BIO2REG

Assessing your region's bio-economy potential: **A practical guide**

Panos Kalimeris, Georgios Maroulis, Panagiotis Koronaios, Antonios Rovolis, Kostas Bithas, Eleftheria Ziakka

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1 Executive summary

The present publicly available practical guide aims to be used by regional stakeholders to quantitatively capture multiple potential dimensions of their regionalised, circular bioeconomy. An advantage of the present guide's design is its simplicity. Keeping in mind to design a method that is practical, operational and meaningful to the non-expert regional stakeholders, the present guide provides a user-friendly four-steps guidance to the regional stakeholders to establish their own regional bioeconomy potentials.

The practical guide is founded on the theoretical framework provided by the BIO2REG regionalisation concept1, while it is complemented with BIO2REG's guide on best practices2. Every region has its own unique and particular traits. These may vary from environmentally related ones such as climate, natural resources and biomass availability to economic e.g., regional industry dynamics and social ones e.g., share of active population. However, it is of great importance to look first at the "bigger picture' i.e., what has already been done on a national and regional level. This can provide a first input whether and how bioeconomy is implemented. Then, the region's strengths and weaknesses as well as the dynamic bioeconomy sectors can be further identified. At this point our practical guide will support at mapping and assessing regional bioeconomy potential, which will also vary on the level of one region's aspiration i.e., how ambitious is one region regarding the development of bioeconomy

Finally, establishing a coherent monitoring process is equally important. Bioeconomy transitions take time and require constant re-evaluation of the progress and the targets. Success often depends on a patient, step-by-step approach with regular check-ins to adjust direction and goals. A clearly defined monitoring system, supported by regional engagement and incremental progress, creates the best conditions for lasting regional transformation.

the technical term of the practical is "Multi-Criteria Assessment" (MCA). The MCA serves as a decision-analysis basis for self-assessment, providing practical information and relevant bioeconomy indicators to the user, through the excel tool provided in Annex I of the present guide.

Towards this end, through different scenarios of bioeconomy, various already available online tools, different set of indicators provided in a user-friendly excel tool, as well as an essential monitoring process, the regional stakeholders would be able to enforce their actionable knowledge and their confidence to design, implement and evaluate an effective regional bioeconomy.

2 Introduction to the regional stakeholders' guide

In a nutshell, bioeconomy is an alternative holistic model of development which uses renewable biological resources from land and sea (e.g. crops, forests, fish, animals and micro-organisms) to fulfil society's needs by producing food, feed, materials and energy. A determined development of the bioeconomy will substantially assist the EU's transition towards a circular and low-carbon economy, by modernising and strengthening the industrial base, and creating greener, more cost-effective industrial processes, new value chains and employment, to all sectors of the economy, while, at the same time, mitigating GHG's and protecting biodiversity and the environment.

The implementation of bioeconomy at the bottom-up regional level is of paramount importance. It could foster regional development by focusing on local needs, region's specific sectoral composition and natural resources capacity. The transition from a linear economy to a bio-based

[1] D 1.1: BIO2REG regionalization concept for circular and systemic bioeconomy model regions
[2] D.1.4 Best practice for regional transitions to bioeconomy model regions (shortly available in the BIO2REG network)

one aims to align economic prosperity, social inclusion as well as environmental sustainability leading to the cross-section of the three dimensions of sustainability. The adoption of bioeconomy related orientation by the European Union aims to achieve the following goals[3]:

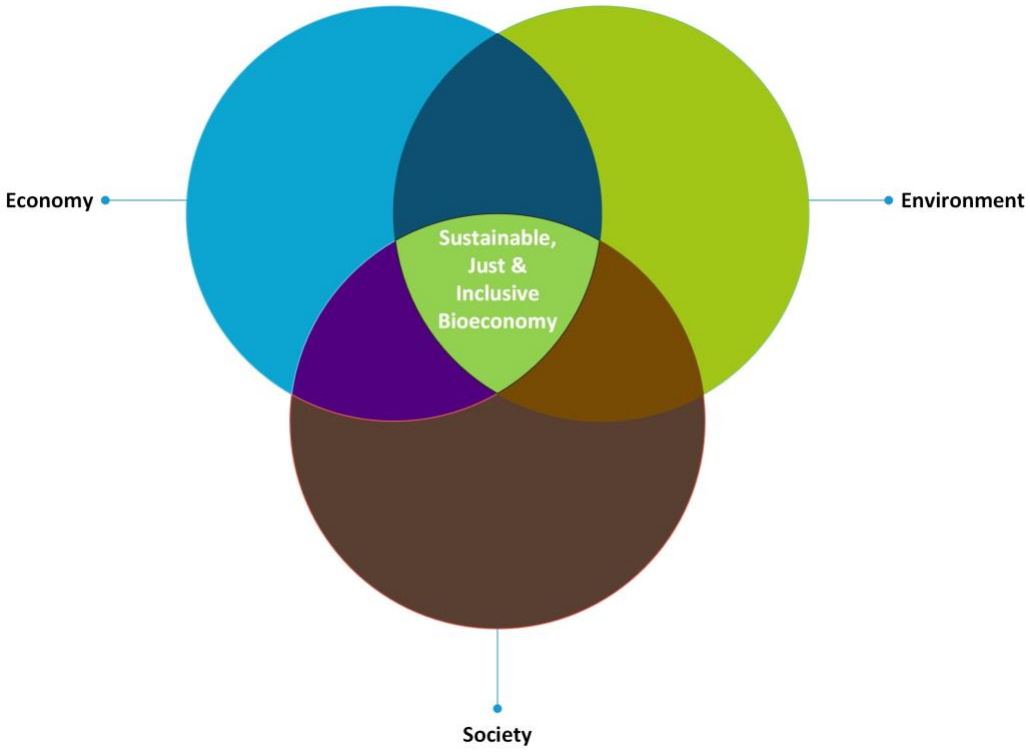
- ensure food and nutrition security
- manage natural resources sustainably
- reduce dependence on non-renewable, unsustainable resources
- limit and adapt to climate change
- strengthen European competitiveness and create jobs

