire.

Part No.	Item adaptation	Tools and materials	Timing	Dimension of application

1	Pre-evaluation	Survey. Questionnaire – "Societal – educational impact assessment through MOOC" (Appendix 6A)	Before the module 1	Kn. through conducting quizzes as a tool to measure self-perception of knowledge change (not through scientific scales).
2	Immediate post-evaluation	Survey. Questionnaire – "Societal – educational impact assessment through MOOC" (Appendix 6B)	At the end of module 3	Kn. through scientific scales Sa. through scientific scales
3	Follow-up evaluation	Survey. Questionnaire – "Societal – educational impact assessment through MOOC" (Appendix 6C)	At the end of module 4	Kn. through conducting quizzes as a tool to measure self-perception of knowledge change (not through scientific scales)."

Table 14. Characteristics of the procedure for conducting the "MOOC Assessment"

The partner EUN will be responsible for conducting these assessments during the delivery of the MOOC. AIJU will handle questionnaire administration, data collection, processing, and preparation of the results report. This feedback will be documented in *D4.3 Impact Assessment - Second Period*.

5. *Scientific measurement scales*

Regarding the scientific measurement scales, the **Pre-evaluation part** consists of:

1. KER's from the GenB project (Quizzes) uses as the tool to measure the increase of knowledge.

The Immediate **Post-evaluation part** includes:

1. Knowledge (Kn.): Further assessed to measure the increase in knowledge gained through the event, using the GenB adapted items from:
    - Sulitest tool outlined by Mason (2019)
    - The Learning Activation Lab – Science Learning Activation – Values
    - The Learning Activation Lab – Science Learning Activation – Competency Belief
    - The Learning Activation Lab – Science Learning Activation – Fascination
    - The Learning Activation Lab – STEM Learning Activation – Values
    - The Learning Activation Lab – STEM Learning Activation – Competency Belief
    - The Learning Activation Lab – STEM Learning Activation – Fascination
1. Satisfaction (Sa.): Assessed through participant satisfaction and the appeal of activities, as described by:
    - Badau & Badau (2018)
    - Learning Activation Lab – Successes– Engagement Survey

The **Follow-up evaluation** is the same questionnaire as in **Pre-evaluation part**, which consists of answering the quizzes developed in the Task 1.4

Figure 7 shows an overview of the structure, objectives, scales and tool employed in GenB materials assessment questionnaire to assess both knowledge gain and participant satisfaction.

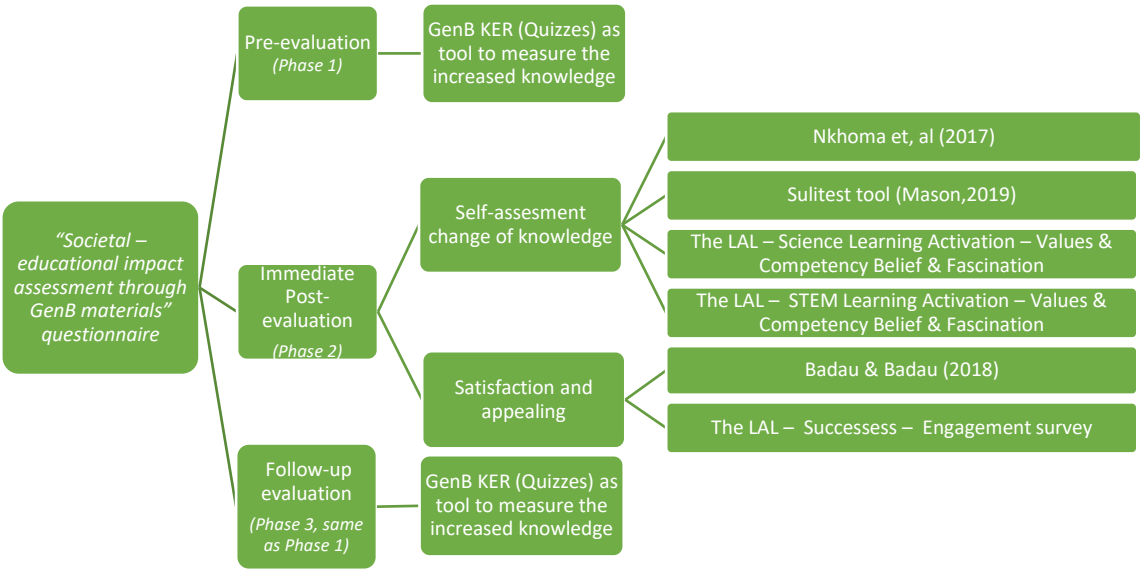

Figure 7. Measurement variables, scientific measurement scales and questionnaire structure for KERs Assessment

6. GenB Quizzes as an evaluation tool

The GenB Bioeconomy quizzes will serve to establish the participants' baseline knowledge of bioeconomy, as well as to determine, through comparison of results, whether there has been an increase in knowledge by the end of the KERs assessment. Specifically, *"20 Bioeconomy quizzes for social media and training for High schools"* have been selected for testing with young people aged 14 to 19. The *"20 Bioeconomy quizzes for social media and high school training"* is one of the materials that will be developed under *Task 1.4 Toolkits for young people, teachers, and other multipliers*, which will form the GenB Toolkit. It will consist of 20 quizzes—likely using multiple-choice and true/false question—designed to assess and enhance users' knowledge on key topics such as sustainability, bio-based plastics, waste management or the circular economy, among others.

To replicate this evaluation for the other two target groups (ages 4-8 and 9-13) during the schools' intervention, additional quizzes from the GenB Library (developed under *T1.1 Collection of bioeconomy awareness, information and educational contents*) will be selected to address these age groups.

7. Selection of GenB materials (KERs) to be evaluated most formally

The expected resources to be used to evaluate whether GenB materials from the GenB Toolkit[18] increase knowledge and appeal in the bioeconomy among young people will include those planned for development in T1.4 *Toolkits for young people, teachers and other multipliers.*

In the **school interventions**, the selected KERs will specifically focus on the *"game or gamified educational experience"* (developed under T1.4.) and the *"Role-play game on bioeconomy jobs at school"* (developed under T2.2 *Inspire and inform students in bioeconomy careers*, specifically). The target group that will use them will consist of three categories of young people. These materials have been selected because are part of the ones which will have an educational impact after the end of the project.

In **delivering the MOOC**, the *"MOOC course"* itself will serve as the material evaluated to assess changes in knowledge about bioeconomy and the satisfaction it may produce a GenB material among two target groups: MOOC participants, who are primarily expected to be teachers, and the students of these teachers. It should be recalled that the MOOC is a direct result of Task 1.4 and, therefore, KER of the project.

8. Procedure for adapting and implementing the questionnaire

A different questionnaire will be designed and programmed for each project's exploitable outcomes, namely, *"game or gamified educational experience", "Role-play game on bioeconomy jobs at school"* and *"MOOC course"*. Likewise, the language and expression will be adapted for each of the three intended age groups of young people (a pre-test will be conducted to determine this necessity). The *"Societal – Educational impact assessment through GenB materials (KERs)"* questionnaire will serve as the basis. Also, for each of the contexts where the "KER Assessment" is applied the questionnaire will be adapted (Appendix 6). The following outlines the steps for implementing the named questionnaire for each school intervention and for the delivery of the MOOC, as well as the procedures for its implementation.

Regarding the **educational institutions**, in each school, the evaluation should be conducted on:

1. two Pre- and early school group (4–8 y.o.),
2. two Elementary school group (9–13 y.o.), and
3. two High school group (14–19 y.o.)

One group from each age range will receive the GenB materials (experimental group), while the other group will not receive the materials being tested (control group)[19].

[19] A control group in a formal evaluation is a group of participants that does not receive the treatment or intervention being tested, serving as a baseline for comparison against the group that does. This group is essential for establishing the effectiveness of the intervention by isolating the effects of the treatment from other variables. By comparing outcomes between the control group and the experimental group

Since the adapted scales from the Learning Activation Lab are designed for children aged 7 to 15, a pre-test will be conducted to ensure that children aged 7, 8, and 9 properly understand the concepts. The questionnaires will undergo minor modifications to better accommodate the youngest segment of the target audience.

Before the intervention in the school, participants will conduct the 1- Pre-evaluation part by answering *"Societal – educational impact assessment through GenB materials (KERs)"* questionnaire (Appendix 5A) aimed at measuring knowledge and habits.

Immediately after using the toolkits, participants will conduct the 2 - Immediate Post-evaluation by answering *"Societal – educational impact assessment through GenB activities"* questionnaire (Appendix 5B) aimed at measuring the satisfaction about the activity.

Finally, after the intervention, participants will conduct the 3 - Follow-up evaluation by replicating the questionnaire conducted in the 1- Pre-evaluation part (specifically, the "GenB KER – Quizzes – as tool to measure the change of knowledge"). The goal is to analyse possible change of knowledge about bioeconomy in participants.

Regarding the delivery of the MOOC, the evaluation should be conducted on participants, who are expected to have a profile as teachers. Before Module 1 of the MOOC, the Pre-evaluation (Phase 1) will be conducted by the participants through the accomplishment of the *"Societal – educational impact assessment through MOOC"* questionnaire (Appendix 6A). At the end of Module 3, the Immediate Post-evaluation (Part 2) will be conducted by the participants through the accomplishment of the *"Societal – educational impact assessment through MOOC"* questionnaire (Appendix 6B). At the end of the MOOC delivery, the Follow-up evaluation (Appendix 6C) will be carried out by filling this questionnaire which is the same questionnaire as Phase 1. Additionally, participants will complete a mandatory questionnaire embedded within the MOOC itself (to be determined by EUN), which will be provided by EUN. The results of this questionnaire will complement the evaluation conducted through the GenB materials questionnaire.

As just described, the evaluation questionnaire will be implemented similarly in both the school context and the MOOC. However, for MOOC participants (teachers), the content will be specifically adapted to their role as educators. The items of the questionnaire will be adjusted to reflect the teachers' perceptions of the usefulness of the MOOC materials in the teaching process and how these contribute to improving knowledge and satisfaction in the field of bioeconomy.

The questionnaire administered to the expected teachers participating in the MOOC capacity serves multiple objectives, which differs from school interventions context of use. Firstly, the

(the group receiving the intervention), evaluators can determine whether any observed changes are due to the intervention itself or other external factors. Control groups help to enhance the reliability and validity of the evaluation results, making it easier to draw conclusions about the impact of the intervention.

questionnaire includes items adapted from the *"Societal – educational impact assessment through GenB activities"* questionnaire to assess the hypothetical impact of the MOOC on teachers' knowledge concerning bioeconomy topics. By measuring any shifts in their understanding, the project aims to assess how well the MOOC supports knowledge acquisition. Secondly, the MOOC version questionnaire (Appendix 6) incorporates the adaptation of questions from *"Societal – educational impact assessment through GenB activities"* to determine hypothetical whether the proposed classroom content—developed for use by the teachers—will effectively facilitate knowledge transfer to students. These questions will assess whether the materials are not only informative but also appropriate for educational settings, ultimately helping to improve student learning outcomes in bioeconomy. Thirdly, it enables the analysis of teacher satisfaction regarding the course completed. The responses will help assess overall engagement and usefulness of the activity from a professional development perspective.

Data source and sample description

For schools, the evaluation will take place in at least two schools from two participating countries in the GenB project. In each country and each school, the evaluation will involve six classes: two from Pre- and early school (4–8 y.o.), two from Elementary school group (9–13 y.o.), and two from High school group (14–19 y.o.). The Pre- and early education group is expected to include students aged 7 to 8 years, the Elementary education group will consist of students aged 11 to 12 years and the High school education group is expected to include students aged 14 to 15 years. The ages of the participants will be dependent on the target audience of the materials that are ultimately selected for the evaluation.

For MOOC, the evaluation will take place during its delivery and the expected target group is described in Section 5.4.2.

Data collection formats

To ensure maximum flexibility and accessibility of collecting feedback from intended respondents, the questionnaire will be available in different formats for administration. Proposed alternatives are:

a) online questionnaire,
b) printed surveys to be filled in directly in person where the focal activity takes place,
c) online platforms for live questionnaires such as Kahoot or Quizizz.

The suitability of the format will be agreed upon between the school responsible where the assessment will be conducted and the partner technicians responsible for data collection, i.e – AIJU, PEDAL and EUN. Once decided, the questionnaire will be designed in the preferred format.

Administration timeframe and data analysis

"Societal – educational impact assessment through GenB materials" questionnaire will be administrated to the target audience by adhering to the timelines and workflows outlined for the three phases of the questionnaire: Pre-evaluation (Phase 1), Post-evaluation (Phase 2), and Follow-up Evaluation (Phase 3). After the questionnaires are implemented, the collected data

will be processed and analysed using Gandia Barbwin. The partner AIJU will be responsible for administering the questionnaires to the involved partners (i.e., PEDAL and EUN), collecting the data, processing it, and preparing the results report. This feedback will be documented in *D4.3 Impact Assessment - Second Period.*

9. Qualitative feedback from partners

On the other hand, the GenB consortium will qualitatively evaluate the KERs —specifically the perceived increase in knowledge and satisfaction in students—using direct observation techniques. An online meeting will be held with at least one representative from each partner, during which AIJU, as the responsible partner, will conduct a semi-structured informal interview to gather partners' impressions on how they assess the educational impact of the activities. AIJU will be responsible for collecting the data, processing it, and preparing the results report too. This feedback will be documented in *D4.3 Impact Assessment - Second Period.*

4.4.2 Target audience and data source

For calculating the KERs Assessment impact within the societal impact, the questionnaire title *"Societal – educational impact assessment through GenB materials (KERs)"* (Appendix 5) will be distributed among the participants in the 1) school interventions, and 2) MOOC. Additionally, a qualitative evaluation through a semi-structured informal interview among the AIJU, PEDAL and EUN partners will be carried out. An overview of this distribution among the target groups are provided in Table 15.

Dimension	Measurement method	Target audience	Tools and materials	Responsible for data collection	Data source
Societal	KERs Assessment	Pre- and early school children (4–8 years old) Elementary school children (9–13 years old) High school students (14–19 years old)	Survey. Questionnaire – "Societal – educational impact assessment through GenB materials (KERs)" (Appendix 5)	AIJU PEDAL	Schools
		Participants in the MOOC	Survey. Questionnaire – "Societal – educational impact assessment through GenB materials (KERs)" (Appendix 6) Survey. Questionnaire – Mandatory questionnaire embedded within the MOOC itself (TBD by EUN)	EUN	MOOC capacity
		GenB consortium	Semi-structured informal interview	AIJU	Online meeting

Table 15. Relationship between measurement methods, target audience, methods, tools, materials and data source in societal impact assessment

1. *Three target groups of young people – schools' intervention*

Participants in the GenB materials assessment are expected to involve the three target groups of young people during school interventions. In accordance with the procedure outlined in Section 5.3.1 – *8. Procedure for adapting and implementing the questionnaire for each GenB activity – Sample description*, the sample of responses will be correlated with the number of tools from the GenB toolkit and the GenB Library used in the evaluations.

2. *Participants in the MOOC*

Concerning the target audience for MOOC delivery, it expects to include practicing teachers of all experience levels and subject areas, as well as student teachers preparing to enter the profession. Additionally, the course is expected to aim at other educational professionals, researchers, and bioeconomy stakeholders interested in integrating the topic of bioeconomy into their work. No prior experience or knowledge of bioeconomy will be required to participate in the MOOC course.

The *"Societal – educational impact assessment through GenB materials (KERs)"* questionnaire (Appendix 6) will be distributed to all the participants. Taking into account the KPIs of the project, a total of 800 teachers and 12.000 students indirect will be educated in teaching bioeconomy through the following resources: *"What's bioeconomy" MOOC* (Task 2.4a), *"How to use GenB toolkits"* (Task 2.4b) and *"Bioeconomy job profiles" on factsheets explanation* (Task 2.4c).

Additionally, these participants will complete the questionnaire embedded within the MOOC itself, following the quality guidelines of the platform where it will be hosted, for which the partner EUN will be responsible. Some of the questions will complement the previously mentioned evaluation, as alignment with the content of the questions is anticipated.

5 Scientific impact

One of the main pillars is the impact on the scientific community and how the project's outputs can lead to knowledge making and advancement, to knowledge sharing, availability and accessibility, and open future lines and opportunities for research.

5.1 Scientific KIPs Assessment

Key Impact Pathways are a methodology used to evaluate and measure the impact of research and innovation projects. These indicators help identify and analyse the direct and indirect effects of a project in various domains, such as science, economy, and society. They provide valuable information on how a project's outcomes contribute to scientific advancement, sustainable economic growth, and societal well-being, facilitating strategic decision-making and future planning. Figure 8 shows the scientific impact KIPs defined by Horizon Europe.

