



Bio-based strategies and roadmaps for enhanced rural and regional development in the EU



# Sustainability and Participation in the Bioeconomy: A Conceptual Framework for BE-Rural

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## **EXECUTIVE SUMMARY**

This report outlines the conceptual framework of BE-Rural and provides practical guidance to the design and implementation of the five regional Open Innovation Platforms (OIPs) within BE-Rural. This conceptual framework aims to provide guidance regarding the overall ambition of BE-Rural, and the foundations by which the project will operate throughout its duration. The first part of this document describes the context, objectives and regional focus to be taken within the project. The second part outlines key concepts and founding principles that lay at the heart of the project. Following this, the conceptual framework of BE-Rural is presented and discussed.

Overall, the founding principles that lay at the heart of BE-Rural include the principles of co-creation, openness and inclusiveness, sustainability and transparency. These are incorporated into the key concept of the Quintuple Helix Approach, in which knowledge and innovation generated by key stakeholders from policy, business, academia and civil society are placed within the larger frame of the environment. Supporting this, the Action Research Approach ensures that reflection is integrated throughout all stages of project work.

Building on these key concepts and principles, the BE-Rural conceptual framework lays out the methodological approach by which the regional OIPs will engage with relevant bioeconomy actors, explore options for sustainable small-scale business models for their regions and natural resources, and develop regional bioeconomy strategies and roadmaps. This approach follows the Research and Innovation Strategy for Smart Specialisation (RIS3) process laid out by the European Commission and is connected to the project's individual work packages and tasks.

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## Abbreviations

<b>CSOs</b>	Civil Society Organisations
<b>IPBES</b>	Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services
<b>NGOs</b>	Non-governmental Organisations
<b>OIPs</b>	Open Innovation Platforms
<b>R&amp;I</b>	Research and Innovation
<b>RIS3</b>	Research and Innovation Strategy for Smart Specialisation
<b>S3</b>	Smart Specialisation Strategy
<b>SDGs</b>	Sustainable Development Goals
<b>SWGs</b>	Stakeholder Working Groups
<b>T</b>	Task
<b>WP</b>	Work Package

# 1 Introduction to BE-Rural

The European bioeconomy carries the promise of opportunities for rural employment and sustainable growth. This transition towards a new, bio-based regional economy requires the active involvement of a broad spectrum of stakeholders and the sustainable use of agricultural, forest and marine ecosystems. In recent years, politicians have taken interest in the development of regional bioeconomies at the EU and Member State level. However, the development of the bioeconomy is strongly influenced by the ability of actors to engage with each other, to discuss opportunities and build networks. This ability varies strongly between regions. Regions located in strong innovation leader countries benefit from established network structures and strong institutional capacities, which is often not seen for regions located in moderate or modest innovator countries. Over one third of European regions are estimated to have low bioeconomy maturity, meaning that they cannot fully exploit the existing potential on their own region and are slow to generate new bio-based economic, social and environmental benefits (Spatial Foresight et al., 2017).

The BE-Rural project aims to enable public sector organisations to establish supportive framework conditions for the development of bio-based sectors in their regions. BE-Rural will support five regions to develop these supportive frameworks in Bulgaria, Latvia, North Macedonia, Poland and Romania. The project will focus on knowledge sharing and capacity building with the aim to facilitate the participatory development of regional bioeconomy strategies and roadmaps that are based on small-scale bio-based business models. Open Innovation Platforms will facilitate this work within each region, and provide the foundations necessary to enable collaborative stakeholder engagement, knowledge exchange and capacity building, and the development of regional bioeconomy strategies and roadmaps.

The purpose of this document is to outline the conceptual framework of BE-Rural and provide practical guidance to the design and implementation of the regional Open Innovation Platforms. The first part of this document describes the context, objectives and regional focus to be taken within the project. The second part outlines key concepts and founding principles that lay at the heart of the project. Following this, the conceptual framework of BE-Rural is presented and discussed.

## 1.1 Objectives of the project

The overall goal of BE-Rural is to realise the potential of regional and local bio-based economies by supporting regional actors in the development of their bioeconomy strategies and roadmaps. Specifically, the project has the following objectives:

- Support emerging innovator countries in the development of regional bioeconomy strategies and roadmaps.
- Increase awareness, education and understanding of the bioeconomy, its potentials and impacts among regional actors by considering stakeholders' and citizens' needs and concerns.
- Mobilise engagement among regional stakeholders and citizens in view of the development of inclusive and balanced bioeconomy strategies and roadmaps.
- Build capacity among regional stakeholders regarding the assessment of innovative bio-based business models and their potential impacts, the fostering of Research & Innovation (R&I) capacities, the design of a supportive policy framework, and effective utilisation of available funding streams.
- Explore small-scale business models and their market potentials suitable for realising bio-based innovations across different bioeconomy sectors.
- Identify and disseminate good practices and facilitate knowledge sharing across European regions.
- Generate new knowledge on the effective development of regional bioeconomy strategies and roadmaps and to make that knowledge available for uptake in policy processes in other regions across Europe.