The present guide aspires to assist you for self-assessing your regional bioeconomy potentials, through an easy-to-use step-by-step guidance. Since bioeconomy ought to be sustainable and inclusive, apart from creating added value and jobs, it is of paramount importance to assess all three pillars of sustainability namely economy, environment and society. For this reason, the indicators provided to you in **Annex I**, are explicitly grouped into the **three pillars** of sustainability, namely, economy; society; and environment (See Fig. 1).

Follow the simple instructions provided and initiate the process of self-assessment (See Fig.2).

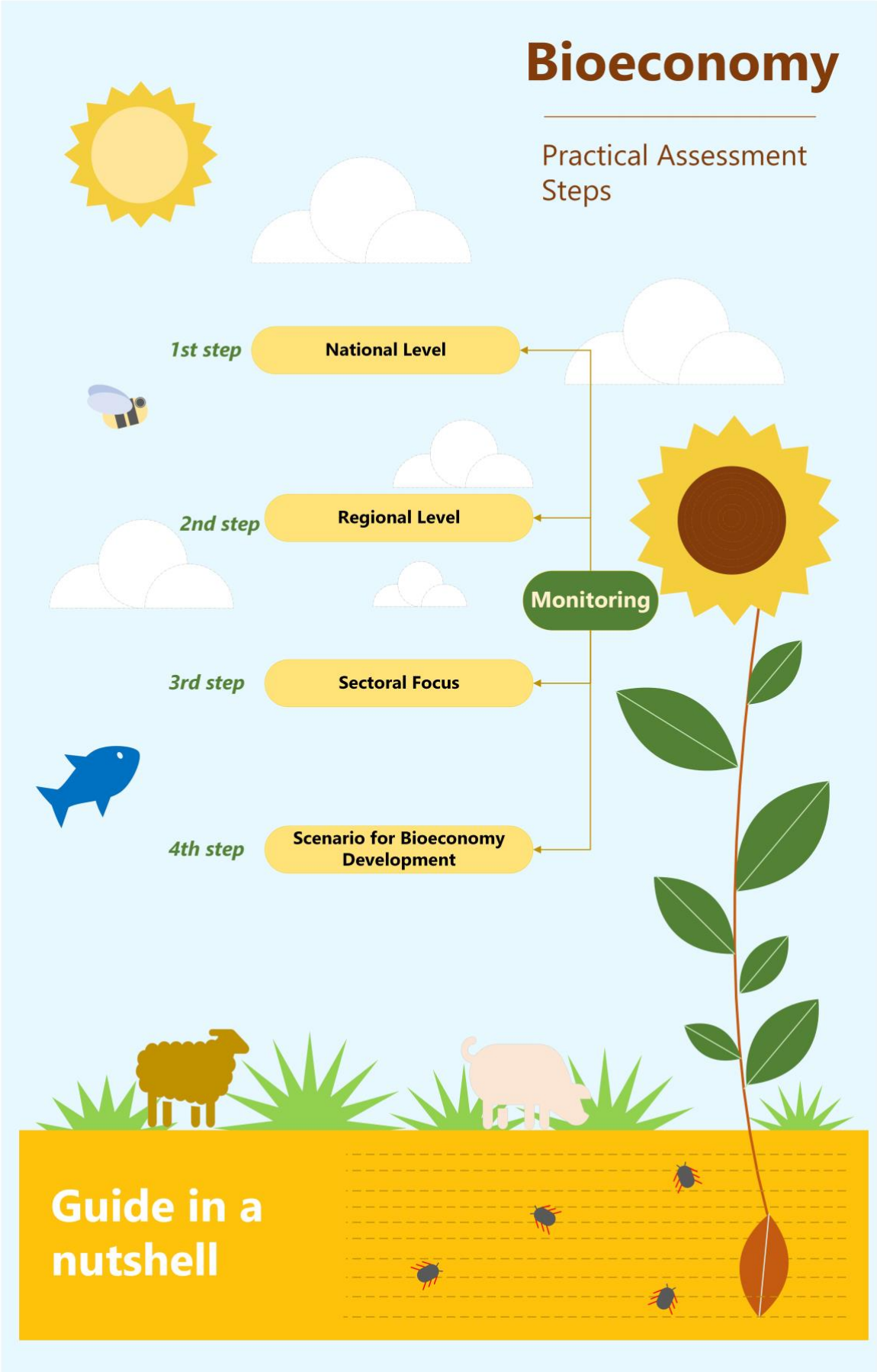
Furthermore, two kinds of boxes are provided for your convenience. **Toolboxes** are proposing relevant online tools useful for extra self-assessment potentials, while **Tip-boxes** are providing valuable hints and tips for specific guidelines that sum up important information for you, in a nutshell.