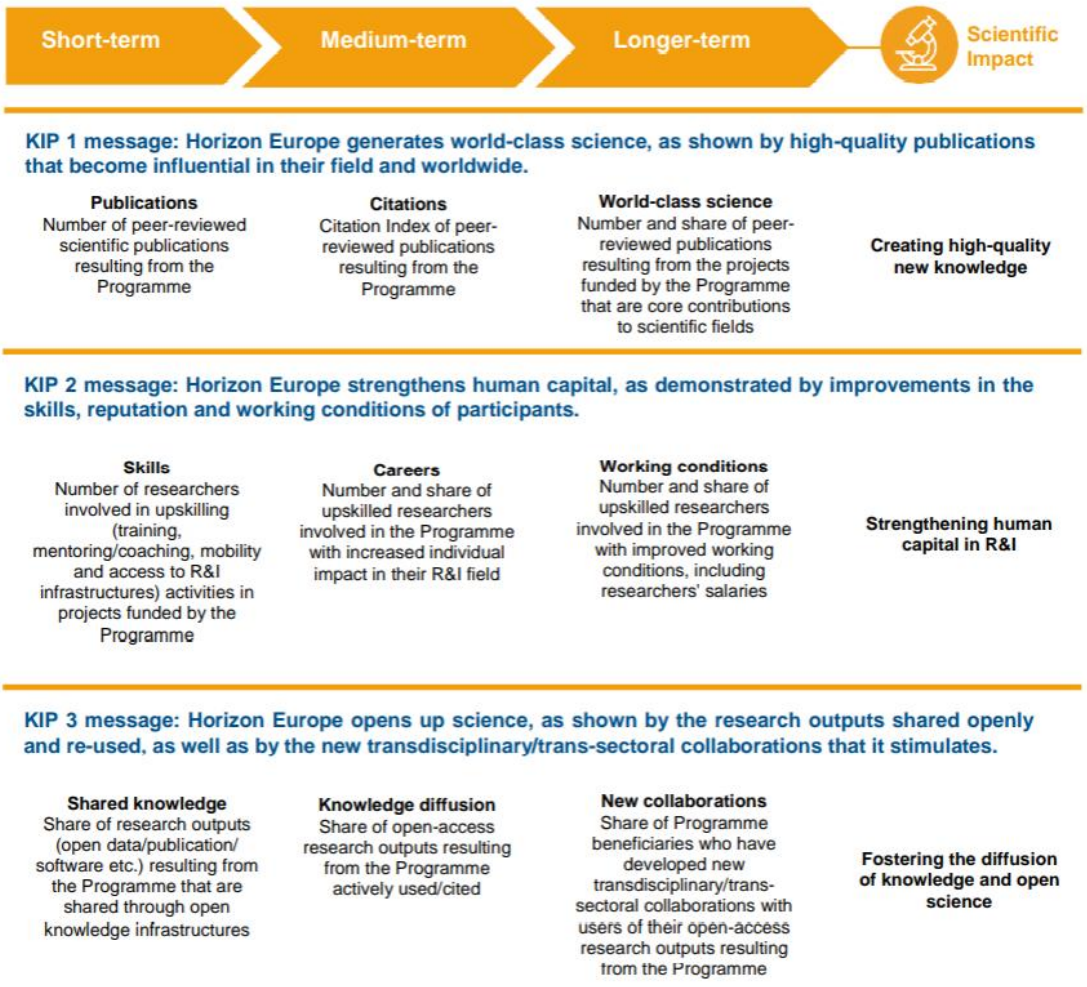

Figure 8. KIPs of scientific impact proposed by Horizon Europe

5.2 Methodology

The methodology focuses on adapting the scientific KPIs to the GenB project framework, converting them into clear and measurable metrics that will form the basis of a questionnaire. This questionnaire, distributed among the GenB consortium by the end of the project, ensures the effective collection of relevant data on societal impacts.

The questionnaire guideline for KIPs scientific impact is provided in Appendix 7. This evaluation related to the KIPs will complement the methodology used to measure the impact of the GenB activities and the KERs developed within the framework of the GenB project.

The correlation between scientific KPIs and the measurable metrics in questions form are gathered in Table 16.

SCIENTIFIC IMPACT	
Item	KIP in HE
1.a Please provide a list of peer-reviewed articles	KIP 1 - Creating high-quality new knowledge - Publications
2. How visible are your research outputs on social media and research platforms such as Academia, Research.edu, etc.?	KIP 1 - Creating high-quality new knowledge - Citations
5. Are the data available on the web (whatever format) with an open license, to be Open Data?	KIP 3 - Fostering diffusion of knowledge and open science - Shared Knowledge
6. Are the data available as machine-readable structured data (e.g., excel instead of image scan of a table)?	
7. Are the data published in a non-proprietary format (e.g., CSV instead of Excel)?	
8. Does your data follow best practices for open data from W3C or another source?	
9. Do the data link to other people's data (sets) to provide context?	
17. Did you ease access to traditional and local knowledge resources, for example to your citizens' knowledge about their local environment and practices?	KIP 3 - Fostering diffusion of knowledge and open science - Knowledge diffusion
18. Did you facilitate knowledge creation among societal actors and groups?	KIP 3 - Fostering diffusion of knowledge and open science - New collaborations
19. Did GenB project generate knowledge that was impossible to generate without a citizen science approach?	KIP 3 - Fostering diffusion of knowledge and open science - Knowledge diffusion
22. Total number of researchers funded by GenB project:	KIP 2 - Strengthening human capital in R&I - Skills
23. Indicate the average H-index of these researchers before their participation in the GENB project:	KIP 2 - Strengthening human capital in R&I - Careers

Table 16. GenB Scientific KPIs Assessment: adaptation of metrics

5.3 Tools and materials

For the assessment of the scientific impact, a questionnaire titled *"Scientific impact assessment through KIP's"* has been developed that includes the metrics outlined in the KIPs (see Table 16) as well as additional items considered relevant for further insight and/or to provide information requested by GenB KPIs. These supplementary questions (questions 3, 4, 10–16, 20, 21, and 24) are directly integrated into the questionnaire template. Appendix 7 provides the questionnaire guidelines.

The named questionnaire is a detailed survey designed to collect comprehensive data on various academic and research outputs, citizen participation in scientific outputs, and the openness of data within the GenB project. It gathers information in key areas, including the categorisation of academic outputs, the assessment of citizen engagement, interdisciplinary contributions, and the openness and visibility of data. Scales are employed to measure these aspects, ensuring a thorough evaluation of the project's impact.

- Academic publications (peer-reviewed, non-peer-reviewed, books, chapters, etc.)
- Visibility of research outputs on social media and academic platforms
- Citizen participation and recognition in scientific outputs
- Openness and FAIRness of data following open data principles
- New research fields and interdisciplinarity contributions
- Educational and training innovations
- Researcher working conditions and satisfaction before and after GenB participation

The questionnaire contains 24 questions, each of which includes multiple sub-questions, resulting in a large total number of questions. Regarding the types of questions, it includes:

- Open-ended questions. These allow for detailed responses, such as *"If you scored 3 or higher, please describe how"* and *"Please list them (and use the right category)."*
- Dichotomous questions. These include Yes/No questions like *"Have you contributed to creating any new research groups in academia?"* and *"Were your citizens recognised for their participation in the scientific output?"*
- Rating scale questions. Several questions use a Likert scale (e.g., 1 to 5), such as *"Please indicate on a scale from 1-5, where 1=not at all, and 5=a lot."*
- Categorical questions. Many questions request detailed lists of academic outputs in categories like peer-reviewed articles, non-peer-reviewed articles, books, book chapters, theses, and non-scientific publications.

The questionnaire addresses all the impacts proposed by the European Commission. Therefore, some may not have a direct relation to GenB, or it may be too early to obtain a response since these indicators pertain to the long term. To facilitate the compilation of this information, we will inform participants at the beginning of the questionnaire that they have the option to respond with "Not applicable" for any impacts they believe are not related to the project.

To collect feedback from partners, the questionnaire will be provided in Word format. It will be sent to the GenB consortium towards the end of the project, in M28. The partner AIJU will be responsible for administering the questionnaire, collecting the data, processing it, and preparing the results report. This feedback will be documented in *D4.3 Impact Assessment - Second Period.*

5.4 Target audience

For calculating the scientific impact, the questionnaire title "*Scientific impact assessment through KIP's"* (Appendix 7) will be distributed among the 10 consortium partners towards the end of the project, at M28. A designated representative from each entity will be responsible for completing the questionnaire. Consequently, a sample of 10 responses will be obtained.

6 Economic impact

The results of the project are also expected to contribute to the European economic and technological advancement and to a fair and just transition. The scientific approach on which the whole project is based allows for specific innovations that generate economic outcomes. The specific innovations arising from the GenB project are expected to contribute to the economic transition by addressing environmental challenges.

6.1 Economic KIPs Assessment

Key Impact Pathways are a methodology used to evaluate and measure the impact of research and innovation projects. These indicators help identify and analyse the direct and indirect effects of a project in various domains, such as science, economy, and society. They provide valuable information on how a project's outcomes contribute to scientific advancement, sustainable economic growth, and societal well-being, facilitating strategic decision-making and future planning. Figure 9 shows the economic impact KIPs defined by Horizon Europe.

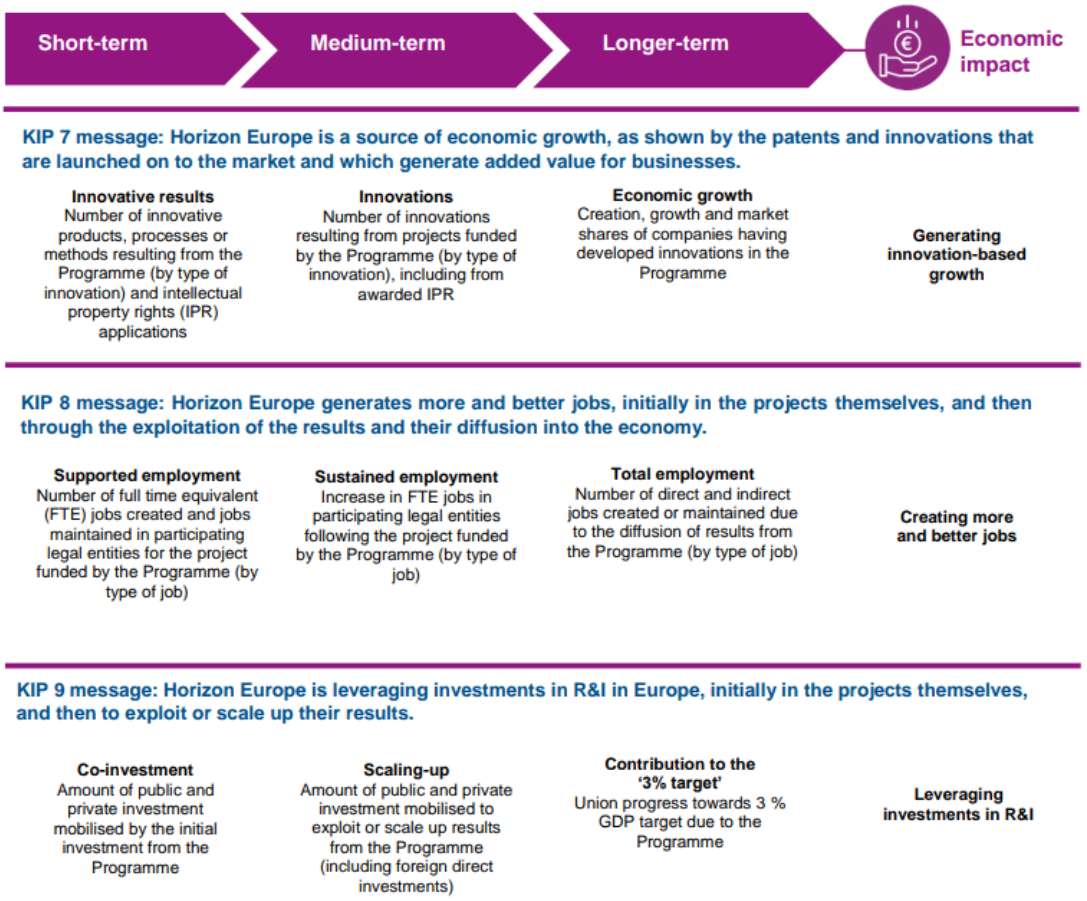

Figure 9. KIPs of economic impact proposed by Horizon Europe

6.2 Methodology

The methodology focuses on adapting the economic KPIs to the GenB project framework, converting them into clear and measurable metrics that will form the basis of a questionnaire. This questionnaire, distributed among the GenB consortium by the end of the project, ensures the effective collection of relevant data on societal impact.

The questionnaire guideline for KIPs economic impact is provided in Appendix 8. This evaluation related to the KIPs will complement the methodology used to measure the impact of the GenB activities and the KERs developed within the framework of the GenB project.

The correlation between economic KPIs and the measurable metrics in questions form are gathered in Table 17.

ECONOMIC IMPACT	
Item	KIP in HE
1.1 Number of innovative materials developed	KIP 7 - Generating innovation based growth - Innovative results
1.2 Number of innovative processes developed	
1.3 Number of innovative methods developed	
1.4 Number of intellectual property rights (IPR) applications submitted (Specify the type of IPR, such as patents, trademarks, designs, etc.):	
1.5 Number of innovations resulting from the project (Briefly describe each innovation):	KIP 7 - Generating innovation based growth - Innovations
1.6 Number of innovations derived from granted intellectual property rights (Specify the granted patents and their application):	
2.1 Number of full-time equivalent (FTE) jobs created during the project (Specify the type of job: researchers, technicians, administrative, etc.):	KIP 8 - Creating more and better jobs - Supported employment
2.2 Number of full-time equivalent (FTE) jobs maintained during the project (Specify the type of job and reasons for maintaining these positions):	
2.3 Growth in employment in beneficiary entities (Number of additional FTE jobs hired after project completion, by type of job):	KIP 8 - Creating more and better jobs - Sustained Employment
2.4 Types of jobs created (Describe the new jobs created, their function, and relevance for exploiting project results):	
2.5 Number of direct jobs created due to the dissemination of project results (Specify the type of job and the employing entity):	KIP 8 - Creating more and better jobs - Total Employment
2.6 Number of indirect jobs created due to the dissemination of project results (Describe the type of job and how it is indirectly related to the project):	

ECONOMIC IMPACT	
Item	KIP in HE
2.7 Number of jobs maintained (direct and indirect) due to the dissemination of project results (Provide details on sustained jobs and economic impact)	
3.1 Amount of public investment mobilised by the initial project investment (In euros, and describe the sources of public funding):	KIP 9 - Leveraging investments in R&I - Co-investment
3.2 Amount of private investment mobilised by the initial project investment (In euros, and describe the sources of private funding):	
3.3 Amount of public investment mobilised to exploit or scale up project results (In euros, describe specific scaling projects):	KIP 9 - Leveraging investments in R&I - Scaling Up
3.4 Amount of private investment mobilised to exploit or scale up project results (In euros, describe specific scaling projects):	
3.5 Total R&D expenditure of the project (In euros, detail all research and development expenses funded by Horizon Europe).	KIP 9 - Leveraging investments in R&I - Contribution to the 3% GDP Target
3.6 Additional R&D investments (In euros, detail all public and private investments mobilised thanks to the project)	

Table 17. GenB Economic KPIs Assessment: adaptation of metrics

6.3 Tools and materials

For the assessment of the economic impact, a questionnaire titled *"Economic impact assessment through KIP's"* has been developed that includes the metrics outlined in the KIPs (see Table 17). No additional items have been deemed relevant for inclusion to provide further insight and/or to provide information requested by GenB KPIs. Appendix 8 provides the questionnaire guidelines.

The named questionnaire is a detailed survey focuses on assessing the economic impacts and outcomes of the GenB project, including innovations generated, job creation and maintenance, leveraging investments in research and innovation (R&I), and the project's influence on local communities and public policies.

The questionnaire consists of a total of 33 questions. These questions are categorised into four main types. There are 17 descriptive or open-ended questions that require detailed responses about innovations, methods, and challenges. The questionnaire also includes 13 quantitative or numeric questions, which ask for specific numerical data such as the number of jobs created, investments made, and patents filed. Additionally, 6 questions use a yes/no format with follow-up prompts to explore the project's involvement in policy development, cost savings, and

additional funding. Lastly, 4 questions use scaled responses to evaluate the extent of the project's positive economic impact and improvements.

The questionnaire addresses all the impacts proposed by the European Commission. Therefore, some may not have a direct relation to GenB, or it may be too early to obtain a response since these indicators pertain to the long term. To facilitate the compilation of this information, we will inform participants at the beginning of the questionnaire that they have the option to respond with "Not applicable" for any impacts they believe are not related to the project.