## 1.2 Working with European regions

To meet the project objectives, it is critical to engage with local and regional stakeholders in the five focal regions within Bulgaria, Latvia, North Macedonia, Poland and Romania. In the context of the bioeconomy, BE-Rural combines the living lab concept with an ‘open innovation platform’ approach. Living labs are physical or virtual networks that promote innovation through multi-stakeholder collaboration (Leminen et al., 2015). By combining this concept with an ‘open innovation platform’ approach, BE-Rural “moves beyond the living lab concept and stresses the importance of network effects and users for mutual value creation in the open innovation activities facilitated by the platforms” (Raunio et al., 2016).

To facilitate the envisioned co-creation process, BE-Rural will create five regional Open Innovation Platforms (OIPs) (see Table 1) for the participatory development of bioeconomy strategies and roadmaps. The BE-Rural OIPs will be established in the selected five regions across the EU with different biomass potentials and will be based on regional Stakeholder Working Group (SWGs). Within the OIPs, the main task of the SWGs will be to formulate concrete strategy or roadmap documents by engaging with different actors and opening the platform for a wide range of stakeholders in the region, including civil society organisations and citizens.

**Table 1: Overview of BE-Rural’s Open Innovation Platforms**

	<p><b>Stara Zagora, Bulgaria:</b> The regional OIP will focus on seeking new technologies for the application of essential oils and herbal plants in the cosmetics and pharmaceutical industry. The small-scale production in this area will be combined with tourism-related activities to expand the existing business status quo and potential. Ultimately, the OIP will establish closer relations and network between companies.</p>
	<p><b>Szczecin Lagoon and Vistula Lagoon, Poland:</b> The regional OIP will focus on small-scale fisheries, specifically on the sustainable use of currently underused and low-value fish species located in two lagoons. The OIP will investigate small-scale technology options that can be applied to utilize low-value fish species as products for human consumption.</p>
	<p><b>Strumica, Macedonia:</b> The regional OIP will focus on the utilization of agricultural residues, specifically the by-production of organic materials from agricultural activities, as a source of energy for domestic and industrial purposes. The OIP will investigate technology options for energy conversion of biomass materials generated on agricultural fields or farms (field-based residues), as well as those generated during the processing of agricultural products (process-based residues).</p>
	<p><b>Covasna, Romania:</b> The regional OIP will focus on addressing fragmented value chains and implementing the circular economy concept within the county’s industrial sectors (i.e. wood and furniture, textiles, agro-food, mechanical engineering, green energy). The OIP will investigate the development potential of underused biomass (plant matter and wood waste) and its implication on societal challenges (e.g., rural unemployment or marginalised communities). This will be done within a local development business model based on a small-scale technology option ensuring the autonomous energy supply for civil and industrial needs.</p>
	<p><b>Vidzeme and Kurzeme, Latvia:</b> The regional OIP will focus on the potential of by-products of forest management (i.e. from young forest stand thinning, short rotation coppice and forestry plantations, removing of overgrowth in abandoned agricultural lands and perennial grasses) as a source of bioenergy or biorefinery. The OIP will investigate the value of agroforestry systems of perennial grasses and trees as grazing areas, and the production of hay or grass seeds. The potential smart use of small timber wood from young forest stand thinning will be explored.</p>

The regional OIPs and all activities around them will be facilitated by BE-Rural's regional partners (OIP facilitators). The role of the OIP facilitators will be to plan and implement participatory stakeholder processes by setting up and managing regional SWGs, which will contribute to the development of regional strategy and roadmap documents. In this regard, a series of SWG meetings will serve the identification of local stakeholders' needs and elaborate the region's overall ambition in terms of bioeconomy development. The regional stakeholder processes will be nourished with key inputs from the broader BE-Rural consortium, focussing on technology assessment, knowledge exchange, awareness-raising and capacity building.

## 2 Foundations of BE-Rural

This section outlines and describes the key concepts and founding principles that lay at the heart of the BE-Rural project. This includes the principles of co-creation, openness and inclusiveness, sustainability and transparency; the Quintuple Helix Approach; as well as the Action Research Approach. Not only do these key concepts and principles help frame the work to be undertaken in the project, but they provide the basis for the conceptual framework described in section 3.

### 2.1 Principles

To meet the objectives of BE-Rural, the project will build on the following principles of co-creation, openness and inclusiveness, sustainability and transparency, all of which are reflected in the project's conceptual approach and work plan.