Figure 1: The three sustainability pillars of bioeconomy indicators' division



[3] For more information see: https://environment.ec.europa.eu/strategy/bioeconomy-strategy_en (Retrieved 06.06.2025)

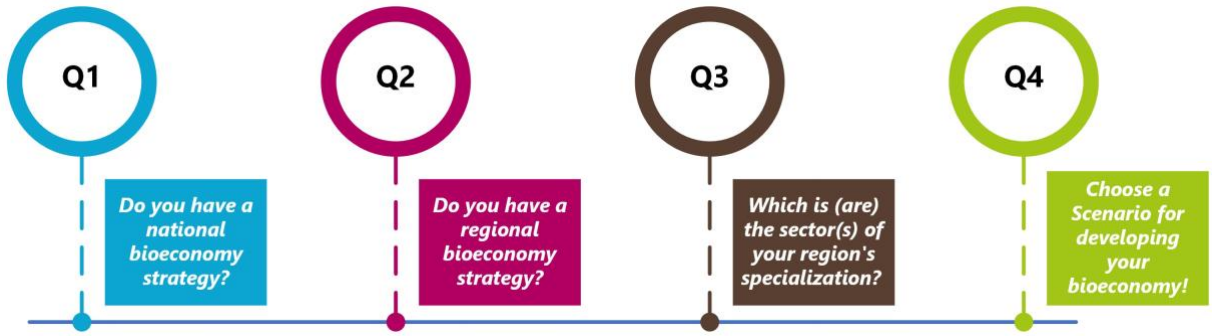
Figure 2: The guide's practical assessment steps in a nutshell



3 Let self-assessment begin!

The present practical guide is based on **four key-questions** that need to be answered to self-assess your regional bioeconomy potentials (See Fig. 3).

Figure 3: The four key-questions for self-assessing your bioeconomy potentials



3.1 Q1: Does your country have a national bioeconomy strategy?

It is a very critical step to start with exploring your national bioeconomy strategy. If there is a national bioeconomy strategy, it could be used as a blueprint for you to construct your specific regional bioeconomy strategy. See the Toolbox below for more help:

Info Toolbox: Check the bioeconomy country dashboard

To identify if your country has already developed a dedicated bioeconomy strategy explore the bioeconomy country dashboard of the European Commission's Knowledge Centre for Bioeconomy. By clicking on the country that you interested in and choosing from the menu the National Strategies options you can identify the existence of a strategy. Furthermore, in the right side of the dashboard you can navigate to the characteristics of your strategy such as main goals, sectors included, monitoring information, as well as the official policy documents related with the strategy.

If your country does not have a national bioeconomy strategy, it is worth looking at countries with dedicated national strategies. See the Tip-box below for more ideas:

Info Tip-box: Lack of national bioeconomy strategy

If your country does not have a dedicated bioeconomy strategy look at the bioeconomy country dashboard of the European Commission's Knowledge Centre for Bioeconomy. Furthermore, if your neighbouring countries have already drafted and published a dedicated national bioeconomy strategy. It is highly possible you share common environmental, social and economic traits. If not, then find the country with a dedicated national bioeconomy strategy that according to your experience might fit better. Check the structure and the objectives of the national strategy. In any case, this can be a good starting point for the next steps.

3.2 Q2: Does your region have a regional bioeconomy strategy?

After the first step, the second step includes the investigation of whether your region has a dedicated bioeconomy strategy or not. It is possible that your country might lack a national strategy but has a regional strategy and vice-versa. See Toolbox and Tip-box below for more help:

Info Toolbox: Check the existence of regional bioeconomy strategy

Look at the bioeconomy strategy development in EU regions provided by the Joint Research Centre report, as well as the bioeconomy country dashboard that mentioned above, in order to identify your regional bioeconomy status. If your country lacks a national strategy combined with non-existence of bioeconomy strategy in your region, visit bioeconomy country dashboard, choose your country and see the section "*Other national bioeconomy-related strategies*" to base your regional strategy.

Info Tip-box: Tips for establishing a regional bioeconomy strategy

In principle, a regional bioeconomy should follow several general rules/ propositions. In brief, these are the following:

- Refine your regional bioeconomy vision and draw a detailed plan
- Identify relevant stakeholders and improve interaction among them
- Formulate and incorporate strategies
- Develop skills and promote capacity building
- Attract investment and acquire funding
- Monitor, evaluate and continuously improve strategy.
- Promote awareness and facilitate communication among the public.

For more ideas, BIO2REG has prepared two documents that can support you in that process: The one concerns governance structures at regional scale[4] and the stakeholder guide on best practices[5]. Additionally, you may look at the Blueprint for the Regional Bioeconomy Strategy of Western Macedonia, Greece.

[4] Deliverable 5.6: Policy brief: Enabling governance structures at regional scale

[5] Deliverable 1.4: Best practice for regional transitions to bioeconomy model regions (shortly available in the BIO2REG network)

3.3 Q3: Which are your regions sectoral specializations?

The third step aims at deep diving into the assessment of your region's bioeconomy potential. After identifying the dedicated national and/or regional bioeconomy, you might have pointed out that every strategy tries to refine its vision and concentrate on specific sectors. This is the point, where you should identify your region's "*dynamic*" bioeconomy sectors, if not already found in the previous two steps.