To collect feedback from partners, the questionnaire will be provided in Word format. It will be sent to the GenB consortium towards the end of the project, in M28. The partner AIJU will be responsible for administering the questionnaire, collecting the data, processing it, and preparing the results report. This feedback will be documented in *D4.3 Impact Assessment - Second Period.*

6.4 Target audience

For calculating the economic impact, the *"Economic impact assessment through KIP's"* (Appendix 8) will be distributed among the 10 consortium partners towards the end of the project, at M28. A designated representative from each entity will be responsible for completing the questionnaire. Consequently, a sample of 10 responses will be obtained.

7 Environmental impact

Since GenB is an educational project focused on raising awareness about sustainability and the bioeconomy, its environmental impact becomes evident only over a long period, as it primarily aims to influence social behaviours. The scale and duration of the project, which focuses on fostering knowledge rather than implementing immediate changes, mean that direct environmental impacts may not be immediately measurable.

This does not, however, imply that GenB lacks environmental benefits. By raising awareness, inspiring and educating diverse target groups—including young people from three age groups, teachers, multipliers, and the general public—about the bioeconomy and sustainable practices, the project contributes to long-term shifts in behaviour and policy. GenB Ambassadors, for example, play a key role by advocating for sustainable practices within their communities, while other groups also help raise awareness and spread knowledge about sustainability topics.

Through tailored events, such as workshops and training sessions, GenB engages young people, educators, and multipliers to deepen their understanding of bioeconomy applications and benefits. Each partner of the GenB consortium organises these events, acting as disseminators and promoters of sustainable practices. Although the project's immediate effects may not be directly measurable, its educational and empowerment efforts are vital for shaping a more sustainable future.

For instance, initiatives like the active involvement of young people in raising awareness, facilitates the adoption of sustainable behaviours. While these efforts do not generate immediate environmental impact, they are crucial for mobilizing future generations towards a deeper commitment to sustainability. Despite the challenge of measuring the environmental impact of the GenB project, given that it does not involve the development of a new product or process, the Consumer Footprint Calculator[20] is provided to gain a comprehensive understanding of the environmental GenB project impact as well as the alignment of the KERs with Sustainable Development Goals.

7.1 Assessment through the Consumer Footprint Calculator and Sustainable Development Goals

The “Environmental Assessment” is presented as an analysis to identify the variables of the Consumer Footprint calculator where the GenB project directly influences consumer habits, as well as the alignment of the KERs with the SDGs.

[20] Sala, S., De Laurentiis, V., Barbero Vignola, G., Marelli, L. and Sanye Mengual, E., The Consumer Footprint Calculator, EUR 31089 EN, Publications Office of the European Union, Luxembourg, 2022, ISBN 978-92-76-53059-6, doi:10.2760/597000, JRC129382. Available in: https://knowsdgs.jrc.ec.europa.eu/cfc

The Consumer Footprint Calculator is an EU tool that enables citizens to assess the environmental impact of their consumption across five areas: food, mobility, appliances, household goods, and housing. It compares users' impacts with EU averages and highlights the contribution of different products. The tool evaluates 16 environmental impact indicators related to emissions and resource use, as defined by the European Commission's Product Environmental Footprint method. It provides a consolidated score to guide users toward sustainable actions and supports efforts to achieve Sustainable Development Goal (SDG) 12 on responsible consumption and other SDG. Additionally, the calculator includes links to climate action tips and pledges from the European Climate Pact and the UN's "Anatomy of Action" project. The Consumer Footprint Calculator will be employed to identify the variables where the GenB project directly influences consumer habits, categorising the impact into three levels of influence (Low, Medium, and High). However, it will not provide quantitative value. To assess this further, an evaluation activity will be conducted among the partners.

The Sustainable Development Goals (Figure 10) are a set of 17 global objectives established by the United Nations in 2015 as part of the 2030 Agenda for Sustainable Development. These goals aim to address major global challenges such as poverty, inequality, climate change, environmental degradation, and peace. Each SDG is interconnected, focusing on areas like clean energy, quality education, responsible consumption, and sustainable economic growth, all with the aim of creating a better, more sustainable future for everyone. Specific SDGs related to environmental issues include Goal 6: Clean Water and Sanitation, Goal 7: Affordable and Clean Energy, Goal 13: Climate Action, Goal 14: Life Below Water, and Goal 15: Life on Land.

Figure 10. Sustainable Development Goals. United Nations.

7.2 Methods, tools and materials

7.2.1 Consumer Footprint Calculator data source

For the assessment of environmental impact, an expert analysis of the 16 variables pointed out in the Consumer Footprint Calculator will be carried out to identify which environmental

indicators included in the calculator are addressed by the GenB project along with the extent of their influence.

The named calculator is divided into six sections: 1) Profiling, which collects demographic information such as gender, age group, and country to analyse results; 2) Food, gathering data on weekly consumption of various food products; 3) Mobility, compiling information on transportation habits and vehicle characteristics; 4) Appliances, recording ownership of household appliances and related consumer behaviour; 5) Household goods, focusing on the consumption of household items and consumer patterns; and 6) Housing, which collects data on household characteristics, including energy and water consumption.

In the same way, the calculator includes 16 environmental impact indicators of the Environmental Footprint:

1. Climate change
2. Ozone depletion
3. Terrestrial eutrophication
4. Aquatic freshwater eutrophication
5. Human toxicity non cancer effects health risk
6. Water scarcity
7. Particulate matter respiratory inorganics
8. Human toxicity cancer effects
9. Land use
10. Marine eutrophication
11. Resource use mineral
12. Ionising radiation
13. Acidification
14. Eco-toxicity freshwater
15. Resource use energy carriers
16. Photochemical ozone formation

The methodology for conducting the environmental impact assessment will rely on expert analysis. The GenB consortium will perform a qualitative evaluation of the 16 impact categories, aiming to determine the extent of the GenB project's influence on each category. This influence will be classified into three levels: low, medium, and high influence. The assessment will be guided by a structured approach, ensuring that each consortium partner provides input on how the project affects these categories. The Questionnaire provides the registration form that outlines the framework for collecting responses from all partners. It is designed to capture qualitative insights and expert opinions systematically. Once the responses are collected, AIJU will consolidate and analyse the data using a methodical expert-based approach, ensuring consistency and depth in evaluating the project's environmental impact. This structured analysis will enable the consortium to provide the project's environmental footprint.

The *"Environmental impact assessment registration form through the Consumer Footprint Calculator"* is designed to systematically gather qualitative insights from the GenB consortium

regarding the project's influence on 16 key environmental impact categories. Each category will be evaluated using a scale of low, medium, and high impact, allowing partners to express the extent of the project's influence. Accompanying each assessment is space for comments or evidence to support the ratings, fostering a better understanding of the project's environmental footprint. Additionally, a "Summary and Additional notes" section encourages respondents to provide an overarching evaluation of the project's impacts.

To support the expert analysis, the datasheet provides clear instructions on the procedure, along with a glossary of terms that explain each of the 16 indicators. The glossary is provided by the European Commission. In any case, AIJU will provide support to partners who require clarification regarding the method, the datasheet, or the environmental concepts included within it during its completion.

To collect feedback from partners, the registration form will be provided in Excel format. It will be sent to the GenB consortium towards the end of the project, in M28. The data collected will subsequently be processed and analysed qualitatively due to the small sample size. The partner AIJU will be responsible for administering the registration form, collecting the data, processing it, and preparing the results report. This feedback will be documented in *D4.3 Impact Assessment - Second Period.*

7.2.2 Sustainable Development Goals data source

The alignment of the KERs with the SDGs is an analysis included within the societal KPIs proposed by the EU. Therefore, the information gathered through *"Societal impact assessment through KIP's"* questionnaire (Appendix 3) regarding the SDGs will complement the results obtained from the analysis conducted by the Consumer Footprint calculator, thereby illustrating the environmental impact of the project. This approach will help identify which materials will have an environmental impact and determine the type of impact involved. The partner AIJU will be responsible for analysing the information and preparing the results report. This feedback will be documented in *D4.3 Impact Assessment - Second Period.*

7.3 Target audience

For calculating the environmental impact, *"Environmental impact assessment registration form through the Consumer Footprint Calculator"* —based on the Consumer Footprint Calculator indicators— will be distributed among the 10 consortium partners towards the end of the project, at M28. A designated representative from each entity will be responsible for completing the questionnaire. Consequently, a sample of 10 responses will be obtained.

8 Fulfilment of Specific Objectives

Other relevant question is related to the fulfilment of the different Specific Objectives (SOs) from the point of view of the impact generated in participants involved in GenB activities. In the context of the GenB project, Specific Objectives (SOs) are clearly defined goals that guide the project's efforts in promoting bioeconomy education and awareness. These objectives aim to provide educational resources, raise awareness of sustainable practices, and foster engagement among young people regarding the environmental, social, and economic benefits of bioeconomy. Each SO is designed to address key areas of focus, such as developing innovative toolkits for diverse audiences, enhancing knowledge of bioeconomy sectors, and encouraging responsible consumption and sustainable behaviours. By achieving these Specific Objectives, the GenB project strives to empower the next generation to embrace bioeconomy principles, thereby contributing to a more sustainable and circular economy.

8.1 GenB Specific Objectives

As it was explained in the GenB DoA, the specific objectives will be achieved by:

SO1. Provide **educational and informational toolkits on bioeconomy** in general and bio-based sectors.

- The toolkits use innovative approaches, formats, materials and tools thengage the students, allow them to learn easily and having fun, include practical application of the theoretical content).
- The toolkits include a variety of materials and tasks (graphical and interactive content, activities that involve discussion and critical thinking).
- The toolkits were designed targeted to different demographic and professional groups (children, parents, and teachers, other formal and non-formal professional educators).
- The toolkits are available for different interest groups: young people, teachers…

SO2. Raise **awareness, interest and knowledge** of young people at **pre-school, elementary and high school** on the **environmental, social and economic benefits of sustainable and circular bioeconomy** and its sectors.

- The activities have increased students' awareness about sustainable and circular bioeconomy
- The activities have raised students' interest about sustainable and circular bioeconomy
- The activities have increased students' knowledge about sustainable and circular bioeconomy
- The activities consider what young people like or are interested in

SO3. Increase **interest** among new generations to **join education and training on bioeconomy** at large and **create new ways of attracting talent in the life science, technology and the bioeconomy** opportunities.

- The activities cover the different aspects of bioeconomy

- The activities allow to know the professional opportunities linked to the bioeconomy sectors
- The activities show the requirements (soft and hard skills) for professional opportunities linked to bioeconomy
- The activities allow to master the requirements (soft and hard skills) for professional opportunities linked to bioeconomy
- The activities are engaging and attract future talents to bioeconomy academic and professional positions

SO4. Contribute to the transition of the **new generations** towards **more sustainable and circular behaviours**, **consumptions and lifestyles** through the **empowerment** of the young generations **to assume their role**.

- The activities clarify which actions and behaviours are in line with sustainability and circular economy principles
- The activities clarify which products and consumption patterns are in line with sustainability and circular economy principles
- The activities exemplify which lifestyles are in line with sustainability and circular economy principles
- The activities encourage children and teenagers to take responsibility on sustainability and circular economy
- The activities make sure that the students know the impact of their daily/long-term actions on sustainability and circular economy

SO5. Maximise the project's impacts towards **behavioural and socio-economic changes** by sparking multipliers and GenB networks and ensuring **exploitation, replicability and sustainability of project's outcomes**.

- The activities teach/train educators on how to explain bioeconomy concepts.
- The activities are sufficiently promoted/communicated as to reach the targeted multipliers (different countries, social groups).
- The activities are accessible to different civil society groups.
- The activities will facilitate further communication and interaction between interest groups involved in the bioeconomy.

SO6. Contribute to the Destination 'Innovative governance, environmental observations and digital solutions in support of the Green Deal' by **supporting the public Administrations and schools** in the **implementation of initiatives promoting the green transition process.**

- The activities will promote the dissemination of results and knowledge of the Project in academic, professional and informational forums.
- The activities will foster policy making and dissemination of the results to national public administrations.

The achievement of the specific objectives during the project will be monitored during project executions by the defined KPI and assessment tools as explained in the following Sections.

8.2 Methods, tools and materials

To assess the achievement of SOs, an expert analysis will be carried out by the GenB consortium. For this purpose, a registration form titled *"Specific Objectives achievement assessment"* has been developed to be filled by each partner (As the questionnaire is created on SharePoint Excel, it is not possible to make it accessible to the general public). It includes the GenB SOs outlined in the previous Section 9.1.

The named questionnaire is designed to evaluate the extent to which the Specific Objectives of the GenB project have been achieved, using a 5-point Likert scale *(1 - Strongly disagree, 5 - Strongly agree).* Its aim is to gather feedback from each GenB consortium partner on how the objectives have been met through various activities and tools. Additionally, a space for any additional insights or feedback to be expressed is provided. For the completion of the registration form, the partner AIJU will provide support to partners who require clarification regarding the method, the registration form, or the SOs concepts included within it during its completion.

To collect feedback from partners, the registration form will be provided in Excel format. It will be sent to the GenB consortium towards the end of the project, in M28. The data collected will subsequently be processed and analysed qualitatively due to the small sample size.

8.3 Target audience

To assess the achievement of SOs, the *"Specific Objectives achievement assessment"* registration form will be administrated to consortium partners towards the end of the project, at M28. A designated representative from each entity will be responsible for providing feedback, resulting in a sample of 10 responses.

9 Monitoring of the achievement of Key Performance Indicators and Specific Objectives

Part of the impact monitoring and assessment strategy involves tracking the impact indicators necessary to achieve the expected impact at a European level. This refers to the measurement of KPIs and, consequently, the SOs of the GenB project, which are presented in the following Section 9. KPIs are quantifiable metrics designed to assess the performance of specific project activities, allowing real-time monitoring of the project's operational progress. In other words, KPIs evaluate what is done and how it is done during the project's implementation.

To ensure the achievement of the SOs and the KPIs within the project, a self-check global table is proposed and described below.

9.1 Methods, tools and materials

Self-check global table is a resource is an online table, to be shared with all the partners in the project, where the tasks and expected results assigned to them can be verified, and the progress monitored. The table is presented in an .xls (Excel) format, so that it can be easily accessed, shared and edited online.

The elaboration process of the self-check global table is detailed in Figure 11. First, an initial version including all KPIs drawn from the grant agreement divided by WP and task, and the proposed monitoring variables, is created. Second, the draft version is shared with the WP leader and the project coordinator, who could provide feedback and suggestions to enhance the tool. Third, the final version is set up based on these comments and eventually shared for its management and use to the different partners involved.

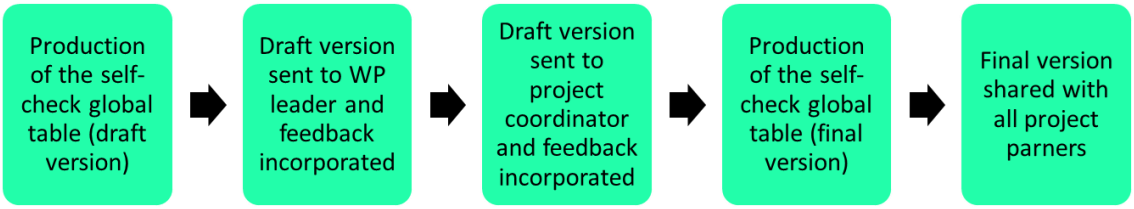

Figure 11. Elaboration process of the self-check global table

The structure of the self-check global table works as follows:

A **Column:** name and number of the task, as defined in the respective WP. For a clearer organisation of the information, tasks are divided and grouped in WPs (Figure 12)

B Column: the target group(s) that the activity is aimed for, identified by an icon. The icons are the same that had been proposed in Section 1.2.7 of the project proposal and can be checked in (Figure 12).

C Column: the expected results linked to the specific task and divided in terms of the partners involved. If, for instance, there are three partners involved in the expected outcome of a task, then the expected result is divided in three subsections, one for each partner, and each of them contains the amount of work allocated to that partner. For this objective, task and WP leaders should supervise the table in first instance and make sure the distribution of tasks is correct. This allows a transparent and clear allocation criterion for the workload of each partner, based on the instructions of the task leader and the WP leader (Figure 12).