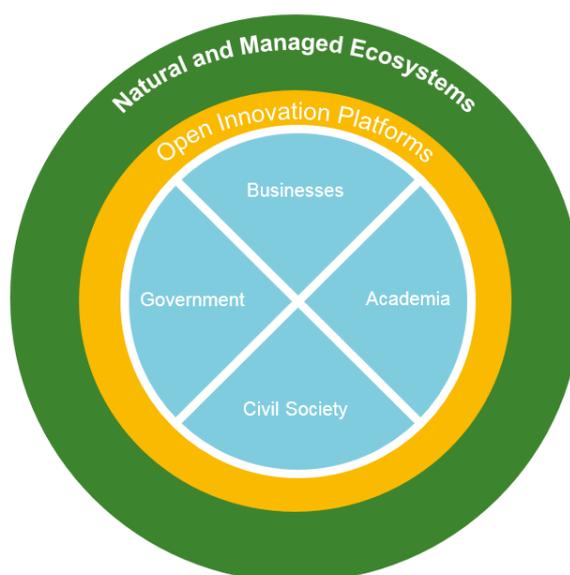
- **Co-creation:** BE-Rural builds on the idea that providing spaces for co-creation for a broad spectrum of stakeholders and citizens will not only contribute to broader societal goals, which can be embedded in the regional strategies and roadmaps, but can stimulate a stronger demand for sustainable, innovative products and services in the regions. The development of bio-based business models and encompassing regional strategies and roadmaps will be embedded in a structured participatory process, which ensures the proper evaluation of alternative policy options and business strategies and their effects on the region. This implies that trade-offs will be made explicit and discussed among relevant stakeholders and the general public, aiming at the definition of shared objectives and the creation of mutually valued outcomes.
- **Openness and inclusiveness:** The regional strategy and roadmap development processes will be open to all relevant stakeholder groups. Besides the so-called 'Triple Helix', representing government, business and academia, BE-Rural will strongly encourage the participation of civil society (organisations) in these processes, thereby facilitating multi-faceted discussions and the implementation of broadly shared objectives. The participation of women will be specifically encouraged to ensure a gender-balanced representation of stakeholders and end-users in all related activities.
- **Sustainability:** The regional strategy and roadmap documents will equally address the three pillars of sustainability (social, environmental and economic sustainability) and explicitly promote the sustainable use of agricultural, forest and marine ecosystems. Explicit reference will be made to the UN's 2030 Agenda for Sustainable Development and its Sustainable Development Goals (SDGs) as incorporated in the European Commission's Communication on 'Next steps for a sustainable European future' (COM(2016) 739), and to the objectives of the EU's Circular Economy Action Plan.
- **Transparency:** In order to allow local stakeholders to enter the regional strategy and roadmap development activities also at later stages of the process, all participatory activities and their outcomes will be documented; this documentation will be publicly available. Besides ensuring full transparency of the project's participatory activities, the BE-Rural team will also evaluate their effectiveness to allow subsequent projects and initiatives to build on BE-Rural experiences.

## 2.2 Quintuple Helix Approach

Overall, the conceptual foundation of BE-Rural builds on a Quintuple Helix Approach, which combines knowledge and innovation generated by key stakeholders from policy, business, academia and civil society<sup>1</sup> within the frame of the environment (see Figure 1). This approach embeds previous approaches of the Triple Helix and Quadruple Helix. The prior focuses on knowledge creation, production, application, diffusion and use generated from the interaction between academia, industry and the government. The Quadruple Helix takes this one step further and frames the Triple Helix within the context of the public (i.e. “media-based and culture-based public”) so that knowledge production, application, diffusion and use takes into consideration social acceptance and uptake. Building on these developments, the Quintuple Helix Approach then embeds the consideration of the natural environment into these knowledge-generation and innovation processes (Carayannis and Campbell, 2010). In other words, the environment acts as a “driver for the creation of new knowledge and innovation in response the environmental challenges” (Grundel and Dahlström, 2016).

As BE-Rural’s main objectives is to support the development of regional bioeconomy strategies and roadmaps that promote a *sustainable use* of agricultural, forest and marine ecosystems, including the environment as a fifth element in the Helix approach is crucial. This is why the first step of BE-Rural is to generate knowledge about the regional social-ecological systems (e.g. analysis of the political, economic, social, technological, environmental and legal framework conditions for bio-based products and services in the regions, screening of available biomass streams, etc.) and to evaluate the environmental effects of selected technology options and business models. This knowledge will later frame the co-creation process in the OIPs by ensuring that the development of new bio-based business models and strategies considers the environmental boundaries of the regions and promotes the sustainable use of the local ecosystems.

**Figure 1: Quintuple Helix Approach as applied in BE-Rural**



Source: Own elaboration

By adding the fifth helix or layer of natural and managed ecosystems, knowledge and innovation are transformed to become sensitive for social ecology (Carayannis and Campbell, 2010; Carayannis et al., 2012). Doing so opens up the possibility of the Quintuple Helix Approach “to serve as an analytical