In general, the bioeconomy sectors are defined according to the "*Nomenclature of Economic Activities Nomenclature of Economic Activities*" (NACE)[6] and are the following:

- Agriculture (A01)
- Forestry (A02)
- Fishing and Aquaculture (A03)
- Paper Industry (C17)
- Food & Beverage and tobacco (C10-C12)
- Bio-based textiles (C13-C15)
- Wood Products and furniture (C16-C31)
- Bio-based chemicals, pharmaceuticals, plastics and rubber (C20-C22)

You can easily acquire your regional **value added** and **employment** in the bioeconomy sectors by using available online tools. For more see the Toolbox below:

Info Toolbox: Check your region's status in bioeconomy related sectors for value added and employment.

Identify your sectoral status as well as your potentials for future sectoral development by using BioRegEU online tool. Choose the option **Regional Profile** or **Sectoral Composition** and click your country and your region. You can opt for the sectors you are interested in. And you will finally be informed about the **value added** of the sector as well as the respective **employment** status in your region.

The **turnover** of the bioeconomy sectors is available only at the national level. Nevertheless, we propose you an easy calculation method to approximately estimate your regional bioeconomy turnover, provided in the following Tip-box below:

[6] NACE is a classification of economic activities developed by the European Union. The NACE is used to identify and group economic activities in order to facilitate statistical analysis (Retrieved 01.06.2025).

Info Tip-box: Check your region's status in bioeconomy-related sectors - the issue of turnover

There is also information available on the turnover for EU countries. This is only available on a national level, but there is a way to estimate your regional value. This can be roughly estimated by using the regional added value. More specifically, you can add the added value of all regions in your country and then simply estimate the percentage rate of each region in the country's sum. This percentage can be used as a "*weight*" to estimate your "*regional*" turnover.

***Regional Turnover**: (Regional Added value/ National Total Added value) * National Turnover*

Here comes a very simple example: Assuming an EU-MS with 5 regions (NUTS II7) has an added value of EUR 200k (we assume that each has a specific regional added value) and a national turnover of 400k. With this rapid assessment method, you can easily calculate, at least at a first stage, your region's approximate bioeconomy turnover.

Region A: (80/200) *400= 160k

Region B: (50/200) *400= 100k

Region C: (20/200) *400= 40k

Region D: (20/200) *400= 40k

Region E: (30/200) *400= 60k

Info Tip-box: Some general guidelines and tips per sector

Some brief, non-exhaustive overview of general characteristics of the most representative bioeconomy sectors are briefly provided below:

Agriculture (A01)

The application of bioeconomy in agriculture prioritises the food and nutrition security by introducing sustainable production and utilisation processes of biological resources in the primary sector. Those sustainable agricultural practices aim to create added value to biomass e.g., the production of biodegradable materials, accelerate rural and urban development through the support of local supply chains as well as to introduce technology and innovation to primary sector, such as nature-based solutions e.g., bioremediation or techniques that reduce water consumption and waste generation to achieve environmental and social related outcomes.

Forestry (A02)

Bioeconomy in forestry ensures that harvesting aligns with ecosystem health, carbon sequestration, and biodiversity conservation. Furthermore, it optimises the use of wood and forest biomass—not just for traditional timber and paper, but also for advanced bioproducts e.g., biochemicals and bioplastics. Several applications of bioeconomy in forestry include the replacement of fossil-fuel plastics with bio-based and biodegradable ones and the use of waste slurry from pulp and paper factories can be used to produce soil improvers and fertilisers.

Fishing and aquaculture (A03)

[7] Nomenclature of Territorial Units for Statistics II (NUTS II) classification, refers to basic regions for regional policies within the European Union. It's a level in a hierarchical system used by Eurostat and other EU bodies for statistical and policy purposes. : For more information: https://ec.europa.eu/eurostat/web/nuts (Retrieved 19.06.2025)

Blue bioeconomy embodies the economic related aspects of food provision for the population as well as the maintenance of the ecosystemic services which are crucial for adaptation and mitigation of climate crisis, such as carbon sequestration. Meanwhile marine bioeconomy encompasses the application of technology in order to create smart and efficient systems, new value chains creation by synergies with land-based sectors, as well as minimization of waste. An innovation driven sector gives the opportunity to develop new applications in variety of economic activities e.g., food, nutraceuticals, food additives, animal feeds, pharmaceuticals and cosmetics, green chemicals and materials enzymes for green industrial processing or decontamination.

Paper industry (C17)

The paper industry utilise renewable biomass, as a result contributes to environmental related goals. The sustainable resources use in the paper industry relates to carbon mitigation, circular economy targets, due to recyclability, and value creation through sectoral expansion beyond traditional products. As a result, it creates alternatives to fossil-based products which are renewable and biodegradable, such as e.g., bioplastics, nanocellulose, and advanced packaging solutions.

Food & beverage and tobacco (C10-C12)

Food & beverage and tobacco plays a key role in achieving food and nutrition security. Sustainable practices and standards of production ensure efficient and high-quality provision of food, reduce the environmental stress, and enhance competitiveness and regional development. The food sector embodies the use of natural resources, sustainable value chains and efficient resource manage in order to achieve environmental, social and economic related goals.

Bio-based textiles (C13-C15)

Bio-based textiles sector plays a key role in minimizing environmental related impacts of the clothing industry. Clothing sector, under the scope of bioeconomy, reduces environmental stress by using bio-based inputs, promotes local economies by strengthen the link of agriculture and forestry sector with manufacturing, introduce circularity practices as well as prolongs the life cycles of the products leading to waste reduction. The untapped potential of wool, hemp and flax are seen as promising applications as well as the further deployment of semi-synthetic fibres such as wood fibres. The development of synthetic biobased polyester fibre, currently in its nascent stages, is also worth mentioned.