A	B	C
Task	**Target**	**Expected Results**
1.1 Education contents		>100 contents from at least >50 sources in several languages
		>10 contents from at least >5 sources in several languages
		>10 contents from at least >5 sources in several languages
		>10 contents from at least >5 sources in several languages
		>10 contents from at least >5 sources in several languages
		>10 contents from at least >5 sources in several languages
		>10 contents from at least >5 sources in several languages
		>10 contents from at least >5 sources in several languages
		>10 contents from at least >5 sources in several languages
		>10 contents from at least >5 sources in several languages

Figure 12. Representation of task, target group and expected results in the self-check global table

D Column: the KPI, expressed in number format. The operationalisation of the objectives requires a measurable, verifiable, realistic and achievable statement; hence, they are expressed as a numerical figure (KPIs) to be achieved in the given time frame.

Sometimes, an expected result is divided into several KPIs, to guarantee a fair and clear allocation of responsibilities (Figure 13).

E column: the target group(s). Based on the information in the grant agreement, it is stated which group should be targeted and selected for data retrieving or sending of communication and/or training activities (Figure 13).

F column: the target country(ies). The abbreviation for the countries where the information should be gathered or disseminated is included, to correctly delimit which is the outreach of each partner (Figure 13).

D	E	F
KPI	Target groups	Target Countries
		WP1. Co-crea
5.000	users	9 languages
500	users	IT
500	users	NL
500	users	PT
500	users	SK
500	users	BE
500	users	AT
500	users	ES
500	users	IT
500	users	EL
500	users	EL

Figure 13. Representation of KPIs, target group and target country in the self-check global table

G column: number of target groups reached. Depending on the task, the outcomes can be people, views to a video or a number of documents to be generated, among others. This column should be filled in by the group responsible for that particular KPI. In that way, the column "is the KPI achieved?" will automatically change and display whether there are enough units of the target group reached, or if an additional effort is required (Figure 14).

H column: "Is the KPI achieved?" Directly linked to the number of respondents and KPI columns, it automatically reflects whether the KPI is accomplished or not. This is a useful indicator for both, partners involved in a task and leaders supervising the progress of the task or the WP in global terms (Figure 14).

I column: responsible partner. The partner for each particular (division of) KPI can be easily identified. The results can also be filtered by partner, so that each partner knows exactly which are the tasks under its responsibility. The abbreviated name for each partner is used (Figure 14).

G	H	I
Number of target groups reached	Is the KPI achieved?	Responsible partner (short name)
ation of innovative approaches		
0	NO	HSPN
	NO	APRE
	NO	BTG
	NO	LOBA
	NO	PEDAL
	NO	EUN
	NO	ZSI
	NO	AIJU
	NO	Q-PLAN
	NO	FVA
	NO	HSPN

Figure 14. Representation of number of target groups reached, achievement of KPI and responsible partner in the self-check global table

J column: deadline. Based on the chronogram of the project, the date where that task is due is included (Figure 15).

K column: achievement date. Partners should also reflect when the KPI was achieved, for management and justification purposes. Also, partners can write their current date to individually know whether they still have margin to finish achieving the KPI (Figure 15).

L column: "deadline accomplished". Similar to the H column, it automatically compares the deadline and achievement dates and informs whether the KPI has been reached on time or not (Figure 15).

J	K	L
Deadline	**Achievement date**	**Deadline accomplished**
30/04/2024	01/05/2024	NO
30/04/2024	28/04/2024	YES
30/04/2024	01/05/2024	NO
30/04/2024	01/05/2024	NO
30/04/2024	01/05/2024	NO
30/04/2024	01/05/2024	NO
30/04/2024	01/05/2024	NO
30/04/2024	01/05/2024	NO
30/04/2024	01/05/2024	NO
30/04/2024	01/05/2024	NO
30/04/2024	01/05/2024	NO

Figure 15. Representation of deadline, achievement date and accomplishment of deadline in the self-check global table

D4.2 Impact Assessment - First Period will focus on presenting the status of activities through the KPIs outlined in the DoA, ensuring their proper implementation, and confirming that the activities are being successfully carried out without any deviations from the planned course.

9.2 Target audience

The idea is that all GenB consortum can have an easy access to the expected results for the tasks they are responsible for, and autonomously add their progress with a triple purpose:

1. The Task leaders and WP leaders can allocate responsibilities to the partners involved in each task, and partners can directly access this information.
2. The Task leaders and WP leaders can have an immediate, up-to-date control of the tasks they manage.
3. Partners involved in the task can know whether they achieved their objective, or if they need an additional effort in some activity.

10 Conclusions

In this deliverable, the impact and monitoring assessment strategy to be implemented in the GenB project has been described. This strategy is built upon three fundamental pillars: a comprehensive assessment of societal, scientific, economic, and environmental impacts (1), an educational impact assessment framed within the broader context of societal impact measurement (2), fulfilment of SOs (3) and progress monitoring (4)

First, the strategy laid out in this deliverable will assess the impact of the GenB project in the societal, scientific, economic and environmental levels. Several indicators have been proposed for each of the three dimensions, with careful consideration of short-, medium-, and long-term outcomes. The assessment will serve to reflect the experiences and results gathered during project implementation, ensuring that the broader impact of the project is effectively measured.

Second, the educational impact assessment of the project has been fully detailed, with specific attention given to participant feedback and the perspectives of project partners. The objective here is to provide reliable SSH indicators to acknowledge the effectiveness of the project in achieving the SOs following the GenB educational model. Therefore, indicators from academic literature have been used to measure each variable. Initially, GenB project will focus on measuring widely applicable variables, namely participants' knowledge and satisfaction.

Third, to evaluate the achievement of the Specific Objectives of the GenB project, an expert analysis by the GenB consortium is proposed. A registration form is developed to assess the extent to which each objective has been met. The data, collected towards the project's conclusion will be analysed qualitatively.

Fourth, the monitoring of objectives fulfilment was demonstrated through the creation of an interactive progress table. This self-check global table tool integrates Key Performance Indicators for each task, alongside deadlines, to ensure that all partners can track the accomplishment of their responsibilities. Leaders and supervisors can also assess progress. The format is developed to facilitate the classification of actions on tasks, involve partners and target outcomes. The content is divided in achievement of KPIs and organization of tasks between partners and time horizons.

This deliverable (4.1.) should be considered as a methodological guide for GenB project impact assessment. And as a guide made at the beginning of the project, possible adaptations based on activities, results and partners requirements could be performed always in benefit of the project results. Possible adaptations of the baseline questionnaires could be made based on age requirements. For this purpose, a pre-test will be carried out by AIJU previous the final launch.

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Appendix 1 Measurement of the knowledge dimension: Theoretical Framework

To derive an accurate measurement of the understanding of bioeconomy and its related dimensions resulting from the project's activities, six sources have been considered:

A. The Learning Activation Lab[Errore. Il segnalibro non è definito.]
B. Bloom's Taxonomy
C. Fink's Taxonomy of Significant Learning
D. SOLO Taxonomy
E. Nkoma et al 2017
F. Sulitest tool

A. The Learning Activation Lab

The Learning Activation Lab is a national research and design effort to dramatically strengthen learning in the United States and beyond. The toolkit provides a variety of tools and instruments to measure different dimensions - understanding and interest- of learning activation, with a focus on both science and STEM fields. Some items from these scales have been adapted in order to obtain the same information regarding the bioeconomy.

The Learning Activation Lab is divided into four instruments: 1) Science Learning Activation, 2) STEM Learning Activation, 3) Successes, and 4) Surveys and Scales.

For **Science Learning Activation instrument**, a Science Learning Activation Survey is designed for 10-14-year-olds, measuring four key dimensions: 1) Fascination[21] – Interest in science, 2) Values[22] – The importance placed on science, 3) Competency Belief [23]– Confidence in one's science abilities, and 4) Scientific Sensemaking[24] – Ability to understand scientific concepts.

[21] Chung, J., Cannady, M. A., Schunn, C., Dorph, R., & Bathgate, M., (2016) Measures Technical Brief: Fascination in Science. Retrieved from: http://www.activationlab.org/wp-content/uploads/2016/02/Fascination-Report-3.2- 20160331.pdf

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For **STEM Learning Activation instrument**, a STEM Learning Activation Survey, also for 10-14-year-olds, measures 1) Fascination[25], 2) Values[26], 3) Competency belief[27], and 4) Innovation Stance[28]. Additionally, a 4) Emerging STEM Learning Activation Survey[29] for 7-9-year-olds assesses early-stage STEM learning.

Regarding **Successes instrument**, a 1) Engagement Survey[30], 2) Choice Preference Survey, and a 3) Engagement Observation Protocol are presented. The Engagement Survey assesses cognitive, behavioural, and emotional engagement in science learning, while the Choice Preference Survey measures students' preference for science-related activities. The Engagement Observation Protocol is used to observe and score engagement during science learning experiences.

B. Bloom's Taxonomy

The Revised Bloom's Taxonomy by Anderson & Krathwohl (2001)[31] is used as a basis to evaluate this aspect. After more than 60 years, this classification is currently applied when defining most of the learning curricula in public schools and other educational institutions in Europe, including both contents and activities.

Bloom's Taxonomy was proposed by the Philosophie Doctor (PhD) in Education Benjamin Bloom, in 1956[32]. The original proposal consisted of six cognitive levels of complexity, depicted hierarchically, that are faced during learning. In this way, teachers encourage their students to "climb up the ladder" and achieve higher levels of knowledge. Likewise, if the student has reached the level of application, this means that s/he has also mastered the knowledge and comprehension of a particular concept. In the original taxonomy, the lowest three levels are:

[25] Chen, Y.-F., Cannady, M. A., Schunn, C., & Dorph, R. (2017) Measures Technical Brief: Fascination in STEM. Retrieved from: http://www.activationlab.org/wp-content/uploads/2017/06/Fascination_STEM-Report_20170403.pdf

[26] Chen, Y.-F., Cannady, M. A., Schunn, C., & Dorph, R. (2017) Measures Technical Brief: Values in STEM. Retrieved from http://www.activationlab.org/wp-content/uploads/2017/06/Values_STEM-Report_20170403.pdf

[27] Chen, Y.-F., Cannady, M. A., Schunn, C., & Dorph, R. (2017) Measures Technical Brief: Competency Beliefs in STEM. Retrieved from http:// www.activationlab.org/wp-content/uploads/2017/06/CompetencyBeliefs_STEMReport_20170403.pdf

[28] Chen, Y.-F., Cannady, M. A., Schunn, C., & Dorph, R. (2017) Measures Technical Brief: Innovation Stance in STEM. Retrieved from http://activationlab.org/tools/

[29] Chen, Y.-F., Cannady, M. A., & Dorph, R. (2018) Measures Technical Brief: Emerging STEM Learning Activation. Retrieved from http://activationlab.org/tools/

[30] Chung, J., Cannady, M. A., Schunn, C., Dorph, R., & Bathgate, M., (2016) Measures Technical Brief: Engagement in Science Learning Activities. Retrieved from: http://www.activationlab.org/wp-content/uploads/2016/02/ Engagement-Report-3.1-20160331.pdf

[31] Anderson, L. W., & Krathwohl, D. R. (2001). A taxonomy for learning, teaching, and assessing: A revision of Bloom's taxonomy of educational objectives: complete edition. Addison Wesley Longman, Inc..

[32] Bloom, B. S. (1956). Taxonomy of. Educational Objectives.

knowledge, comprehension, and application. The upper levels are analysis, synthesis, and evaluation.

The revised Bloom's Taxonomy by Anderson & Krathwohl (2001) [33] was published, were the six-dimension classification was kept, but all dimensions were renamed. The new terms are defined as:

- **Remembering**: Retrieving, recognizing, and recalling relevant knowledge from long-term memory.
- **Understanding**: Constructing meaning from oral, written, and graphic messages through interpreting, exemplifying, classifying, summarizing, inferring, comparing, and explaining.
- **Applying**: Carrying out or using a procedure through executing or implementing.
- **Analysing**: Breaking material into constituent parts, determining how the parts relate to one another and to an overall structure or purpose through differentiating, organizing, and attributing.
- **Evaluating**: Making judgments based on criteria and standards through checking and critiquing.
- **Creating**: Putting elements together to form a coherent or functional whole; reorganizing elements into a new pattern or structure through generating, planning, or producing.

These six dimensions are graphically represented in Figure 16.

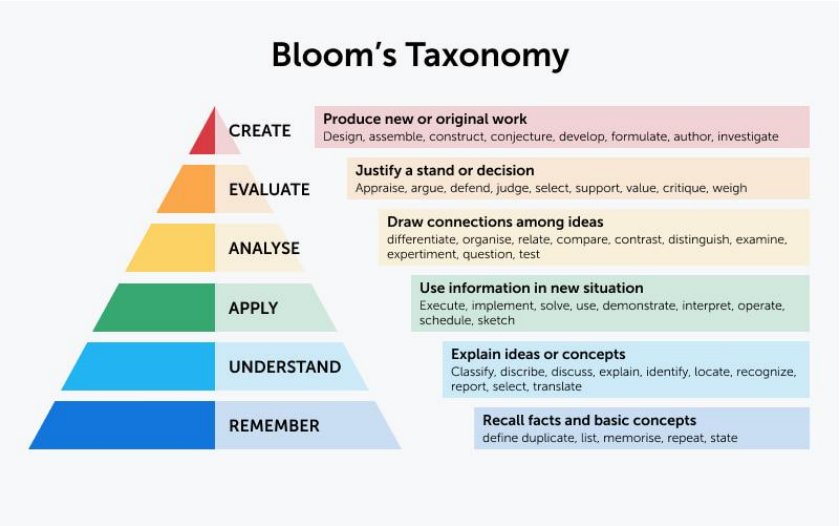

Figure 16. Graphical representation of Bloom's Taxonomy dimensions. Source: Valamis (2022)

[33] Anderson, L. W., & Krathwohl, D. R. (2001). A taxonomy for learning, teaching, and assessing: A revision of Bloom's taxonomy of educational objectives: complete edition. Addison Wesley Longman, Inc..

C. Fink's Taxonomy of Significant Learning

Significant learning refers to long-lasting and solid learning, because it emerges through the interconnection of new learning with previous knowledge that the student already had, in such a way that relationships are produced to reorganize knowledge, making a solid learning structure possible.

To this end, Fink's Taxonomy proposes a taxonomy based on 6 dimensions that are not understood as hierarchical (as in the case of Bloom's Taxonomy) but that interact and interrelate to favour meaningful learning.

These 6 dimensions (presented in Figure 17) are:

- **Foundational Knowledge**: recall and understanding of information and ideas about a topic. This is a basic level of learning, from which more complex operations can be built upon.
- **Application**: practical use of the information and knowledge learnt. It involves the development of skills and abilities based on different ways of thinking:
    - Practical thinking: decision making and problem solving.
    - Critical thinking: discuss critical situations and take decisions.
    - Creative thinking: generate new ideas and perspectives.
- **Integration**: establish and connect ideas, perspectives, actions, etc. in human life situations.
- **Human Dimensions**: knowledge about the human dimension, either learning about oneself (personal dimension) or about others (social dimension).
- **Caring**: developing new feelings, interests, and values related to care. It includes caring in new ways or caring in new ways.
- Learning to Learn: refers to the development of skills and abilities that support lifelong learning and autonomous learning.

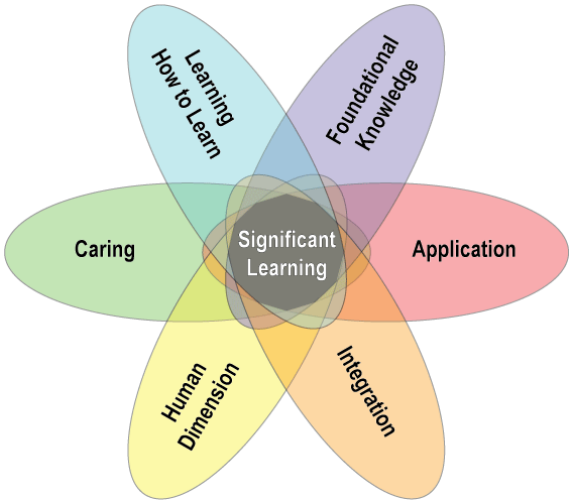

Figure 17. Graphical representation of Fink's taxonomy dimensions. Source: Addison & Tollefson (2022)

D. SOLO Taxonomy

The SOLO Taxonomy (Structure of Observed Learning Outcomes) is a hierarchical taxonomy by Biggs & Collis (1982) based on 5 different stages (Figure 18)

- **Pre-structural level**: at this level learners have only unconnected ideas about the topic, with no relation or connection between them. Therefore, they are not yet able to understand the information.
- **Unistructural level**: learners know and understand the basic information about the concept. Then they are able to begin creating simple connections but do not yet understand the complexity and depth of the topic.
- **Multistructural level**: learners know several relevant aspects of the topic, but independently. In some cases, they begin to establish relationships between these aspects, but are not yet able to establish the overall relationship between all of them.
- **Relational level**: learners know the aspects and concepts of the topic independently and is able to organise them to form and establish a structure. The learner understands the role that each aspect plays in relation to the whole and is able to form coherent and solid knowledge of the subject.
- **Extended Abstract level**: leaners are not only able to establish relationships between different concepts, but to transcend the subject matter and connect with other subjects and domains. In this way, learning can be generalised and extrapolated to other subjects and areas.