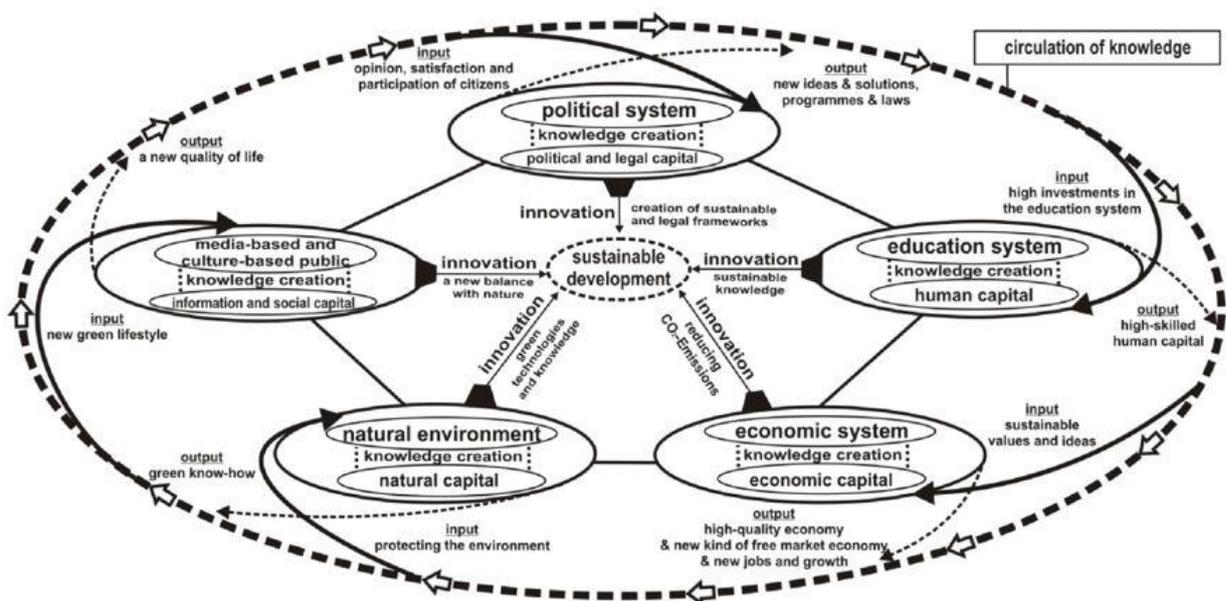
<sup>1</sup> According to the European Commission, a CSO is “any legal entity that is non-governmental, non-profit, not representing commercial interests and pursuing a common purpose in the public interest” (source: <https://ec.europa.eu/info/funding-tenders/opportunities/portal/screen/support/glossary>). A detailed analysis of the participation of CSOs in the EU research framework programmes can be found in Martinuzzi et al. (2016).

framework for sustainable development and social ecology, by conceptually relating knowledge and innovation to the environment” (Carayannis and Campbell, 2010). This generates ‘sustainable knowledge’, which reflects on the performance and quality of natural or managed ecosystems. Looking forward, the production, application, diffusion and use of this generated ‘sustainable knowledge’ has implications for what sustainable development might mean and imply in relation to “eco-innovation” and “eco-entrepreneurship” (Carayannis and Campbell, 2010).

The usefulness of Quintuple Helix Approach can also be found in its ability to act as a framework for inter- and transdisciplinary problem-solving and analysis in relation to sustainable development. The approach is interdisciplinary due to the involvement of a broad range of stakeholders from different backgrounds and groups, e.g. researchers in the field of the natural sciences or the social sciences and humanities, non-governmental organisations (NGOs) or civil society organisations (CSOs), political officers or elected officials, and businesses or entrepreneurs, among others. The Quintuple Helix Approach is also transdisciplinary such that it can act as a tool for decision-making purposes in connection to knowledge, innovation and the natural or managed environment (Carayannis and Campbell, 2010). In BE-Rural, these inter- and transdisciplinary functions will be explored within the regional SWGs and through participatory activities conducted through the OIPs.

This approach has been applied in multiple settings to address multiple challenges. For example, Carayannis et al. (2012) applied this approach to the challenge of global warming, and demonstrate how an investment in and promotion of knowledge-production can bring new impulses for innovation, know-how and the advancement of society (see Figure 2). Pérez et al. (2019) applied this approach to foster open innovation to address societal challenges in the energy, water and agriculture industries in the Southern Mediterranean. And Grundel and Dahlström (2016) applied the Quintuple Helix Approach to the forestry-based bioeconomy in Värmland, Sweden. BE-Rural will expand these applications to other bioeconomy sectors, specifically agriculture, fisheries and green industry. The application of this approach is crucial for BE-Rural, as the bio-based economy relies largely on natural and managed ecosystems as providers of biomass, for the benefit of society.

**Figure 2: Quintuple Helix Model and generation of sustainable knowledge**



Source: Carayannis et al. (2012)

The Quintuple Helix Approach also links actions called forth within the updated EU Bioeconomy Strategy, which calls for the consideration of safe ecological limits within the development of Member State bioeconomies (European Commission, 2018a). Specifically, the Strategy states:

*“It is crucial to ensure that biological resources are used within their sustainability thresholds so that they can recover and replenish, and that ecosystems are not pushed beyond safe boundaries*

*e.g. through exceeding the capacity of specific provisioning ecosystem services” (European Commission, 2018a).*

Action 3 of the EU Bioeconomy Strategy embodies this consideration of safe ecological limits and calls to ‘Understand the ecological boundaries of the bioeconomy’. Within this action point, Member States are encouraged to (1) enhance the knowledge on the bioeconomy to deploy it within safe ecological limits; (2) increase observation, measurement, monitoring and reporting capabilities; and (3) better integrate the benefits of biodiversity-rich ecosystems in primary production (see Table 2 below) (European Commission, 2018a).