Wood products and furniture (C16-C31)

Wood products and furniture sector could contribute to a sustainable and low-carbon bioeconomy. The substitutability of wood-based products reduces the high emissions associated with other inputs and serves as a carbon sink. The application of innovation in the wood products and furniture sector has led to the development of alternatives, such as bioplastics, wood foam, and nanocellulose.

Bio-based chemicals, pharmaceuticals, plastics and rubber (C20-C22)

The bio-based chemicals, pharmaceuticals, plastics and rubber sector development contribute to reduced greenhouse gas emissions, resource efficiency and limiting dependence on fossil resources as well as economic competitiveness. Input of biomass, byproducts and waste from other sectors of the economy, as well as industrial activities, transformed into high value added and innovative products e.g., Polylactic Acid (PLA), Plant Oils, Biolubricants, Natural Compounds, Enzymes, Cellulosic Plastics, Natural Rubber, and Bio-based Synthetic Rubbers.

3.4 Q4: What kind of bioeconomy transition you envisage for your region?

The fourth step foresees your decision on how you envisage the development of the bioeconomy in your region. This can be based on your expectations, your expertise and a region's "*reality check*". This is why we have developed **three main scenarios for the self-assessment for regional bioeconomy potential**. Each scenario comprises a set of specific indicators, which are enriched by further indicators in each step. In that way, you can enable a comparative analysis of your region's assessment and performance with other regions that will participate in the BIO2REG Network and potentially make use of the regional exchange instrument. The three scenarios are (See also Fig. 4):

a. **Weak/soft**

This scenario is mostly suited for those regions that do not have a dedicated national/ regional bioeconomy strategy. Consequently, the indicators selected for this scenario are generic and try to capture the more general potential of the bioeconomy in your regions.

b. **Moderate**

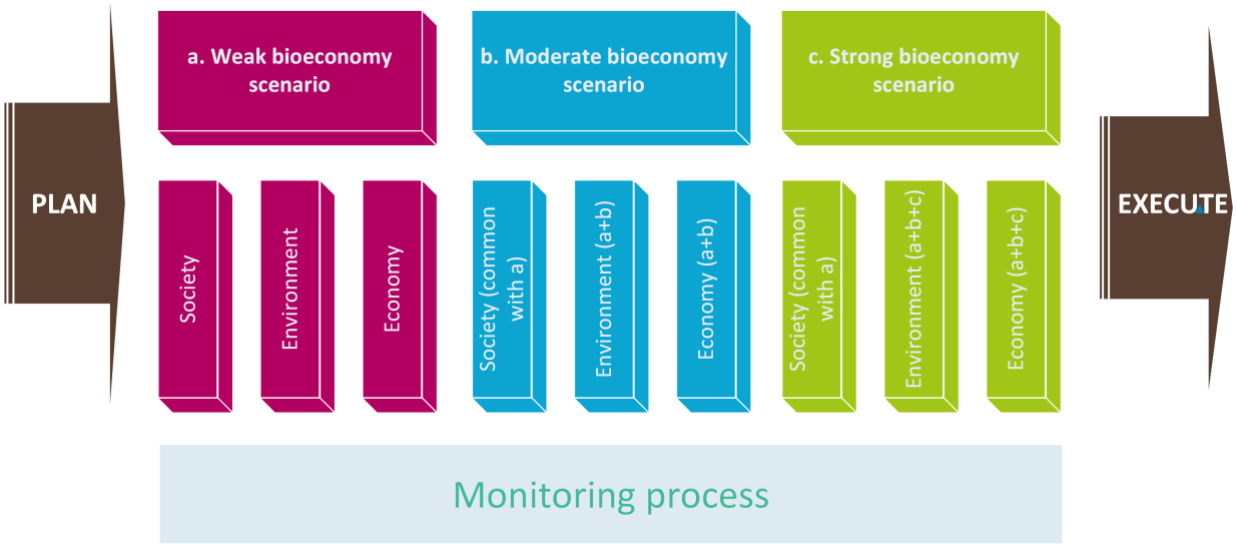
This scenario is mostly suited for those regions that have at least a national and/or regional bioeconomy strategy. It is also possible that this scenario can be selected, even if you do not have a dedicated national/ regional bioeconomy strategy. In this case, you expect or envisage a greater deployment of bioeconomy in your region. This scenario incorporates the indicators of the weak/soft scenario plus additional more targeted indicators

c. **Strong/dedicated**

This scenario is mostly suited for those regions who have a dedicated national/ regional bioeconomy. The indicators included in the scenario will assist you in better understanding how well the bioeconomy is deployed in your region and if there is more room for improvement. This scenario incorporates the indicators of the previous weak/soft and moderate scenarios, plus additional more targeted and specialised indicators.

Please refer to the excel link provided in Annex I to perform your self-assessment.

Figure 4: The groups of indicators for the three bioeconomy scenarios of the Self-Multicriteria Assessment (MCA)



4 Monitoring your progress

After concluding the four-steps self-evaluation process, it is crucial to design an effective regional bioeconomy monitoring system. Establishing a coherent monitoring system ensures that proper feedback loops will identify and facilitate initial weaknesses and shortcomings and re-evaluate the scenarios for developing your regional bioeconomy.