Even though this taxonomy follows a hierarchical structure like Bloom's Taxonomy, rather than holistic such as in Fink's, this particular taxonomy focuses on learning whereas Bloom's Taxonomy deals with acquisition of knowledge.

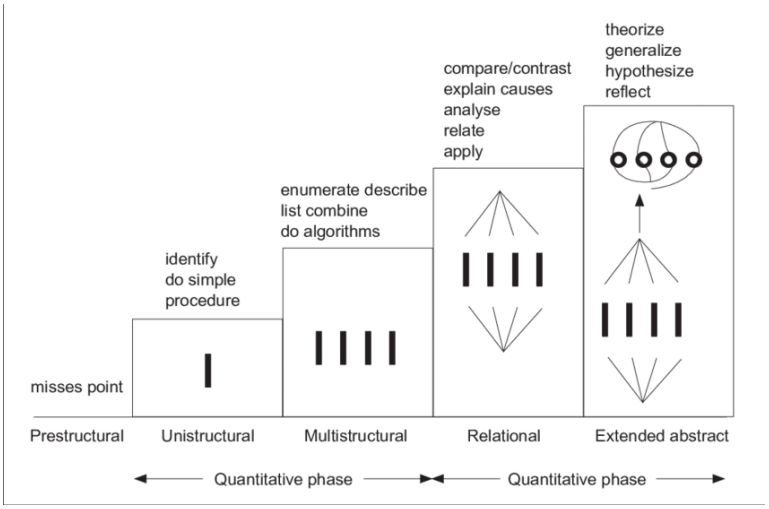

Figure 18. Graphical representation of SOLO's taxonomy dimensions. Source: Rembach & Dison (2016)

Based on Bloom's Taxonomy, understanding would be considered as a lower-level thinking dimension, and the next step after recalling the concept. This would be considered as the primary step to acknowledge that the concept has been integrated by the participant, and hence the basic aim has been accomplished. This dimension corresponds to the foundational knowledge coined by Fink, and is also identifiable with the unstructured language that is presented in SOLO. In all cases, it refers to the minimum necessary knowledge to understand the concept and build subsequent ideas upon it.

E. Nkhoma et al., 2017

Nkhoma (2017) build their theoretical framework around the revised Bloom's taxonomy, which classifies cognitive learning objectives in a hierarchical manner. The study focuses on how this framework can be applied to case-based learning activities to enhance student learning. By integrating the six cognitive levels—remembering, understanding, applying, analysing, evaluating, and creating—the authors aim to design learning activities that progressively develop higher-order thinking skills. The framework highlights the importance of aligning educational activities with these cognitive levels to improve learning outcomes in complex, real-world situations.

The six cognitive levels of Bloom's revised taxonomy provide a structured approach to developing thinking skills. These are:

- **Remembering**: Recalling previously learned information or facts.
- **Understanding**: Comprehending and interpreting the meaning of information.
- **Applying**: Using knowledge in new situations or practical contexts.
- **Analysing**: Breaking down information into components to understand relationships and structure.
- **Evaluating**: Judging the value or validity of ideas or materials based on criteria.
- **Creating**: Combining elements to form a new, original product or idea.

F. Mason (2019) - Sulitest tool

Mason (2019) proposes Sulitest (Sustainability Literacy Test), a globally recognized tool designed to assess the sustainability knowledge and awareness of individuals, particularly within educational and organizational contexts. Its primary goal is to measure sustainability literacy—how well individuals understand the principles of sustainability, including social, environmental, and economic factors—and to promote learning outcomes that drive more sustainable practices. Developed with the support of the United Nations, Sulitest serves as a benchmarking tool for institutions worldwide, helping to foster a deeper understanding of sustainability issues and encouraging both personal and collective action toward a more sustainable future.

Recent studies have also evaluated the effectiveness of Sulitest as a tool not only for assessing sustainability literacy but also as a catalyst for improving affective learning outcomes. One such study by Mason (2019 analyses the efficacy of Sulitest in higher education populations, emphasizing its role in enhancing students' sustainability-related learning and motivation. The study highlights Sulitest's potential to (a) generate interest in sustainability-related topics, (b) improve students' understanding of sustainability concepts, and (c) increase students' engagement with sustainability subjects.

Appendix 2 Measurement of the satisfaction dimension: Theoretical Framework

To derive an accurate measurement of the satisfaction of bioeconomy and its related dimensions as a result of the project's activities, three sources have been considered:

A. Learning Activation Lab[Errore. Il segnalibro non è definito.]
B. Badau & Badau (2018)

A. The Learning Activation Lab

An explanation of Learning Activation Lab theorical framework is explained in Appendix 1A

B. Badau & Badau (2018)

The study proposed by Badau & Badau (2018) aims to highlight the impact of educational, recreational, motoric and satisfaction of adventure education activities in the urban tourism environment. The study identifies four key dimensions of impact:

- **Motric:** Analyses how activities affect participants' motor skills and physical development.
- **Educational:** Examines the impact on learning and knowledge acquisition during activities.
- **Recreational**: Evaluates the recreational value and overall enjoyment that participants get from activities.
- **Satisfaction:** Measures participants' level of satisfaction with the overall experience of the activities.

Table 18 presents the questionnaire items designed to evaluate the educational, recreational, and satisfaction impact of the urban adventure tourism activities.

Item No.	Item adaptation	Original Scale
Item 1	How do you evaluate the educational-formative relevance of the activities?	Satisfaction Badau, & Badau (2018)
Item 2	How do you appreciate the attractiveness of your activities?	
Item 3	How do you appreciate the complexity of the routes?	
Item 4	How do you appreciate the physical effort of the routes	
Item 5	How do you rate the risk of activity?	
Item 6	How do you appreciate the protection of the natural environment within Adventure Park Brasov?	
Item 7	How do you rate the activity recommendation for different age categories?	
Item 8	How do you appreciate the tourist relevance of the activity?	
Item 9	How do you assess the leisure relevance activity?	

Item No.	Item adaptation	Original Scale
Item 10	How do you rate the satisfaction of the activity?	
Item 11	How do you assess educational relevance of the activity?	
Item 12	How do you assess the aspects of collegiate collaboration and assistance in order to fulfil the specific tasks within the activity?	
Item 13	How do you assess the cultural relevance of the activity?	
Item 14	How do you appreciate the attractiveness of the activity?	
Item 15	How do you appreciate the complexity of the activity?	
Item 16	How do you appreciate the physical effort of the activity?	
Item 17	How do you rate the degree of recommendation of the program for different age categories?	
Item 18	How do you appreciate the tourist relevance of the activity?	
Item 19	How do you appreciate the leisure relevance of the activity?	
Item 20	How do you rate satisfaction of the activity?	

Table 18. Evaluating the educational, recreational and satisfaction impact By Badau & Badau (2018)

Societal impact assessment through KIP´S

GenB Partners

NOTE: Respond NO APPLY if you think that the answer is no related with GenB project.

Section 1: Total Number of Educational Materials

1. Total number of educational materials: Please list the educational materials generated by the project and classify them according to the EU policy priorities they address.

Educational Material 1:

Description:

EU Policy Priority Addressed:

Related SDG (if applicable):

Educational Material 2:

2. Of the educational materials generated, indicate the percentage specifically designed to address EU policy priorities.

3. % of educational materials addressing EU policy priorities:

4. % of educational materials addressing EU policy priorities: % of materials related to SDGs:

Section 2: Methodology and Evaluation

5. What methods has your project used to ensure that the educational materials developed are aligned with EU policy priorities and the SDGs?

Methods used:

6. What challenges has your project faced in attempting to align educational materials with EU policy priorities and the SDGs?

Description of challenges:

7. How has your project addressed these challenges?

Solutions implemented:

Section 3: Impact on Participants

8. Which stakeholders or audiences have been the main beneficiaries of the educational materials developed?

Description of stakeholders:

9. How many innovations or research outcomes has the project generated to date?

Total number of innovations/outcomes:

Please list the innovations or research outcomes generated by the project and classify them according to the EU policy priorities they address.

Innovation/Outcome 1:

Description:

Type of innovation/outcome (e.g., method, technology, tool, commercial good, commercial service, scientific or industrial process, business model):

EU Policy Priority Addressed:

Related SDG (if applicable):

Analysis of Observed Changes:

Section 4: Recommendations and Feedback

10. What recommendations do you have for improving the alignment of educational materials in future projects with EU policy priorities and the SDGs?

11. Are EU citizens and/or end-users involved in the co-creation of R&D&I content in your project?

Yes / No

Indicate the total number of citizens and end-users involved in the project. (KPIs)

Total number:

12. Has your entity developed any mechanism for citizen and end-user participation after the completion of the Horizon Europe-funded project?

Yes / No

If yes, please specify the types of participation mechanisms developed.

Appendix 4. Questionnaire for the societal impact assessment through GenB activities

A. Reduced version (Part 1)

Societal – educational impact assessment through activities reduced version

Activities

1. Do you know what bioeconomy is?
   Yes No (In case of "No", please go to question 2)

   1.2. Which of the following answers best describes bioeconomy concept?

   - ❑ Bioeconomy is the economy based on using natural resources, such as plants and animals, sustainably to produce food, energy, and products without harming the environment.
   - ❑ Bioeconomy is the study of animals living in the ocean.
   - ❑ Bioeconomy is a branch of economics that focuses on investing in sustainable technologies to protect the environment.
   - ❑ Bioeconomy is the economy based on extracting precious stones from the ground.
   - ❑ I don't know what bioeconomy is.

2. Answer the following questions using the scale where 1 = Not at all important and 4 = Very important.

	No at all important	A little important	Important	Very important
How important is it for you learn about bioeconomy?	1	2	3	4
Bioeconomists think about how to make things work better. How important is it for you to think like this?	1	2	3	4

3. Indicate your level of agreement or disagreement with the following statements 1= NO! and 4= YES!

	YES!	Yes	No	NO!
Bioeconomy makes the world a better place to live.	1	2	3	4
I think bioeconomist are the most important people in the world.	1	2	3	4
Bioeconomy is the most important thing in the world for me to learn.	1	2	3	4
Knowing bioeconomy is important for being a good citizen	1	2	3	4
I think bioeconomy is more important to know than anything else	1	2	3	4
I think bioeconomy ideas are valuable	1	2	3	4

4. Indicate your level of agreement or disagreement with the following statement 1= No jobs and 4= All jobs

	No jobs	A few jobs	Most jobs	All jobs
Knowing bioeconomy is important for:	1	2	3	4

5. In general, when I work on bioeconomy:

   ❑ I hate it
   ❑ I don´t like it
   ❑ I like it
   ❑ I love it

6. . Please indicate your opinion about the activity you have performed on a scale from 1= NO! and 4= YES!

	YES!	Yes	No	NO!
During this activity/MOOC/Material (game, etc.): I felt bored.	1	2	3	4
During this activity/MOOC/Material (game, etc.): I felt happy.	1	2	3	4
During this activity/MOOC/Material (game, etc.): I felt excited.	1	2	3	4
During this activity/MOOC/Material (game, etc.): I was daydreaming a lot.	1	2	3	4
During this activity/MOOC/Material (game, etc): I was focused on the things we were learning most of the time.	1	2	3	4

During this activity/MOOC/Material (game, etc): I was busy doing other tasks	1	2	3	4
During this activity/MOOC/Material (game, etc): I talked to others about stuff not related to what we were learning.	1	2	3	4
During this activity/MOOC/Material (game, etc): Time went by quickly.	1	2	3	4

7. Please indicate your opinion about the activity you have performed on a scale from 1 Strongly Disagree to 5 Strongly Agree

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
The activity was fun and entertaining	1	2	3	4	5
The activity is recommendable for different age categories	1	2	3	4	5
I am satisfied with this activity	1	2	3	4	5
The activity increases my knowledge about bioeconomy	1	2	3	4	5
I catch the basic ideas of the knowledge taught about bioeconomy	1	2	3	4	5
I will try to apply the knowledge learned about bioeconomy in the activity	1	2	3	4	5
The activity motivates me to integrate the knowledge taught about bioeconomy	1	2	3	4	5
I am interested in and want to learn more about the bioeconomy	1	2	3	4	5
I know the impact of the bioeconomy on the world around us	1	2	3	4	5
When I grow up, I would like to work in something related to the bioeconomy	1	2	3	4	5
I know what I need to learn to work in the bioeconomy	1	2	3	4	5

B. Full version (Part 2)

Societal – educational impact assessment through GenB activities full version

Activities

1. Answer the following questions using the scale where 1 = Not at all important and 4 = Very important.

	No at all important	A little important	Important	Very important
How important is it for you to learn about bioeconomy?	1	2	3	4
Bioeconomists think about how to make things work better. How important is it for you to think like this?	1	2	3	4

2. Indicate your level of agreement or disagreement with the following statements 1= NO! and 4= YES!

	YES!	Yes	No	NO!
Bioeconomy make the world a better place to live.	1	2	3	4
I think bioeconomist are the most important people in the world.	1	2	3	4
Bioeconomy is the most important thing in the world for me to learn.	1	2	3	4
Knowing bioeconomy is important for being a good citizen	1	2	3	4
I think bioeconomy is more important to know than anything else	1	2	3	4
I think bioeconomy ideas are valuable	1	2	3	4

3. Indicate your level of agreement or disagreement with the following statement 1= Never and 4= All the time

	Never	Sometimes	Most of the time	All the time
Knowing bioeconomy helps me understand how the world works.	1	2	3	4

4. Indicate your level of agreement or disagreement with the following statement 1= None and 4= All my classes

	None of my classes	A few classes	Most of my classes	All my classes
Thinking like a bioeconomist will help me do well in:	1	2	3	4

5. Indicate your level of agreement or disagreement with the following statement 1= No jobs and 4= All jobs

	No jobs	A few jobs	Most jobs	All jobs
Knowing bioeconomy is important for:	1	2	3	4

6. I wonder about how bioeconomy works:

   ❑ Never
   ❑ Once a month
   ❑ Once a week
   ❑ Every day

7. In general, when I work in class/study/practice on bioeconomy:

   ❑ I hate it
   ❑ I don´t like it
   ❑ I like it
   ❑ I love it

8. In general, I find bioeconomy:

   ❑ Very boring
   ❑ Boring
   ❑ Interesting
   ❑ Very interesting

9. I can do (I am able to follow) the bioeconomy activities I get in class:

   ❑ Rarely
   ❑ Half the time
   ❑ Most of the time
   ❑ All the time

10. If I went to a bioeconomy museum, I could figure out what is being show in:

- ❑ None of it
- ❑ A few areas
- ❑ Most areas
- ❑ All areas

11. I can understand bioeconomy information on websites for my age:

- ❑ None of them
- ❑ A few websites
- ❑ Most websites
- ❑ All websites
- ❑ I have not visited websites related to bioeconomy

12. If I did my own project in an after-school bioeconomy club, it would be (how you will feel):

- ❑ Poor
- ❑ Ok
- ❑ Good
- ❑ Excellent

13. Indicate your level of agreement or disagreement with the following statements 1= NO! and 4= YES!

	YES!	Yes	No	NO!
I think I am very good at: Figuring out how to fix a bioeconomy activity that didn't work.	1	2	3	4
I think I am very good at: Coming up with questions about bioeconomy.	1	2	3	4
I think I am very good at: Doing bioeconomy experiments.	1	2	3	4

14. . Please indicate your opinion about the activity you have performed on a scale from 1= NO! and 4= YES!