**Table 2: Action 3 of EU Bioeconomy Strategy to consider ecological boundaries**

Action 3: Understand the ecological boundaries of the bioeconomy	Who
3.1 Enhance the knowledge on the bioeconomy, including on biodiversity and ecosystems, to deploy it within safe ecological limits and make it accessible through the Knowledge Centre for Bioeconomy	Commission, Member States, International Organisations, IPBES
3.2 Increase observation, measurement, monitoring and reporting capabilities and build an EU-wide, internationally coherent monitoring system to track economic, environmental and social progress towards a sustainable bioeconomy	Commission, Member States, private sector
3.3 Provide voluntary guidance to operate the bioeconomy within safe ecological limits	Commission
3.4 Better integrate the benefits of biodiversity-rich ecosystems in primary production through a specific support to agro-ecology, the development of microbiome-based solutions, and new tools to integrate pollinators in supply value chains	Commission, Member States, private stakeholders

A recent report on the implementation of the EU Circular Economy Action Plan states that “implementing the recently updated Bioeconomy Strategy and the revised renewable energy framework will be further steps towards using biological resources in a circular way, respecting the ecological boundaries and contributing to halting biodiversity loss” (European Commission, 2019). As such, progress towards the objectives of the EU’s Circular Economy Action Plan can also be supported through the application of the Quintuple Helix Approach and the generation of ‘sustainable knowledge and innovation’ (Carayannis et al., 2012).

At a broader international level, taking into consideration and promoting the generation and use of ‘sustainable knowledge and innovation’ in the frame of the bioeconomy will also have implications for the UN’s 2030 Agenda for Sustainable Development and the 17 SDGs. BE-Rural’s ambition is to foster the local implementation of the Agenda 2030, in particularly with regard to:

- SDG 2 target 2.4: *“By 2030, ensure sustainable food production systems and implement resilient agricultural practices that increase productivity and production, that help maintain ecosystems, that strengthen capacity for adaptation to climate change, extreme weather, drought, flooding and other disasters and that progressively improve land and soil quality.”* (e.g. BE-Rural will offer solutions to shift to a more sustainable and healthy food system in the Szczecin Lagoon and the Vistula Lagoon, Poland)
- SDG 8 target 4: *“Improve progressively, through 2030, global resource efficiency in consumption and production and endeavour to decouple economic growth from environmental degradation, in accordance with the 10-year framework of programmes on sustainable consumption and production, with developed countries taking the lead.”* (e.g. BE-Rural will foster the smart use of small timber wood from young forests in Vidzeme and Kurzeme, Latvia, and the use of plant matter and wood waste in Covasna, Romania, thereby contributing to increased resource efficiency and sustainable consumption in the regions)
- SDG 9 target 4: *“By 2030, upgrade infrastructure and retrofit industries to make them sustainable, with increased resource-use efficiency and greater adoption of clean and environmentally sound technologies and industrial processes, with all countries taking action in accordance with their respective capabilities.”* (e.g. BE-Rural will explore new technologies

for the application of essential oils and herbal plants in the cosmetics and pharmaceutical industry in Stara Zagora, Bulgaria, thereby improving the efficient use of the plants and the oils in the region)

- SDG 11 cross-cutting issue A: “*Support positive economic, social and environmental links between urban, per-urban and rural areas by strengthening national and regional development planning.*” (e.g. the strategies, roadmaps and business models developed in BE-Rural will outline concrete measures for national and regional development taking into account their economic, social and environmental implications)
- SDG 12 target 2: “*By 2030, achieve the sustainable management and efficient use of natural resources.*” (e.g. the promotion of sustainable natural resource management is one of the four key principles of BE-Rural)
- SDG 13 target 2: “*Integrate climate change measures into national policies, strategies and planning*” (e.g. BE-Rural will explore the use of organic materials from agricultural activities as a source of energy for domestic and industrial purposes in Strumica, North Macedonia, thereby contributing to the reduction of greenhouse gas emissions in the region)
- SDG 14 target 7b: “*Provide access for small-scale artisanal fishers to marine resources and markets*” (e.g. BE-Rural will strive to increase the demand for the underused bycatch fish roach in the Szczecin Lagoon and the Vistula Lagoon, Poland)
- SDG 15 target 1: “*By 2020, ensure the conservation, restoration and sustainable use of terrestrial and inland freshwater ecosystems and their services, in particular forests, wetlands, mountains and drylands, in line with obligations under international agreements.*” (e.g. see SDG 12)

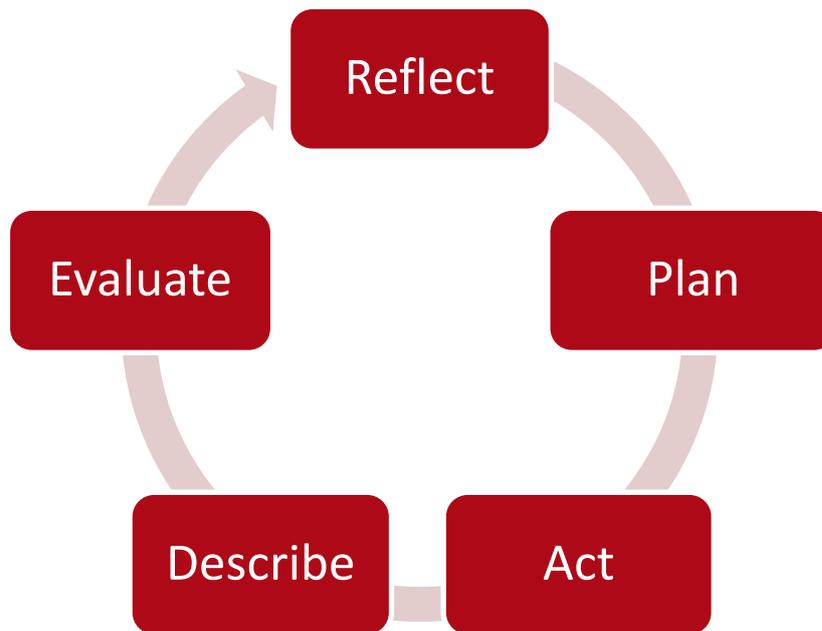
The UN SDGs directly take into consideration the sustainable use and development of local, regional, national and global economies. At its core, the UN Agenda 2030 envisions a world with sustainable and inclusive economic growth, where humans live in harmony with nature. To promote this, knowledge production, application, diffusion and use, especially within the development of regional bioeconomy strategies and roadmaps should be framed within the sustainable use of local ecosystems and natural resources.