Figure 5 provides a brief five-steps process for establishing an effective monitoring system. If you need to attain more knowledge on monitoring, please see the additional information provided by the following Tip-box below:

Info Tip-box: Check FAO's detailed guide for establishing an effective regional bioeconomy monitoring system

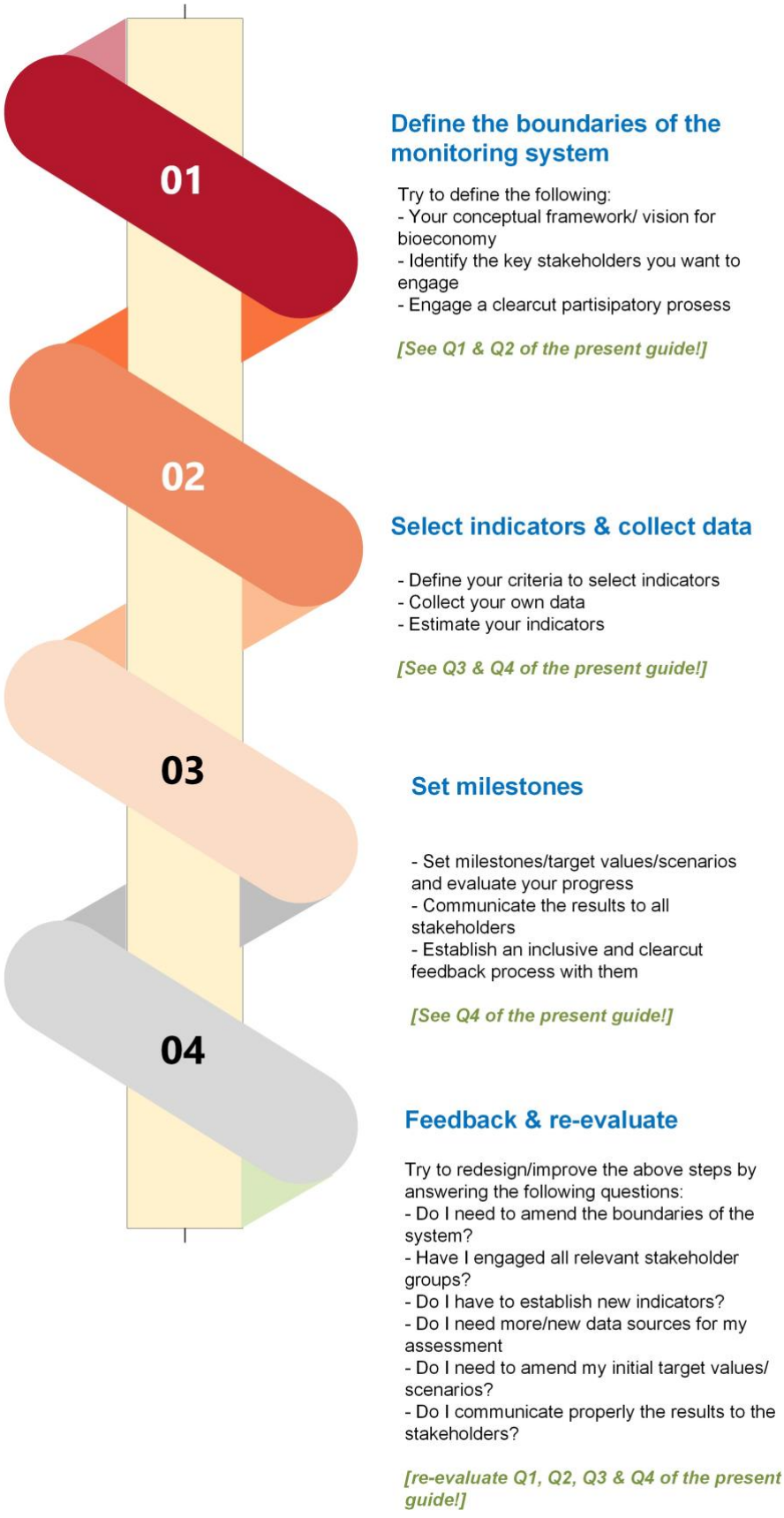
If you need more details, a 10 steps for establishing a monitoring system, proposed by FAO could be a valuable blueprint for designing your own regional bioeconomy monitoring system.

Although focused on Germany, further interesting insights and guidance on monitoring can be found in Monitoring Bioeconomy, provided by Center for Environmental Systems Research at the University of Kassel in the context of the SYMOBIO 2.0 project.

Finally, you may find useful the BIO2REG Deliverable 1.4 "Chapter 4: *Set up a coordination and governance structure*" as it includes relevant guidance on monitoring aspects. Additionally, the BIO2REG Policy Brief on Governance Structures provides further useful context and practical insights[8].

[8] https://bio2reg.eu/results/https://bio2reg.eu/wp-content/uploads/Deliverable-5.6_Policy-brief-governance-structures_final.pdf

Figure 5: Proposed steps towards an effective monitoring system for regional bioeconomy



5 Exploring potential synergies and knowledge transfer

Info Tip box: BIO2REG's initial MCA assessment

Once you have completed your first MCA self-assessment and initiate your monitoring process, it is worth looking at other EU regions that have excelled in specific bioeconomy sectors. BIO2REG has performed an EU-27 MCA regional assessment of the bioeconomy sectors based on indicators presented in the guide, where data were available. Below you can find the top 5 regions in each of the bioeconomy sectors. These regions could serve as best practice examples and in parallel/ in conjunction with the BIO2REG network[9] and the regional exchange instrument[10], regional cooperation and partnership can be crafted. The results are the following:

Agriculture (A01)

Spain (ES61/Andalucía)

Romania (RO21/Nord-Est)

Poland (PL92/Mazowiecki regionalny)

Romania (RO31/Sub-Muntenia)

The Netherlands (NL33/South Holland)

Forestry (A02)

Finland (FI1D/Pohjois- ja Itä-Suomi)

Germany (DE60 Hamburg)

Poland (PL91 Warszawski stołeczny)

Sweden (SE31/Norra Mellansverige)

Latvia (LV00/Latvia)

Fishing and aquaculture (A03)

Spain (ES11/Galicia)

Iceland (IS00/Iceland)

France (FRH0/Bretagne)

Romania (RO22/Sub-Est)

Food & beverage and tobacco (C10-C12)

France (FR10/Ile-de-France)

Spain (ES51/Cataluña)

Italy (ITC4/Lombardia)

France (FRG0/Pays de la Loire)

Italy (ITH5/Emilia-Romagna)

Bio-based textiles (C13-C15)

Italy (ITI1/Toscana)

Italy (ITC4/Lombardia)

Italy (ITH3/Veneto)

Portugal (PT11/Norte)

Malta (MT00/Malta)

Wood products and furniture (C16-C31)

Italy (ITC4/Lombardia)

Italy (ITH3/Veneto)

Germany (DEA4/Detmold)

Latvia (LV00/Latvia)

Estonia (ES00/Estonia)

Paper industry (C17)

Slovakia (SK03/Stredné Slovensko)

France (FR10/Ile-de-France)

Italy (ITC4/Lombardia)

Italy (ITH3/Veneto)

Spain (ES51/Cataluña)

Bio-based chemicals, pharmaceuticals, plastics and rubber (C20-C22)

France (FR10/Ile-de-France)

Germany (DEB2/Trier)

Denmark (DK01/Hovedstaden)

Italy (ITC4/Lombardia)

Belgium (BE21/Prov. Antwerpen)

6 Concluding remarks

The MCA self-assessment guide aims to present a user-friendly process for examining, underlining, estimating and monitoring a region's potential for a circular bioeconomy. Supported and complemented by BIO2REG's other practical guides, and frameworks it aims to fill the current gap by presenting a more comprehensive and operational approach to the bioeconomy.

The choice of indicators for each scenario was based on a rigorous assessment that began in January 2024 and concluded in May 2025. This included an initial review of bioeconomy-related indicators, a filtering exercise based on specific inclusion/exclusion criteria (e.g. data availability), and a detailed MCA assessment of EU regions. This was followed by feedback from the consortium's experts and other experts outside the BIO2REG consortium (see Annex II for more details).

[9] BIO2REG network community of European regions (expected to be launched in July/ August 2025) will facilitate the exchange of regional stakeholders with each other and with experts, practitioners and decision-makers from politics, business and industry, finance, society, science and education. Regional stakeholders will be capacitated through trainings in regional and interregional network events. For more visit: https://bio2reg.eu/services-for-regions/

[10] The interregional exchange instrument (expected in October 2025) will build the capacity of regional stakeholders through a guided, knowledge-based exchange that will initiate interregional transition alliances between bioeconomy model regions and carbon-intensive regions. For more visit: https://bio2reg.eu/services-for-regions/

The four clear steps proposed by the present guide are accompanied by several tips to help non-experts understand what the bioeconomy is and how it can be measured. Furthermore, we aimed to offer our experience and expertise by providing short descriptions of each indicator and, most importantly, links to available data, as well as suggestions to stakeholders on how to find these data. Based on that, we aspire to offer an innovative, clear-cut database of indicators (See Annex I). Supported by the implementation stages provided in this guide, it can be seen as the first crucial step for 'bioeconomy beginners' to familiarise themselves with the bioeconomy and learn about the interrelations between the real economy and the bioeconomy.

The guide is not restricted to informational or educational purposes. Regardless of one's level of expertise in the field of bioeconomy, the guide aims to engage stakeholders in the process of transforming regions into 'bioeconomy model regions'[11]. The guide aims to support this transformation process by providing one of the first operational attempts at self-assessing a region's bioeconomy potential. Since the transformation process is dynamic, a constant re-evaluation through the monitoring process is essential. For this purpose, BIO2REG has envisioned the interregional exchange instrument as an important next step.

Once the BIO2REG network is launched and the interregional exchange instrument is activated, an initial MCA self-assessment can be conducted to reveal one region's key areas of expertise and potential areas of improvement (environmental, social and economic). Through the monitoring process and the support of BIO2REG tailor-made policies and measures can be suggested, based upon the BIO2REG consortium's expertise as well as the experience of the participating regions in the network. For that reason, it is also crucial to repeat the MCA self-assessment at least after the end of the interregional exchange. At this point, the region can evaluate its transitions towards bioeconomy and look at new prospects.