	YES!	Yes	No	NO!
During this activity/MOOC/Material (game, etc.): I felt bored.	1	2	3	4

During this activity/MOOC/Material (game, etc.): I felt happy.	1	2	3	4
During this activity/MOOC/Material (game, etc.): I felt excited.	1	2	3	4
During this activity/MOOC/Material (game, etc.): I was daydreaming a lot.	1	2	3	4
During this activity/MOOC/Material (game, etc): I was focused on the things we were learning most of the time.	1	2	3	4
During this activity/MOOC/Material (game, etc): I was busy doing other tasks	1	2	3	4
During this activity/MOOC/Material (game, etc): I talked to others about stuff not related to what we were learning.	1	2	3	4
During this activity/MOOC/Material (game, etc): Time went by quickly.	1	2	3	4

15. Please indicate your opinion about the activity you have performed on a scale from 1 Strongly Disagree to 5 Strongly Agree

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
The activity was fun and entertaining	1	2	3	4	5
The activity is recommendable for different age categories	1	2	3	4	5
I am satisfied with this activity	1	2	3	4	5
The activity increases my knowledge about bioeconomy	1	2	3	4	5
I catch the basic ideas of the knowledge taught about bioeconomy	1	2	3	4	5
I will try to apply the knowledge learned about bioeconomy in the activity	1	2	3	4	5
The activity motivates me to integrate the knowledge taught about bioeconomy in my daily life	1	2	3	4	5
I am interested in and want to learn more about the bioeconomy.	1	2	3	4	5
When I grow up, I would like to work in something related to the bioeconomy.	1	2	3	4	5
I know the impact of the bioeconomy on the world around us.	1	2	3	4	5

16. Indicate your level of agreement or disagreement with the following statements
    1= NO!
and 4= YES!

	YES!	Yes	No	NO!
After a really interesting bioeconomy activity is over, I look for more information about bioeconomy	1	2	3	4
I need to know how bioeconomy works.	1	2	3	4
I want to read everything I can find about bioeconomy.	1	2	3	4
I want to know everything about bioeconomy.	1	2	3	4
I want to know how to do everything that bioeconomists do	1	2	3	4
After a really interesting bioeconomy activity is over, I can't stop thinking about it	1	2	3	4
I talk about how bioeconomy work with friends or family	1	2	3	4
I love bioeconomy!	1	2	3	4
Bioeconomy makes me feel excited	1	2	3	4
I am interested in and want to learn more about the bioeconomy	1	2	3	4
I know the impact of the bioeconomy on the world around us	1	2	3	4
In the future, I would like to work in something related to the bioeconomy	1	2	3	4
I know what I need to learn to work in the bioeconomy	1	2	3	4
I want to know how to do everything related with my favourite theme on bioeconomy (biomaterials, bioenergy, farming, etc.)	1	2	3	4

17. Please indicate your opinion about the activity you have performed on a scale from 1 Strongly Disagree to 7 Strongly Agree

	Strongly Disagree	Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Agree	Strongly Agree

The knowledge my students will gain from the GenB content will help them see sustainable opportunities around them.	1	2	3	4	5	6	7
My students will learn a great deal by completing the GenB content.	1	2	3	4	5	6	7
The GenB content will help my students reflect on their knowledge of sustainability.	1	2	3	4	5	6	7
The GenB content will help my students understand how their knowledge of sustainability compares to other children of the same age in my country.	1	2	3	4	5	6	7
The GenB content will help my students understand how their knowledge of sustainability compares to other children of the same age globally.	1	2	3	4	5	6	7
The GenB content will motivate my students to share sustainability-related information with others they know.	1	2	3	4	5	6	7
The GenB content will motivate my students to seek additional sustainability information from others they know.	1	2	3	4	5	6	7
My students will likely retake the GenB content voluntarily in the future to see if they have improved their sustainability-related knowledge.	1	2	3	4	5	6	7

Appendix 5. Questionnaire for the societal impact assessment through GenB materials (KERs) – baseline questionnaire

A. Pre-evaluation (Phase 1)

Societal -educational impact assessment through GenB materials pre evaluation

Toolkits in schools

1. Have you ever heard the word "bioeconomy"?

   - ❑ Yes
   - ❑ No

2. Do you know what bioeconomy is?

   - ❑ Bioeconomy is the economy based on using natural resources, such as plants and animals, sustainably to produce food, energy, and products without harming the environment.
   - ❑ Bioeconomy is the study of animals living in the ocean.
   - ❑ Bioeconomy is a branch of economics that focuses on investing in sustainable technologies to protect the environment.
   - ❑ Bioeconomy is the economy based on extracting precious stones from the ground.
   - ❑ I don't know what bioeconomy is.

3. Are all bio-based plastics biodegradable?

   - ❑ Yes
   - ❑ No
   - ❑ I don’t know

4. Can bio-based plastics be recycled?

   - ❑ Yes
   - ❑ No
   - ❑ I don’t know

5. The dominant application for bio-based plastics is…

   ❑ Automotive
   ❑ Packaging
   ❑ Footwear
   ❑ Electronics
   ❑ I don't know

6. Where are bio-based plastics recycled?

   ❑ Chemical recycling plants
   ❑ They cannot be recycled
   ❑ They decompose in the ground
   ❑ Composting facilities
   ❑ I don't know

7. You can make fuel out of:

   ❑ Wood
   ❑ Used cooking oil
   ❑ Horse poop
   ❑ All of them
   ❑ I don't know

8. In what forms can biofuel be presented?

   ❑ Solid
   ❑ Liquid
   ❑ Gas
   ❑ All of them
   ❑ I don't know

9. What are barriers to the development of the biofuel market?

   ❑ High production cost
   ❑ Lack of affordable raw materials
   ❑ Insufficient infrastructure
   ❑ All of them
   ❑ I don't know

10. What areas does the bioeconomy cover?

- ❑ Agriculture
- ❑ Production and manufacturing
- ❑ Forestry and fishing
- ❑ All of them
- ❑ I don't know

11. Why do we use renewable energy in the bioeconomy?

- ❑ To use up non-renewable resources
- ❑ To reduce fossil fuel use and support sustainability
- ❑ To ignore environmental issues in energy production
- ❑ To reduce fossil fuel use and support sustainibility
- ❑ I don't know

12. Bioeconomy…

- ❑ Contributes to the reduction of CO2 emissions
- ❑ Reuses waste to produce new materials and energy
- ❑ Creates new jobs
- ❑ All of them
- ❑ I don't know

13. Which of the following best describes Life Cycle Assessment (LCA) in the context of the bioeconomy?

- ❑ A method to increase agricultural yield
- ❑ A technique to evaluate the environmental impact of a product throughout its lifespan
- ❑ A process to improve the genetic modification of crops
- ❑ A strategy for marketing bio-based products
- ❑ I don't know

14. Which of these processes optimizes resources for the bioeconomy?

- ❑ Simply disposing of waste in landfills
- ❑ Processing residues or by-products into raw materials
- ❑ Burning all waste materials
- ❑ Avoiding the generation of waste altogether
- ❑ I don't know

15. What is the difference between upcycling and downcycling in the recycling process? – Answer:

- ❑ Upcycling creates lower quality and value materials, while downcycling improves quality and value
- ❑ Both processes create materials of the same quality
- ❑ Downcycling produces lower quality and value materials, while upcycling enhances quality and value
- ❑ Upcycling and downcycling are unrelated to recycling
- ❑ I don't know

16. Which of the following statements about composting is true?

- ❑ Composting involves burning organic waste to generate energy
- ❑ Composting converts organic waste and improves soil quality
- ❑ Composting is a method for recycling plastics
- ❑ All of them are true
- ❑ I don't know

17. What does biodegradation refer to?

- ❑ Burning organic waste to make energy
- ❑ Making new materials with chemicals
- ❑ Recycling plastics using machines
- ❑ Microorganisms breaking down organic materials
- ❑ I don't know

18. What is biomimicry?

- ❑ Imitating natural processes and systems to solve human problems
- ❑ Creating synthetic materials using biotechnology
- ❑ Breeding animals for specific genetic traits
- ❑ The study of fossils and ancient life forms
- ❑ I don't know

19. Why do non-biodegradable materials, like plastics, pose long-term environmental risks?

- ❑ They decompose quickly but leave harmful residues
- ❑ They are easily absorbed by natural processes

- ❑ They persist for a long time and can harm ecosystems and wildlife
- ❑ They break down into harmless substances that benefit the environment
- ❑ I don't know

20. What is an important feature of non-renewable energy sources?

- ❑ They are always being made by nature
- ❑ They don't harm the environment much
- ❑ They can be used forever without running out
- ❑ They will run out because they can't be replaced quickly
- ❑ I don't know

21. Which of the following is an example of a green job?

- ❑ Coal miner
- ❑ Solar panel installer
- ❑ Oil rig worker
- ❑ Plastic factory worker
- ❑ I don't know

22. What is the benefit associated with bio-based plastics, their recycling, and their environmental impact?

- ❑ They increase greenhouse gas emissions
- ❑ They reduce dependence on fossil fuels
- ❑ They are non-biodegradable
- ❑ They contribute to ocean pollution
- ❑ I don't know

23. Please indicate your opinion about the following statements on a scale from 1 Strongly Disagree to 5 Strongly Agree

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
I turn off the lights/television when I leave a room.	1	2	3	4	5
I unplug appliances that are left in stand-by mode	1	2	3	4	5
I reduce the use of heating or air-conditioning to limit energy consumption.	1	2	3	4	5
I reduce the time I take showers to save water.	1	2	3	4	5

I watch TV programs, videos or movies on environmental issues	1	2	3	4	5
I have increased the amount of organic fruits and vegetables that I eat.	1	2	3	4	5
I talk to other people about their environmentally friendly behaviors.	1	2	3	4	5
I reduce the amount of meat that I eat.	1	2	3	4	5
In general, if I have to go by car, I try to carpool.	1	2	3	4	5
In general, I use public transport instead of the car.	1	2	3	4	5
In general, I ride a bike, scooter or walk instead of using the car	1	2	3	4	5
I turn off the lights/television when I leave a room.	1	2	3	4	5

B. Immediate Post-evaluation (Phase 2)

Societal -educational impact assessment through GenB activities immediate post evaluaton

Toolkits in schools

1. Answer the following questions using the scale where 1 = Not at all important and 4 = Very important.

	No at all important	A little important	Important	Very important
How important is it for you to learn about bioeconomy?	1	2	3	4
Bioeconomists think about how to make things work better. How important is it for you to think like this?	1	2	3	4

2. Indicate your level of agreement or disagreement with the following statements 1= NO! and 4= YES!

	YES!	Yes	No	NO!
Bioeconomy make the world a better place to live.	1	2	3	4
I think bioeconomist are the most important people in the world.	1	2	3	4
Bioeconomy is the most important thing in the world for me to learn.	1	2	3	4
Knowing bioeconomy is important for being a good citizen	1	2	3	4
I think bioeconomy is more important to know than anything else	1	2	3	4
I think bioeconomy ideas are valuable	1	2	3	4

3. Indicate your level of agreement or disagreement with the following statement 1= Never and 4= All the time

	Never	Sometimes	Most of the time	All the time
Knowing bioeconomy helps me understand how the world works.	1	2	3	4

4. Indicate your level of agreement or disagreement with the following statement 1= None and 4= All my classes

	None of my classes	A few classes	Most of my classes	All my classes
Thinking like a bioeconomist will help me do well in:	1	2	3	4

5. Indicate your level of agreement or disagreement with the following statement 1= No jobs and 4= All jobs

	No jobs	A few jobs	Most jobs	All jobs
Knowing bioeconomy is important for:	1	2	3	4

6. I wonder about how bioeconomy works:

   - ❑ Never
   - ❑ Once a month
   - ❑ Once a week

- ❑ Every day

7. In general, when I work in class/study/practice on bioeconomy:

   - ❑ I hate it
   - ❑ I don´t like it
   - ❑ I like it
   - ❑ I love it

8. In general, I find bioeconomy:

   - ❑ Very boring
   - ❑ Boring
   - ❑ Interesting
   - ❑ Very interesting

9. I can do (I am able to follow) the bioeconomy activities I get in class:

   - ❑ Rarely
   - ❑ Half the time
   - ❑ Most of the time
   - ❑ All the time

10. If I went to a bioeconomy museum, I could figure out what is being show in:

    - ❑ None of it
    - ❑ A few areas
    - ❑ Most areas
    - ❑ All areas

11. I can understand bioeconomy information on websites for my age:

    - ❑ None of them
    - ❑ A few websites
    - ❑ Most websites
    - ❑ All websites
    - ❑ I have not visited websites related to bioeconomy

12. If I did my own project in an after-school bioeconomy club, it would be (how you will feel):

- ❏ Poor
- ❏ Ok
- ❏ Good
- ❏ Excellent

13. Indicate your level of agreement or disagreement with the following statements 1= NO! and 4= YES!

	YES!	Yes	No	NO!
I think I am very good at: Figuring out how to fix a bioeconomy activity that didn't work.	1	2	3	4
I think I am very good at: Coming up with questions about bioeconomy.	1	2	3	4
I think I am very good at: Doing bioeconomy experiments.	1	2	3	4

14. . Please indicate your opinion about the activity you have performed on a scale from 1= NO! and 4= YES!

	YES!	Yes	No	NO!
During this activity/MOOC/Material (game, etc.): I felt bored.	1	2	3	4
During this activity/MOOC/Material (game, etc.): I felt happy.	1	2	3	4
During this activity/MOOC/Material (game, etc.): I felt excited.	1	2	3	4
During this activity/MOOC/Material (game, etc.): I was daydreaming a lot.	1	2	3	4
During this activity/MOOC/Material (game, etc): I was focused on the things we were learning most of the time.	1	2	3	4
During this activity/MOOC/Material (game, etc): I was busy doing other tasks	1	2	3	4
During this activity/MOOC/Material (game, etc): I talked to others about stuff not related to what we were learning.	1	2	3	4
During this activity/MOOC/Material (game, etc): Time went by quickly.	1	2	3	4

15. Please indicate your opinion about the activity you have performed on a scale from 1 Strongly Disagree to 5 Strongly Agree

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

The activity was fun and entertaining	1	2	3	4	5
The activity is recommendable for different age categories	1	2	3	4	5
I am satisfied with this activity	1	2	3	4	5
The activity increases my knowledge about bioeconomy	1	2	3	4	5
I catch the basic ideas of the knowledge taught about bioeconomy	1	2	3	4	5
I will try to apply the knowledge learned about bioeconomy in the activity	1	2	3	4	5
The activity motivates me to integrate the knowledge taught about bioeconomy in my daily life	1	2	3	4	5
I am interested in and want to learn more about the bioeconomy.	1	2	3	4	5
When I grow up, I would like to work in something related to the bioeconomy.	1	2	3	4	5
I know the impact of the bioeconomy on the world around us.	1	2	3	4	5

16. Indicate your level of agreement or disagreement with the following statements
    1= NO!
and 4= YES!

	YES!	Yes	No	NO!
After a really interesting bioeconomy activity is over, I look for more information about bioeconomy	1	2	3	4
I need to know how bioeconomy works.	1	2	3	4
I want to read everything I can find about bioeconomy.	1	2	3	4
I want to know everything about bioeconomy.	1	2	3	4
I want to know how to do everything that bioeconomists do	1	2	3	4
After a really interesting bioeconomy activity is over, I can't stop thinking about it	1	2	3	4
I talk about how bioeconomy work with friends or family	1	2	3	4
I love bioeconomy!	1	2	3	4

Bioeconomy makes me feel excited	1	2	3	4
I am interested in and want to learn more about the bioeconomy	1	2	3	4
I know the impact of the bioeconomy on the world around us	1	2	3	4
In the future, I would like to work in something related to the bioeconomy	1	2	3	4
I know what I need to learn to work in the bioeconomy	1	2	3	4
I want to know how to do everything related with my favourite theme on bioeconomy (biomaterials, bioenergy, farming, etc.)	1	2	3	4

17. Please indicate your opinion about the activity you have performed on a scale from 1 Strongly Disagree to 7 Strongly Agree

	Strongly Disagree	Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Agree	Strongly Agree
The knowledge my students will gain from the GenB content will help them see sustainable opportunities around them.	1	2	3	4	5	6	7
My students will learn a great deal by completing the GenB content.	1	2	3	4	5	6	7
The GenB content will help my students reflect on their knowledge of sustainability.	1	2	3	4	5	6	7
The GenB content will help my students understand how their knowledge of sustainability compares to other children of the same age in my country.	1	2	3	4	5	6	7
The GenB content will help my students understand how their knowledge of sustainability compares to other children of the same age globally.	1	2	3	4	5	6	7
The GenB content will motivate my students to share sustainability-related information with others they know.	1	2	3	4	5	6	7

The GenB content will motivate my students to seek additional sustainability information from others they know.	1	2	3	4	5	6	7
My students will likely retake the GenB content voluntarily in the future to see if they have improved their sustainability-related knowledge.	1	2	3	4	5	6	7

C. Follow-up evaluation (Phase 3)

Societal -educational impact assessment through GenB materials follow up evaluation

Toolkits in schools

1. Have you ever heard the word "bioeconomy"?

   ❑ Yes
   ❑ No

2. Do you know what bioeconomy is?

   ❑ Bioeconomy is the economy based on using natural resources, such as plants and animals, sustainably to produce food, energy, and products without harming the environment.
   ❑ Bioeconomy is the study of animals living in the ocean.
   ❑ Bioeconomy is a branch of economics that focuses on investing in sustainable technologies to protect the environment.
   ❑ Bioeconomy is the economy based on extracting precious stones from the ground.
   ❑ I don't know what bioeconomy is.