## 2.3 Action Research Approach

BE-Rural draws on an ‘action research’ approach (Lewin, 1946; Argyris, Putnam and McLain Smith, 1985; Freire, 1982; Heron, 1987; Reason and Bradbury, 2008). Whereas traditional forms of research are conducted from outside the focus of the research and aim for objectivity, action research:

- focuses on facilitating transformation by working out concrete solutions to problems and building practical ‘how to’ knowledge, rather than on generating ‘pure’ knowledge;
- is “conducted from within the system being studied” (Fazey et al., 2018, p.62), i.e. researchers should recognise that their values, viewpoints and actions can shape and potentially influence research outcomes;
- builds in reflexivity so that researchers undertake an ongoing critical reflection of their own values, preconceptions and circumstances, which are recognised to shape knowledge and scope for action – and, the process, space may be opened up for more radical innovation;
- involves active cooperation between researchers and a wide range of other individuals and organisations with different types of knowledge and capacities, aimed at practical problem-solving and facilitating the co-creation of knowledge;
- implies that researchers take on a wide range of roles and undertake many different activities, in addition to knowledge gathering, analysis and generation – including e.g. communicators, network facilitators, advocates and knowledge brokers.

Action research is structured in the form of continuous feedback loops (Figure 3), with researchers involved at all stages of activity. Whereas conventional forms of research progress from knowledge gathering to analysis to knowledge transfer or dissemination, action research instead moves in an ongoing loop, from planning, to action, to description and evaluation, to reflection, and then to planning and action once more.

**Figure 3: The Action Research reflexive spiral**

Action research's focus on working collaboratively to solve specific problems is consistent with the orientation of the EU's next research and innovation framework programme, Horizon Europe, which prioritises "mission-oriented research and innovation" (Mazzucato, 2018) and aims to target R&I investment on catalysing broader resources and energies to solve concrete societal and technological problems, e.g. relating to sustainability and quality of life. Horizon Europe will concentrate on key challenges or 'missions', which:

- are bold and address societal value;
- have concrete targets;
- involve research and innovation, and lead to technological readiness within a limited time frame;
- foster cross-sectoral, cross-actor, and cross disciplinary collaborations; and
- allow multiple, competing and bottom-up solutions to emerge.

### 3 The BE-Rural conceptual framework

This section presents the conceptual framework of BE-Rural, which builds on the key concepts and principles explained in the section above. This framework lays out the methodological approach by which the regional OIPs will engage with relevant bioeconomy actors, explore options for sustainable small-scale business models for their regions and natural resources, and develop regional bioeconomy strategies and roadmaps. This approach follows the Research and Innovation Strategy for Smart Specialisation process laid out by the European Commission.

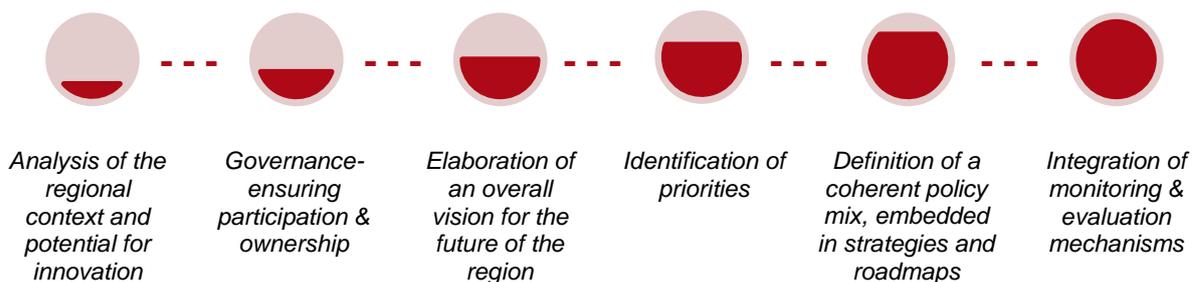
#### 3.1 Building on RIS3

The BE-Rural conceptual framework adopts and builds upon the Research and Innovation Strategy for Smart Specialisation (RIS3) as defined in EU regulation 1301/2013 (European Parliament, 2013; European Commission, 2014) and in European Commission guidelines, which state that national and regional authorities are required to design and implement Smart Specialisation Strategies to stimulate and support innovation, drawing on the European Structural & Investment Funds and national/regional resources (European Commission, 2012).