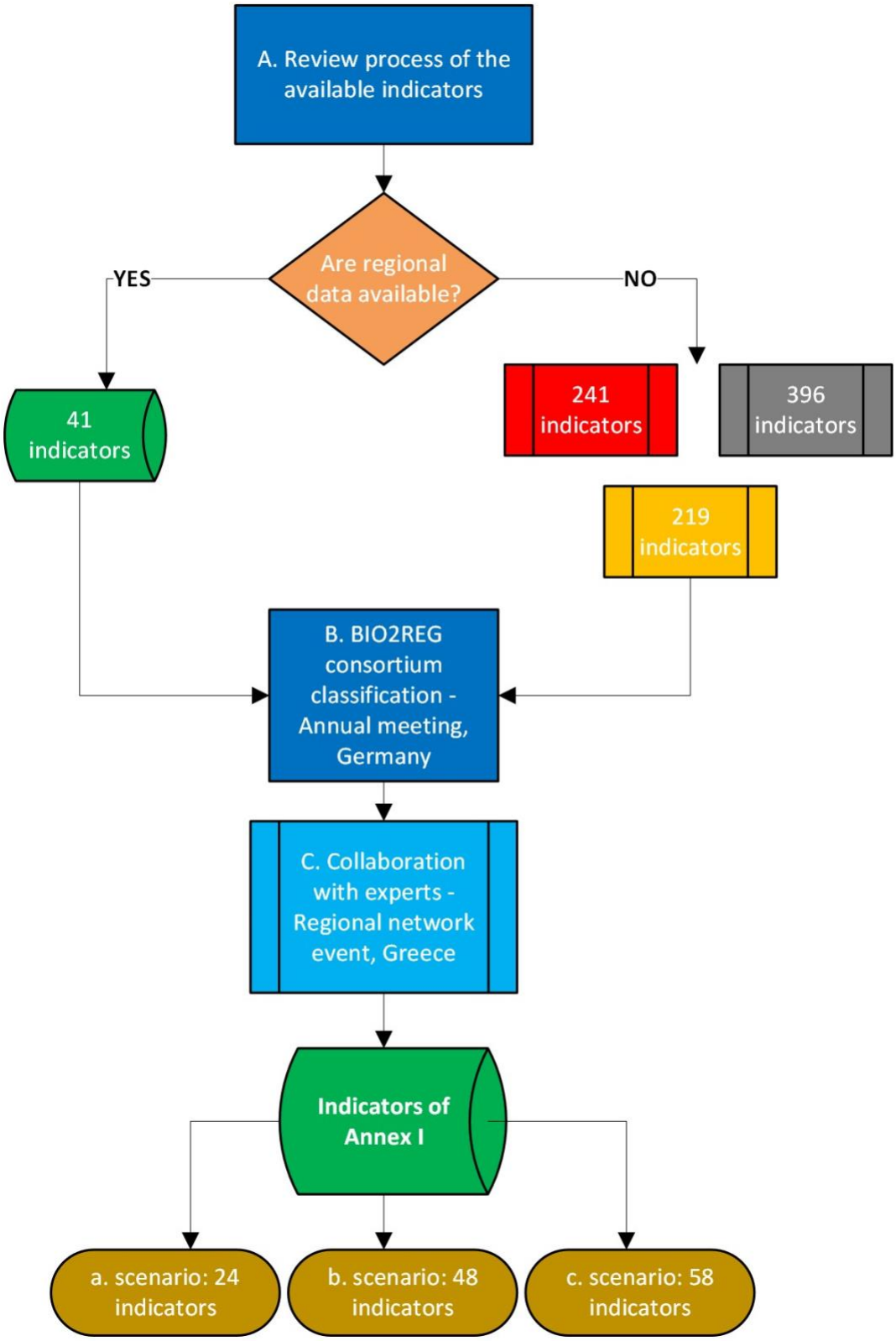
The list of indicators included in the MCA assessment is not exhaustive and it can be further complemented if needed. Furthermore, some key figures and data that are not publicly available, can be available and accessible to regional stakeholders. This is why more detailed and focused indicators were presented, especially in the moderate and strong scenarios. Finally, as it was mentioned above, transition is a dynamic, long-term process, well beyond BIO2REG's timeframe. Nevertheless, it is hoped that this could be the starting point of that process.

7 Annex I – The MCA self-assessment tool

https://bio2reg.eu/wp-content/uploads/D1.3_Annex_I.xlsm

[11] For more s. https://bio2reg.eu/bioeconomy-model-regions/

8 Annex II – The initial review process



BIO2REG in a nutshell

A circular bioeconomy is essential for achieving the EU's sustainability goals. However, the implementation of a regional bioeconomy is fraught with challenges. Bioeconomy model regions offer a systemic approach to the transition to sustainable development, based on circular economy concepts. The EU-funded BIO2REG project aims to help greenhouse gas-intensive economies unlock their circular bioeconomy potential by becoming bioeconomy model regions.

The project will promote regional networking, interregional exchange and cooperation, and provide regional stakeholders with a conceptual framework for regionalisation in bioeconomy model regions. This includes mapping best practices in a circular and sustainable bioeconomy, assessing bioeconomy potential, providing mentoring and training, forming transition alliances and making policy recommendations. The project adopts a multi-stakeholder approach, developing tools and guidelines in collaboration with regional stakeholders and engaging with regions through guided exchanges on the ground.

Find out more:

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Contact Denise Gider (Project coordinator): d.gider@fz-juelich.de

For technical queries on the guide, contact: g.maroulis@panteion.gr; p.kalimeris@panteion.gr; koronaiospanagiotis@gmail.com

Authors: Panos Kalimeris, Georgios Maroulis, Panagiotis Koronaios, Antonios Rovolis, Kostas Bithas, Eleftheria Ziakka (Panteion University Athens, University Research Institute of Urban Environment & Human Resources)

Review by: Denise Gider (BioökonomieREVIER, Forschungszentrum Jülich), Gabriela Munares (Senior Europa (Kveloce))

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