3. Are all bio-based plastics biodegradable?

   ❑ Yes
   ❑ No
   ❑ I don’t know

4. Can bio-based plastics be recycled?

- ❑ Yes
- ❑ No
- ❑ I don't know

5. The dominant application for bio-based plastics is…

- ❑ Automotive
- ❑ Packaging
- ❑ Footwear
- ❑ Electronics
- ❑ I don't know

6. Where are bio-based plastics recycled?

- ❑ Chemical recycling plants
- ❑ They cannot be recycled
- ❑ They decompose in the ground
- ❑ Composting facilities
- ❑ I don't know

7. You can make fuel out of:

- ❑ Wood
- ❑ Used cooking oil
- ❑ Horse poop
- ❑ All of them
- ❑ I don't know

8. In what forms can biofuel be presented?

- ❑ Solid
- ❑ Liquid
- ❑ Gas
- ❑ All of them
- ❑ I don't know

9. What are barriers to the development of the biofuel market?

- ❑ High production cost
- ❑ Lack of affordable raw materials
- ❑ Insufficient infrastructure

- ❑ All of them
- ❑ I don't know

10. What areas does the bioeconomy cover?

- ❑ Agriculture
- ❑ Production and manufacturing
- ❑ Forestry and fishing
- ❑ All of them
- ❑ I don't know

11. Why do we use renewable energy in the bioeconomy?

- ❑ To use up non-renewable resources
- ❑ To reduce fossil fuel use and support sustainability
- ❑ To ignore environmental issues in energy production
- ❑ To reduce fossil fuel use and support sustainibility
- ❑ I don't know

12. Bioeconomy…

- ❑ Contributes to the reduction of CO2 emissions
- ❑ Reuses waste to produce new materials and energy
- ❑ Creates new jobs
- ❑ All of them
- ❑ I don't know

13. Which of the following best describes Life Cycle Assessment (LCA) in the context of the bioeconomy?

- ❑ A method to increase agricultural yield
- ❑ A technique to evaluate the environmental impact of a product throughout its lifespan
- ❑ A process to improve the genetic modification of crops
- ❑ A strategy for marketing bio-based products
- ❑ I don't know

14. Which of these processes optimizes resources for the bioeconomy?

- ❑ Simply disposing of waste in landfills
- ❑ Processing residues or by-products into raw materials

- ❑ Burning all waste materials
- ❑ Avoiding the generation of waste altogether
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15. What is the difference between upcycling and downcycling in the recycling process? – Answer:

- ❑ Upcycling creates lower quality and value materials, while downcycling improves quality and value
- ❑ Both processes create materials of the same quality
- ❑ Downcycling produces lower quality and value materials, while upcycling enhances quality and value
- ❑ Upcycling and downcycling are unrelated to recycling
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16. Which of the following statements about composting is true?

- ❑ Composting involves burning organic waste to generate energy
- ❑ Composting converts organic waste and improves soil quality
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17. What does biodegradation refer to?

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- ❑ Imitating natural processes and systems to solve human problems
- ❑ Creating synthetic materials using biotechnology
- ❑ Breeding animals for specific genetic traits
- ❑ The study of fossils and ancient life forms
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19. Why do non-biodegradable materials, like plastics, pose long-term environmental risks?

- ❑ They decompose quickly but leave harmful residues
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20. What is an important feature of non-renewable energy sources?

- ❑ They are always being made by nature
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- ❑ They can be used forever without running out
- ❑ They will run out because they can't be replaced quickly
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21. Which of the following is an example of a green job?

- ❑ Coal miner
- ❑ Solar panel installer
- ❑ Oil rig worker
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- ❑ I don't know

22. What is the benefit associated with bio-based plastics, their recycling, and their environmental impact?

- ❑ They increase greenhouse gas emissions
- ❑ They reduce dependence on fossil fuels
- ❑ They are non-biodegradable
- ❑ They contribute to ocean pollution
- ❑ I don't know

23. Please indicate your opinion about the following statements on a scale from 1 Strongly Disagree to 5 Strongly Agree

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
I turn off the lights/television when I leave a room.	1	2	3	4	5

I unplug appliances that are left in stand-by mode	1	2	3	4	5
I reduce the use of heating or air-conditioning to limit energy consumption.	1	2	3	4	5
I reduce the time I take showers to save water.	1	2	3	4	5
I watch TV programs, videos or movies on environmental issues	1	2	3	4	5
I have increased the amount of organic fruits and vegetables that I eat.	1	2	3	4	5
I talk to other people about their environmentally friendly behaviors.	1	2	3	4	5
I reduce the amount of meat that I eat.	1	2	3	4	5
In general, if I have to go by car, I try to carpool.	1	2	3	4	5
In general, I use public transport instead of the car.	1	2	3	4	5
In general, I ride a bike, scooter or walk instead of using the car	1	2	3	4	5
I turn off the lights/television when I leave a room.	1	2	3	4	5

Appendix 6. Questionnaire for the societal impact assessment through GenB materials (KERs) – questionnaire adapted for the MOOC

A. Pre-evaluation – MOOC (Phase 1)

Societal – educational impact assessment through GenB Mooc pre evaluation

MOOC

1. Have you ever heard the word "bioeconomy"?

   ❑ Yes
   ❑ No

2. Do you know what bioeconomy is?

   ❑ Bioeconomy is the economy based on using natural resources, such as plants and animals, sustainably to produce food, energy, and products without harming the environment.
   ❑ Bioeconomy is the study of animals living in the ocean.
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3. Are all bio-based plastics biodegradable?

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5. The dominant application for bio-based plastics is…

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6. Where are bio-based plastics recycled?

   ❑ Chemical recycling plants
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7. You can make fuel out of:

   ❑ Wood
   ❑ Used cooking oil
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   ❑ I don't know

8. In what forms can biofuel be presented?

   ❑ Solid
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   ❑ All of them
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9. What are barriers to the development of the biofuel market?

   ❑ High production cost
   ❑ Lack of affordable raw materials
   ❑ Insufficient infrastructure
   ❑ All of them
   ❑ I don't know

10. What areas does the bioeconomy cover?

- ❑ Agriculture
- ❑ Production and manufacturing
- ❑ Forestry and fishing
- ❑ All of them
- ❑ I don't know

11. Why do we use renewable energy in the bioeconomy?

- ❑ To use up non-renewable resources
- ❑ To reduce fossil fuel use and support sustainability
- ❑ To ignore environmental issues in energy production
- ❑ To reduce fossil fuel use and support sustainibility
- ❑ I don't know

12. Bioeconomy…

- ❑ Contributes to the reduction of CO2 emissions
- ❑ Reuses waste to produce new materials and energy
- ❑ Creates new jobs
- ❑ All of them
- ❑ I don't know

13. Which of the following best describes Life Cycle Assessment (LCA) in the context of the bioeconomy?

- ❑ A method to increase agricultural yield
- ❑ A technique to evaluate the environmental impact of a product throughout its lifespan
- ❑ A process to improve the genetic modification of crops
- ❑ A strategy for marketing bio-based products
- ❑ I don't know

14. Which of these processes optimizes resources for the bioeconomy?

- ❑ Simply disposing of waste in landfills
- ❑ Processing residues or by-products into raw materials
- ❑ Burning all waste materials
- ❑ Avoiding the generation of waste altogether
- ❑ I don't know

15. What is the difference between upcycling and downcycling in the recycling process? – Answer:

- ❑ Upcycling creates lower quality and value materials, while downcycling improves quality and value
- ❑ Both processes create materials of the same quality
- ❑ Downcycling produces lower quality and value materials, while upcycling enhances quality and value
- ❑ Upcycling and downcycling are unrelated to recycling
- ❑ I don't know

16. Which of the following statements about composting is true?

- ❑ Composting involves burning organic waste to generate energy
- ❑ Composting converts organic waste and improves soil quality
- ❑ Composting is a method for recycling plastics
- ❑ All of them are true
- ❑ I don't know

17. What does biodegradation refer to?

- ❑ Burning organic waste to make energy
- ❑ Making new materials with chemicals
- ❑ Recycling plastics using machines
- ❑ Microorganisms breaking down organic materials
- ❑ I don't know

18. What is biomimicry?

- ❑ Imitating natural processes and systems to solve human problems
- ❑ Creating synthetic materials using biotechnology
- ❑ Breeding animals for specific genetic traits
- ❑ The study of fossils and ancient life forms
- ❑ I don't know

19. Why do non-biodegradable materials, like plastics, pose long-term environmental risks?

- ❑ They decompose quickly but leave harmful residues
- ❑ They are easily absorbed by natural processes

- ❑ They persist for a long time and can harm ecosystems and wildlife
- ❑ They break down into harmless substances that benefit the environment
- ❑ I don't know

20. What is an important feature of non-renewable energy sources?

- ❑ They are always being made by nature
- ❑ They don't harm the environment much
- ❑ They can be used forever without running out
- ❑ They will run out because they can't be replaced quickly
- ❑ I don't know

21. Which of the following is an example of a green job?

- ❑ Coal miner
- ❑ Solar panel installer
- ❑ Oil rig worker
- ❑ Plastic factory worker
- ❑ I don't know

22. What is the benefit associated with bio-based plastics, their recycling, and their environmental impact?

- ❑ They increase greenhouse gas emissions
- ❑ They reduce dependence on fossil fuels
- ❑ They are non-biodegradable
- ❑ They contribute to ocean pollution
- ❑ I don't know

23. Please indicate your opinion about the following statements on a scale from 1 Strongly Disagree to 5 Strongly Agree

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
I turn off the lights/television when I leave a room.	1	2	3	4	5
I unplug appliances that are left in stand-by mode	1	2	3	4	5
I reduce the use of heating or air-conditioning to limit energy consumption.	1	2	3	4	5
I reduce the time I take showers to save water.	1	2	3	4	5

I watch TV programs, videos or movies on environmental issues	1	2	3	4	5
I have increased the amount of organic fruits and vegetables that I eat.	1	2	3	4	5
I talk to other people about their environmentally friendly behaviors.	1	2	3	4	5
I reduce the amount of meat that I eat.	1	2	3	4	5
In general, if I have to go by car, I try to carpool.	1	2	3	4	5
In general, I use public transport instead of the car.	1	2	3	4	5
In general, I ride a bike, scooter or walk instead of using the car	1	2	3	4	5
I turn off the lights/television when I leave a room.	1	2	3	4	5

B. Immediate Post-evaluation – MOOC (Phase 2)

Societal – educational impact assessment through Mooc inmediate post evaluation

MOOC

1. Answer the following questions using the scale where 1 = Not at all important and 4 = Very important.

	No at all important	A little important	Important	Very important
Do you think it would be important for your students to learn about bioeconomy?	1	2	3	4
Do you consider it important for your students to develop the ability to think like a bioeconomist, that is, thinking about how to make things work better?	1	2	3	4

Funded by the European Union

2. Indicate your level of agreement or disagreement with the following statements 1= NO! and 4= YES!

	YES!	Yes	No	NO!
Bioeconomy make the world a better place to live.	1	2	3	4
I think bioeconomist are the most important people in the world.	1	2	3	4
Bioeconomy is the most important thing in the world for me to learn.	1	2	3	4
Knowing bioeconomy is important for being a good citizen	1	2	3	4
I think bioeconomy is more important to know than anything else	1	2	3	4
I think bioeconomy ideas are valuable	1	2	3	4

3. Indicate your level of agreement or disagreement with the following statement 1= Never and 4= All the time

	Never	Sometimes	Most of the time	All the time
Learning about bioeconomy help my students understand how the world works.	1	2	3	4

4. Indicate your level of agreement or disagreement with the following statement 1= None and 4= All my classes

	None	A few classes	Most of my classes	All my classes
Thinking like a bioeconomist will help my students do well in:	1	2	3	4

5. Indicate your level of agreement or disagreement with the following statement 1= No jobs and 4= All jobs

	No jobs	A few jobs	Most jobs	All jobs
Knowing bioeconomy is important for:	1	2	3	4

6. My students will wonder about how bioeconomy works:

- ❑ Never
- ❑ Once a month
- ❑ Once a week

❑ Every day

7. In general, when my students work on bioeconomy content:

❑ They hate it
❑ They don´t like it
❑ They like it
❑ They love it

8. In general, my students will find bioeconomy:

❑ Very boring
❑ Boring
❑ Interesting
❑ Very interesting

9. My students will be able to do the bioeconomy activities they get in class:

❑ Rarely
❑ Half the time
❑ Most of the time
❑ All the time

10. If my students go to a bioeconomy museum, they will be able to figure out what is being shown.:

❑ None of it
❑ A few areas
❑ Most areas
❑ All areas

11. My students will be able to understand bioeconomy information on websites suitable for their age:

❑ None of them
❑ A few websites
❑ Most websites
❑ All websites

12. If my school offers extracurricular activities on bioeconomy, my students will find them:

- ❑ Poor
- ❑ Ok
- ❑ Good
- ❑ Excellent

13. My students will be able to understand bioeconomy in books meant for adults.

- ❑ A little of the time
- ❑ Some of the time
- ❑ Most of the time
- ❑ All of the time

14. Indicate your level of agreement or disagreement with the following statements 1= NO! and 4= YES!

	YES!	Yes	No	NO!
I think the majority of my students are very good at: Figuring out how to fix a bioeconomy activity that didn't work.	1	2	3	4
I think the majority of my student are very good at: Coming up with questions about bioeconomy.	1	2	3	4
I think the majority of my student are very good at: Doing bioeconomy experiments.	1	2	3	4

15. . Please indicate your opinion about the activity you have performed on a scale from 1= NO! and 4= YES! (this question is related to your personal opinion about the MOOC activity (not the opinion of your students).

	YES!	Yes	No	NO!
During this activity/MOOC/Material (game, etc.): I felt bored.	1	2	3	4
During this activity/MOOC/Material (game, etc.): I felt happy.	1	2	3	4
During this activity/MOOC/Material (game, etc.): I felt excited.	1	2	3	4
During this activity/MOOC/Material (game, etc.): I was daydreaming a lot.	1	2	3	4
During this activity/MOOC/Material (game, etc): I was focused on the things we were learning most of the time.	1	2	3	4

During this activity/MOOC/Material (game, etc): I was busy doing other tasks	1	2	3	4
During this activity/MOOC/Material (game, etc): I talked to others about stuff not related to what we were learning.	1	2	3	4
During this activity/MOOC/Material (game, etc): Time went by quickly.	1	2	3	4

16. Please indicate your opinion about the activity you have performed on a scale from 1 Strongly Disagree to 5 Strongly Agree

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
The activity was fun and entertaining	1	2	3	4	5
I am satisfied with this activity	1	2	3	4	5
The activity increases my knowledge about bioeconomy	1	2	3	4	5
I catch the basic ideas of the knowledge taught about bioeconomy	1	2	3	4	5
I will try to apply the knowledge learned about bioeconomy in the activity in my classes	1	2	3	4	5
The activity motivates me to integrate the knowledge taught about bioeconomy in my classes	1	2	3	4	5
The content of the activity is recommendable for different age categories	1	2	3	4	5

17. Indicate your level of agreement or disagreement with the following statements 1= NO!
and 4= YES!

	YES!	Yes	No	NO!
After a really interesting bioeconomy activity is over, I look for more information about it.	1	2	3	4
I need to know how bioeconomy work.	1	2	3	4
I want to read everything I can find about bioeconomy.	1	2	3	4
I want to know everything about bioeconomy.	1	2	3	4
I want to know how to do everything that bioeconomists do	1	2	3	4

After a really interesting bioeconomy activity is over, I can't stop thinking about it	1	2	3	4
I talk about how bioeconomy work with friends or family	1	2	3	4
I love bioeconomy!	1	2	3	4
Bioeconomy makes me feel excited	1	2	3	4
I am interested in and want to learn more about the bioeconomy	1	2	3	4
I know the impact of the bioeconomy on the world around us	1	2	3	4
In the future, I would like to work in something related to the bioeconomy	1	2	3	4
I know what I need to learn to work in the bioeconomy	1	2	3	4

18. Please indicate your opinion about the activity you have performed on a scale from 1 Strongly Disagree to 7 Strongly Agree

	Strongly Disagree	Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Agree	Strongly Agree
The knowledge my students will gain from the GenB content will help them see sustainable opportunities around them.	1	2	3	4	5	6	7
My students will learn a great deal by completing the GenB content.	1	2	3	4	5	6	7
The GenB content will help my students reflect on their knowledge of sustainability.	1	2	3	4	5	6	7
The GenB content will help my students understand how their knowledge of sustainability compares to other children of the same age in my country.	1	2	3	4	5	6	7
The GenB content will help my students understand how their knowledge of sustainability compares to other children of the same age globally.	1	2	3	4	5	6	7

The GenB content will motivate my students to share sustainability-related information with others they know.	1	2	3	4	5	6	7
The GenB content will motivate my students to seek additional sustainability information from others they know.	1	2	3	4	5	6	7
My students will likely retake the GenB content voluntarily in the future to see if they have improved their sustainability-related knowledge.	1	2	3	4	5	6	7

C. Follow-up evaluation – MOOC (Phase 3)

Societal – educational impact assessment through GenB Mooc follow up

MOOC

1. Have you ever heard the word "bioeconomy"?

   ❑ Yes
   ❑ No

2. Do you know what bioeconomy is?

   ❑ Bioeconomy is the economy based on using natural resources, such as plants and animals, sustainably to produce food, energy, and products without harming the environment.
   ❑ Bioeconomy is the study of animals living in the ocean.
   ❑ Bioeconomy is a branch of economics that focuses on investing in sustainable technologies to protect the environment.
   ❑ Bioeconomy is the economy based on extracting precious stones from the ground.
   ❑ I don't know what bioeconomy is.