The RIS3 process involves the analysis of regional assets and capacities, and the identification and agreement of a shared vision and priorities for action in support of innovation (see Figure 4). According

to Carayannis and Rakhmatullin (2014), “smart specialisation strategies mainly build on strengthening pre-existing specialisations at the regional level with the aim of reaching the European 2020 goals in research and innovation”. Importantly, RIS3 draws on “a partnership-based policy process of discovery and learning on the part of both policy-makers and entrepreneurs” (McCann and Ortega-Argilés, 2015), which brings a wide range of stakeholders together to identify and combine assets and capacities, and to share and develop region-specific knowledge and a future-oriented vision. This emphasis on existing regional assets and regionally-tailored priorities/measures means that the RIS3 process can be applied in all regions, including moderate and modest innovator regions, rather than only in the most innovative locations (McCann and Ortega-Argilés, 2015).

**Figure 4: RIS3 process**



Source: Own elaboration

Indeed, the RIS3 process brings particular added-value in less developed regions, where there is often a need to strengthen formal and informal institutions in order to enable regional actors to take the risks associated with sharing their knowledge; to cooperate with each other; to build trust and to encourage participation (Barca, 2009). These dimensions are fundamental to successful innovation and economic development. BE-Rural complements the RIS3 process by facilitating knowledge exchange, the co-creation of ideas and bottom-up strategy-building within smaller regions/localities than are covered by existing RIS3 and with a specific thematic focus on a limited dimension of the bioeconomy in each OIP region. Where RIS3 already exist at national or larger-regional levels, BE-Rural will engage with existing RIS3 structures, networks and stakeholders.

BE-Rural recognises the importance and difficulty of bringing in a wide range of stakeholders to build links across sectoral silos and organisations, especially in regions where these types of activities are relatively new. This is the reason for the application and adoption of the Quintuple Helix Approach explained above. BE-Rural aims to co-organise structures and activities which can provide a safe ‘holding’ for a wide range of regional actors (including CSOs/NGOs as well as policy-makers, businesses and research/education institutions) to cooperate, to share regionally-specific knowledge and capacities, and to develop shared visions and priorities.

In addition, BE-Rural aims to bring ideas and knowledge from outside the regions that can provide added value (e.g., different business models, technology options, participatory approaches to strategy building, potential synergies with different policies, etc.). This role is sensitive, in that BE-Rural does not want to promote any specific actions or take a top-down approach toward regional bio-based development. Rather, the project team will focus on listening to and encouraging bottom-up learning within the region, based on the expressed interests of regional actors and stakeholders.

### 3.2 Linking RIS3 to BE-Rural

The main work in BE-Rural will follow the six steps within the RIS3 process within the individual OIPs in Bulgaria, Latvia, North Macedonia, Poland and Romania (see Table 1). The BE-Rural conceptual framework incorporates multiple stakeholder groups and contextual considerations that rely fundamentally on mutual capacity building and the generation and transfer of knowledge. The bio-based economy and the beginnings of policy movement in this field require a pooling of knowledge and experience, which is the foundation of the BE-Rural conceptual framework.

By following the general structure of the RIS3 steps, the BE-Rural conceptual framework will facilitate the development of regional bioeconomy strategies and roadmaps in line with EU requirements for regional Smart Specialisation Strategies, as well as promote inclusive sustainable development through the application of the Quintuple Helix Approach. The links between the RIS3 process steps and the planned work in BE-Rural are detailed in Table 3 below. The links shown indicate the relevant work package (WP) and task (T) within the BE-Rural project.

**Table 3: RIS3 assessment steps and links to BE-Rural**

RIS3 steps	BE-Rural work packages
 <p><b>Analysis of regional context</b></p> <ul style="list-style-type: none"> <li>Regional assets</li> <li>Outward dimension</li> <li>Entrepreneurial dynamics</li> </ul>	<ul style="list-style-type: none"> <li>- <b>WP2:</b> analyses macro-level context of OIP regions (PESTEL analysis); analyses the bioeconomy potential in the OIP regions (T2.4 &amp; 2.5).</li> <li>- <b>WP5:</b> identifies and maps relevant stakeholders (T5.1).</li> </ul>
 <p><b>Governance</b></p> <ul style="list-style-type: none"> <li>Identify governance bodies &amp; allocate tasks</li> <li>Broad participation</li> <li>Management &amp; communication including citizen dialogue</li> </ul>	<ul style="list-style-type: none"> <li>- <b>WP2:</b> analyses existing policy frameworks within PESTEL analysis (T2.4).</li> <li>- <b>WP3:</b> raises awareness and promotes engagement within the OIPs, including in the education sector (T3.2, 3.3, 3.4 &amp; 3.5).</li> <li>- <b>WP4:</b> creates a 'Network of Knowledge' among regional stakeholders (T4.1).</li> <li>- <b>WP5:</b> sets up regional SWGs, and establishes permanent regional bioeconomy stakeholder panels (T5.2 &amp; 5.5).</li> </ul>
 <p><b>Shared vision</b></p> <ul style="list-style-type: none"> <li>Broad view of innovation</li> <li>Grand challenges</li> <li>Scenario analysis</li> </ul>	<ul style="list-style-type: none"> <li>- <b>WP2:</b> analyses bio-based business models and their social, economic and environments impacts (T2.2).</li> <li>- <b>WP4:</b> facilitates educational outreach and capacity building in OIPs (T4.3, 4.4 &amp; 4.5).</li> <li>- <b>WP5:</b> evaluates the market potential of bio-based business models and involves all relevant stakeholder groups in the definition of priority areas (T5.3).</li> </ul>
 <p><b>Identification of priorities</b></p> <ul style="list-style-type: none"> <li>Revision of past priorities</li> <li>Consistency</li> <li>Critical mass</li> </ul>	<ul style="list-style-type: none"> <li>- <b>WP2:</b> ensures consistency with existing framework conditions, and identifies key sectors, biomass streams and business models which will be prioritised in the strategy and roadmap development processes (T2.5).</li> <li>- <b>WP5:</b> develops innovative bio-based business models and analyses their market potentials (T5.3).</li> </ul>
 <p><b>Policy mix</b></p> <ul style="list-style-type: none"> <li>Roadmap</li> <li>Balance</li> <li>Framework conditions</li> </ul>	<ul style="list-style-type: none"> <li>- <b>WP5:</b> develops strategies and roadmaps that outline concrete actions and include a range of measures, <i>inter alia</i>, relating to business sector development, R&amp;I capacities and activities, use of funding streams, synergies with other policy fields, education and information, and international collaboration (T5.4).</li> </ul>
 <p><b>Monitoring &amp; evaluation</b></p> <ul style="list-style-type: none"> <li>Output &amp; Result Indicators</li> <li>Monitoring</li> <li>RIS3 Update</li> </ul>	<ul style="list-style-type: none"> <li>- <b>WP6:</b> evaluates the participatory processes in the OIPs including their outputs and generates lessons learned (T6.4).</li> <li>- <b>WP4 and WP5:</b> build connections with S3 strategies at national/macro-regional levels covered by the OIP, with a view to ensuring synergies and ensuring mutual lesson-learning.</li> </ul>

Note: This table draws on thematic groupings found within the RIS3 assessment wheel (European Commission, 2018b)

The implementation of the individual work steps, particularly the design of the regional stakeholder processes, might vary across the OIPs, taking into account different political systems, cultures of participation and level of organisation of relevant interest groups.

In the frame of BE-Rural, strategies are understood as documents which entail a political mandate, meaning that the actions outlined in such a document should be taken up in the regional policy framework. Roadmaps, on the other hand, outline actions that address specific challenges and that might be taken forward by individual sectors and actors, e.g. businesses or cluster organisations.

### 3.3 Action Research in BE-Rural

The BE-Rural team is implementing an action research approach by:

- Working to generate solutions to specific practical problems e.g.: How can awareness of the bioeconomy be increased in rural regions in modest/moderate innovation? How can capacity be built among stakeholders in such regions to build effective bioeconomy strategies, roadmaps and business models? How can knowledge sharing on good practice be facilitated across European regions?
- Undertaking research from within the system being studied, i.e. we are not simply observing 'the participatory development of bioeconomy strategies/roadmaps in rural regions' but are also actively engaged within this field;
- Prioritising an ongoing collective and critical reflection on our activities and on the values which underpin our work, in order to learn lessons to take forward into subsequent activities, to adjust our work as we go along, and to allow space for new ideas and knowledge to emerge;
- Seeking to solve practical problems via active cooperation and the co-creation of knowledge with other individuals and organisations, both in the OIP regions and Europe-wide;
- Sharing our ideas and knowledge openly with other stakeholders, and being explicit about our actions and values;
- Working ethically, e.g. acknowledging the contribution and knowledge of other stakeholders and ensuring high standards in data collection, processing and storage;
- Embodying a range of roles and undertaking diverse activities, including not only research but also education, communication, network facilitation, and knowledge brokering.

Continuous reflection will be built into BE-Rural:

- Within each OIP (also involving regional stakeholders where appropriate), particularly at regular intervals during WP3, WP4 and WP5, and documented via short evaluation reports on each activity (workshop, event...) in each region;
- At the level of BE-Rural as a whole, among all project partners, aimed at facilitating mutual learning and knowledge exchange e.g. via project meetings and webinars, during reviews of Deliverables, and at mid-term. Reflections will be documented in short evaluation reports and will feed into project-level reporting at mid-term and project conclusion.

The reflection and evaluation activities will include the following questions:

- What was most energising/interesting (about the workshop/Task...)?
- Were there any difficulties? How were these addressed?
- Are there any lessons or concerns for other parts of BE-Rural (other regions, Tasks...)?
- Did new themes/needs emerge that we had not planned for?
- What single idea/action will we take away (from this workshop/Task...)?

These regular reflection activities and evaluation reports will also provide a valuable resource in the last months of BE-Rural for drawing larger lessons for the whole project and for providing ideas and recommendations for future research needs and policy guidance. An explicit phase of future-oriented reflection and evaluation among project partners will be built into WP6 (T6.4 and T6.5) and in final project reporting.

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