3. Are all bio-based plastics biodegradable?

   ❑ Yes
   ❑ No
   ❑ I don’t know

4. Can bio-based plastics be recycled?

   ❑ Yes
   ❑ No
   ❑ I don't know

5. The dominant application for bio-based plastics is…

   ❑ Automotive
   ❑ Packaging
   ❑ Footwear
   ❑ Electronics
   ❑ I don't know

6. Where are bio-based plastics recycled?

   ❑ Chemical recycling plants
   ❑ They cannot be recycled
   ❑ They decompose in the ground
   ❑ Composting facilities
   ❑ I don't know

7. You can make fuel out of:

   ❑ Wood
   ❑ Used cooking oil
   ❑ Horse poop
   ❑ All of them
   ❑ I don't know

8. In what forms can biofuel be presented?

   ❑ Solid
   ❑ Liquid
   ❑ Gas
   ❑ All of them
   ❑ I don't know

9. What are barriers to the development of the biofuel market?

   ❑ High production cost

- ❑ Lack of affordable raw materials
- ❑ Insufficient infrastructure
- ❑ All of them
- ❑ I don't know

10. What areas does the bioeconomy cover?

- ❑ Agriculture
- ❑ Production and manufacturing
- ❑ Forestry and fishing
- ❑ All of them
- ❑ I don't know

11. Why do we use renewable energy in the bioeconomy?

- ❑ To use up non-renewable resources
- ❑ To reduce fossil fuel use and support sustainability
- ❑ To ignore environmental issues in energy production
- ❑ To reduce fossil fuel use and support sustainibility
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12. Bioeconomy…

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- ❑ They can be used forever without running out
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- ❑ Solar panel installer
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- ❑ They contribute to ocean pollution
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23. Please indicate your opinion about the following statements on a scale from 1 Strongly Disagree to 5 Strongly Agree

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
I turn off the lights/television when I leave a room.	1	2	3	4	5

I unplug appliances that are left in stand-by mode	1	2	3	4	5
I reduce the use of heating or air-conditioning to limit energy consumption.	1	2	3	4	5
I reduce the time I take showers to save water.	1	2	3	4	5
I watch TV programs, videos or movies on environmental issues	1	2	3	4	5
I have increased the amount of organic fruits and vegetables that I eat.	1	2	3	4	5
I talk to other people about their environmentally friendly behaviors.	1	2	3	4	5
I reduce the amount of meat that I eat.	1	2	3	4	5
In general, if I have to go by car, I try to carpool.	1	2	3	4	5
In general, I use public transport instead of the car.	1	2	3	4	5
In general, I ride a bike, scooter or walk instead of using the car	1	2	3	4	5
I turn off the lights/television when I leave a room.	1	2	3	4	5

Appendix 7. Questionnaire for the scientific impact assessment through KIP's

Scientific impact assessment through KIP‘s

GenB Partners

NOTE: Respond NO APPLY if you think that the answer is no related with GenB project.

Section 1: Creating High-Quality New Knowledge

Publications

1. Have you written or contributed to any publications based on GenB project? If so, please list them (and use the right category).

    a. Please provide a list of **peer-reviewed articles** based on GenB project:

Authors	Year	Title	Journal

    b. Please provide a list of **non-peer-reviewed articles** based on GenB project:

Authors	Year	Title	Journal/source

    c. Please provide a list of **books** based on GenB project:

Authors	Year	Title	Publisher

d. Please provide a list of **book chapters** based on GenB project:

Authors	**Year**	**Title**	**Book**

e. Please provide a list of **BA/MA/PhD/other** theses based on GenB project:

Authors	**Year**	**Title**

f. Please provide a list of **non-scientific** publications based on GenB, such as blog posts, articles in magazines, radio/tv broadcastings, videos, podcasts, etc:

Description

Note: *In the "publications" column, you need to add the names of the publications you have completed based on the GenB Project.*

Citations

1. How visible are your research outputs on social media and research platforms such as Academia, Research.edu, etc?

Publications	Downloads	Likes	Shares	Citations
Peer-reviewed article 1	Number	Number	Number	
Peer-reviewed article 2	Number	Number	Number	
Book 1	Number	Number	Number	
…	Number	Number	Number	

2. To what extent did your citizens participate in the scientific output, for example in analysing the data or in writing up the results?

   a. *Please indicate on a scale from 1-5, where 1=not at all, and 5=a lot.*

Publications	Not at all	2	3	4	A lot
Peer-reviewed article 1					
Peer-reviewed article 2					
Book 1					
…					

   b. If you scored 3 or higher, please describe how:

Publications	How?
Peer-reviewed article 1	
Peer-reviewed article 2	
Book 1	
…	

3. Were your citizens recognized for their participation in the scientific output?

Publications	Yes	No	Not applicable

Peer-reviewed article 1			
Peer-reviewed article 2			
Book 1			
…			

Section 2: Fostering diffusion of knoweledge and open science

Shared knowledge

The following five questions are based on a 5 star rating scheme for Open Data and on the FAIR principles.

1. Are the data available on the web (whatever format) with an open license, to be Open Data?

Publications	Yes, please spicify where	No	Not applicable
Peer-reviewed article 1			
Peer-reviewed article 2			
Book 1			
…			

2. Are the data available as machine-readable structured data (e.g. excel instead of image scan of a table)?

Publications	Yes	No	Not applicable
Peer-reviewed article 1			
Peer-reviewed article 2			
Book 1			
…			

3. Are the data published in a non-proprietary format (e.g. CSV instead of excel)?

Publications	Yes	No	Not applicable
Peer-reviewed article 1			
Peer-reviewed article 2			
Book 1			
…			

4. Does your data follow best practices for open data from W3C or another source?

Publications	Yes	No	Not applicable
Peer-reviewed article 1			
Peer-reviewed article 2			
Book 1			
…			

5. Do the data link to other people's data(sets) to provide context?

Publications	Yes	No	Not applicable
Peer-reviewed article 1			
Peer-reviewed article 2			
Book 1			
…			

FAIR principles

6. To what extent do you consider your data easily **Findable**?

Please indicate on a scale from 1-5, where 1=not at all, and 5=a lot.

Publications	Not at all	2	3	4	A lot
Peer-reviewed article 1					
Peer-reviewed article 2					
Book 1					
…					

b. If you scored 3 or higher, please describe how:

Publications	How?
Peer-reviewed article 1	
Peer-reviewed article 2	
Book 1	

…	

7. To what extent do you consider your data **Accessible**?

Please indicate on a scale from 1-5, where 1=not at all, and 5=a lot.

Publications	Not at all	2	3	4	A lot
Peer-reviewed article 1					
Peer-reviewed article 2					
Book 1					
…					

b. If you scored 3 or higher, please describe how:

Publications	How?
Peer-reviewed article 1	
Peer-reviewed article 2	
Book 1	
…	

8. To what extent do you consider your data **Interoperable**?

Please indicate on a scale from 1-5, where 1=not at all, and 5=a lot.

Publications	Not at all	2	3	4	A lot
Peer-reviewed article 1					
Peer-reviewed article 2					
Book 1					
…					

b. If you scored 3 or higher, please describe how:

Publications	How?

Peer-reviewed article 1	
Peer-reviewed article 2	
Book 1	
…	

9. To what extent do you consider your data **Reusable**?

Please indicate on a scale from 1-5, where 1=not at all, and 5=a lot.

Publications	Not at all	2	3	4	A lot
Peer-reviewed article 1					
Peer-reviewed article 2					
Book 1					
…					

b. If you scored 3 or higher, please describe how:

Publications	How?
Peer-reviewed article 1	
Peer-reviewed article 2	
Book 1	
…	

New research fields and interdisciplinarity

10. Do you consider GenB Project:

❑ Strongly interdisciplinary, please describe:…..

❑ Somewhat interdisciplinary, please describe:…...
❑ Not interdisciplinary

11. Have you contributed to creating any new research groups in academia?

❑ Yes, please describe:
❑ No
❑ Not applicable

12. Have you contributed to creating a new sub-discipline?

❑ Yes, please describe:
❑ No
❑ Not applicable

Knowledge difusion

13. Did you ease access to traditional and local knowledge resources, for example to your citizens' knowledge about their local environment and practices?

    a. *Please indicate on a scale from 1-5, where 1=not at all, and 5=a lot.*

    1 2 3 4 5

    b. If you scored 3 or higher, please describe how:

14. Did you facilitate knowledge creation among societal actors and groups?

    a. *Please indicate on a scale from 1-5, where 1=not at all, and 5=a lot.*

    1 2 3 4 5

    b. b. If you scored 3 or higher, please describe how:

15. Did GenB project generate knowledge that was impossible to generate without a citizen science approach?

❑ Yes, please describe:
❑ No
❑ Not applicable

Innovation in education

16. To what extent did GenB project lead to innovations in academic or school curricula?

    a. Please indicate on a scale from 1-5, where 1=not at all, and 5=a lot.

    1 2 3 4 5

    b. If you scored 3 or higher, please describe how:

17. To what extent did GenB project lead to innovations in (other) educational or training methods?

    a. Please indicate on a scale from 1-5, where 1=not at all, and 5=a lot.

    1 2 3 4 5

    b. b. If you scored 3 or higher, please describe how:

Regarding your participation in the GENB project, please provide the following information about the researchers at your institution

Section 3: Strengthening human capital in R&I

Skills

1. Total number of researchers funded by GenB project:

2.1. How many of these researchers have participated in upskilling activities during the duration of the project, expressed in full-time equivalents (FTE)?

2.2. Indicate the types of upskilling activities these researchers have participated in. Select all that apply:

- ❏ Technical training courses
- ❏ Professional development workshops
- ❏ Seminars and conferences
- ❏ Collaboration networks and mentoring
- ❏ Publications and conference presentations
- ❏ Mobility and access to research and innovation (R&I) infrastructures
- ❏ Others (please specify)

Careers

The H-index is a numerical indicator used to measure the productivity and impact of a researcher based on their academic publications and the number of citations those publications have received. It represents the maximum number of publications (H) of a researcher that have received at least H citations each.

Arrange your publications by the number of citations received and identify the highest number where each publication has at least that number of citations.

For instance, if your most cited publications have 10 citations each and you have at least 10 publications with 10 or more citations each, your H-index would be 10.

1. Indicate the average H-index of these researchers before their participation in the GENB project: [Number]

1.1. Indicate the current average H-index of these researchers, after their participation in the GENB project: [Number]

1.2. If possible, provide additional details on how their participation in the GENB project has contributed to this increase in the H-index (e.g., greater access to research infrastructures, increased international collaboration, publications in high-impact journals, etc.):

Working Conditions

2. Indicate if there have been improvements in the working conditions of these researchers during their participation in the GENB project. Select all that apply and provide additional details where necessary:

- ❑ Increase in net salaries
- ❑ Improvement in job security (e.g., more stable or permanent contracts)
- ❑ Improvement in pension and social security provisions
- ❑ Improvement in other work benefits (e.g., paid time off, health benefits)
- ❑ Others (please specify)

2.1. Provide specific details about salary increases (Average of all reserchears involved in GenB Porject):

Average net salary before participating in the GENB project: [Amount in €]

Current average net salary: [Amount in €]

2.2. Indicate the level of satisfaction of the researchers with the following areas of their working conditions, before and after their participation in the GENB project (use a scale from 1 to 5, where 1 is "very dissatisfied" and 5 is "very satisfied"):

- ❑ Job security
- ❑ Pension and social security provisions
- ❑ Other work benefits
- ❑ Work-life balance
- ❑ Work environment and available resources

2.3. Indicate the contract type of the researchers involved in the GenB project:

Researcher	Contract type

Researcher 1	
Researcher 2	
Researcher 3	
…	

Economic impact assessment through KIP'S

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NOTE: Respond NO APPLY if you think that the answer is no related with GenB project.

Section 1: Generating Innovation-Based Growth

Innovative results (Direct results of the project)

1.1 Number of innovative products developed (Briefly describe each product):

1.2 Number of innovative processes developed (Briefly describe each process):

1.3 Number of innovative methods developed (Briefly describe each method):

1.4 Number of intellectual property rights (IPR) applications submitted (Specify the type of IPR, such as patents, trademarks, designs, etc.):

Innovations (Results reaching the market and generating added value)

1.5 Number of innovations resulting from the project (Briefly describe each innovation):

1.6 Number of innovations derived from granted intellectual property rights (Specify the granted patents and their application):

Patent	Citations	Number of countires in which the patent is registered	Scope (National, European, International)	How and when each innovation was introduced to the market
Patent 1	Number	Number	Number	
Patent 2	Number	Number	Number	

Section 2: Creating More and Better Jobs

Suported Employment

2.1 Number of full-time equivalent (FTE) jobs created during the project (Specify the type of job: researchers, technicians, administrative, etc.):

2.2 Number of full-time equivalent (FTE) jobs maintained during the project (Specify the type of job and reasons for maintaining these positions):

Sustained Employment (Medium-term impact after project completion)

2.3Growth in employment in beneficiary entities (Number of additional FTE jobs hired after project completion, by type of job):

2.4 Types of jobs created (Describe the new jobs created, their function, and relevance for exploiting project results):

Total Employment (Long-term impact due to dissemination of project results):

2.5 Number of direct jobs created due to the dissemination of project results (Specify the type of job and the employing entity):

2.6 Number of indirect jobs created due to the dissemination of project results (Describe the type of job and how it is indirectly related to the project):

2.7 Number of jobs maintained (direct and indirect) due to the dissemination of project results (Provide details on sustained jobs and economic impact)

Section 3: Leveraring investments in R&I (Research, Development and Innovation)

Co-Investment (Investment mobilised by the initial project investment):

3.1 Amount of public investment mobilised by the initial project investment (In euros, and describe the sources of public funding):

3.2 Amount of private investment mobilised by the initial project investment (In euros, and describe the sources of private funding):

Scaling Up (Investment to exploit or scale up project results):

3.3 Amount of public investment mobilised to exploit or scale up project results (In euros, describe specific scaling projects):

3.4Amount of private investment mobilised to exploit or scale up project results (In euros, describe specific scaling projects):

Contribution to the 3% GDP Target (Long-term impact on R&I investment):

3.5 Total R&D expenditure of the project (In euros, detail all research and development expenses funded by Horizon Europe).

3.6 Additional R&D investments (In euros, detail all public and private investments mobilised thanks to the project).

Section 4: Cost Savings

4.1 Do you believe your GenB project generated cost savings for stakeholders?

☐ YES / ☐ NO

a. If yes, how?

Description:

_____

4.2 Please indicate the number of hours dedicated to the project by volunteers.

Number of hours: _____

a. If precise information is unavailable, please provide an estimate.

Estimate: _____

4.3 Please indicate the number of hours dedicated to citizen engagement and support by your team.

Number of hours: _____

Section 5: Economic Impact on the Local Community

5.1 To what extent will the GenB project have a positive economic impact (monetary or non-monetary) on the local community?

5.2 For example, will the project enhance the attractiveness of the location where it was carried out? Will it promote new economic activities for residents?

Description:

_____

5.3 Has the GenB project influenced the development of public policies or strategies related to the bioeconomy at the local, regional, or national level?

☐ YES / ☐ NO

a. If yes, can you describe how?

Description:

_____

5.4 Has the GenB project improved the capacity of local communities to implement sustainable practices and bioeconomy-based solutions?

☐ YES / ☐ NO

a. If yes, how?

Description:

_____

5.5 Has the GenB project attracted additional funding or investments for bioeconomy-related initiatives?

☐ YES / ☐ NO

a. If yes, what type and amount?

Type of funding:

_____

Amount:

_____

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