SCALE UP
community-driven
bioeconomy development

Evidence-based guidance framework for designing, implementing and monitoring small-scale bio-based solutions in rural areas

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Holger Gerdes, Zoritza Kiresiewa, Gerardo Anzaldúa, Sterre van der Voort, Frans Feil – with valuable contributions from all SCALE-UP regions

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Responsible author(s):	Holger Gerdes, Zoritza Kiresiewa, Gerardo Anzaldúa (ECO); Sterre van der Voort, Frans Feil (BTG)
Internal peer review:	Antonio Carlos Ruiz Soria (CTA)
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EXECUTIVE SUMMARY

This report presents the evidence-based guidance framework developed in the SCALE-UP project to support the design, implementation and monitoring of small-scale bio-based solutions in rural areas. The framework draws on the experiences of six regional platforms established under the SCALE-UP project – in Mazovia (Poland), Northern Sweden, Strumica (North Macedonia), Upper Austria, the French Atlantic Arc, and Andalusia (Spain) – each reflecting distinct geographical, socio-economic, and institutional contexts. Together, these platforms demonstrated that rural bioeconomy development is not only a technical and economic undertaking, but also a territorial and societal one, rooted in local assets, governance arrangements and cultural realities.

The analysis shows that EU and national policy frameworks, particularly the Green Deal, the Common Agricultural Policy and the Bioeconomy Strategy, provided important reference points for regional action, while participatory and bottom-up approaches ensured ownership and commitment among local stakeholders. Shared visions for bio-based development were created through inclusive processes, and concrete innovations were identified and supported through SCALE-UP's Innovation Support Programme (ISP), which proved crucial in helping entrepreneurs to refine business models and explore new market opportunities. At the same time, the project highlighted the importance of embedding bioeconomy objectives into long-term strategies and monitoring systems to ensure lasting impact.

Drawing on these insights, the guidance framework outlines a structured but adaptable process for regional decision-makers. It covers three phases: design, implementation and monitoring. Each phase combines practical steps such as contextual analysis, stakeholder engagement, innovation support, pathway realization and evaluation, while maintaining flexibility to accommodate local conditions. The framework emphasizes the principles of circularity, inclusiveness, resilience and sustainability, helping regions to connect local aspirations with broader European policy goals.

The report concludes that small-scale bio-based solutions, when embedded in local contexts and supported by strong regional platforms and networks, can act as powerful levers for sustainable rural development. Consolidating these achievements will require integrating bioeconomy measures into regional strategies, securing long-term funding and strengthening cross-sector partnerships. EU and national policy makers have a key role to play in supporting these efforts by providing stable frameworks, reducing administrative barriers and investing in capacity building.

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Abbreviations

CAP	**Common Agricultural Policy**
CRM	**Customer Relationship Management**
CSRD	**Corporate Sustainability Directive**
EAFRD	**European Agricultural Fund for Rural Development**
EoI	**Expression of Interest**
EU	**European Union**
ERDF	**European Regional Development Fund**
I4CE	**Ingredients for a Circular Economy**
ISP	**Innovation Support Programme**
KPIs	**Key performance indicators**
LEAP	**Local Environmental Action Plan**
LIFE	**L'Instrument Financier pour l'Environnement**
MAF+	**BRIGAID Market Analysis Framework**
NGOs	**Non-governmental organisations**
NUTS	**Nomenclature des unités territoriales statistiques**
ONRB	**Observatoire national des ressources en biomasse**
R&D	**Research & Development**
RE2020	**Réglementation environnementale**
RED	**Renewable Energy Directive**
RIS	**Regional innovation strategy**
RIS3	**Research & Innovation Strategy for Smart Specialization**
SDGs	**Sustainable Development Goals**
SMEs	**Small and Medium-sized Enterprises**
WFD	**Water Framework Directive**

1 Introduction

This report presents an evidence-based guidance framework developed within the SCALE-UP project to supports the design, implementation, and monitoring of small-scale bio-based solutions in rural areas across Europe. The framework builds on the experiences of six regional platforms that participated in SCALE-UP, reflecting diverse geographical, institutional, and socio-economic contexts.

At the core of this framework is the principle of participatory governance and inclusive innovation, as demonstrated throughout the SCALE-UP project. The project adopted a holistic approach to strengthening regional bioeconomies while fostering social, environmental, and economic benefits in the wider context of rural development (Gerdes et al., 2023). In doing so, it explicitly drew on key policy frameworks and aligned its activities with the six priorities of rural policy defined by the European Agricultural Fund for Rural Development (EAFRD) under the EU's Common Agricultural Policy (CAP) (see Figure 1).

Figure 1: Visualisation of the project's conceptual framework (Gerdes et al., 2023)

Rural regions have a critical role to play in the European Green Deal, the EU Bioeconomy Strategy, and the EU's long-term vision for rural areas. However, tapping into this potential requires place-based approaches that link local assets with sustainable development goals. This report synthesizes lessons learned from three years of collaborative work. It illustrates how shared visions, stakeholder engagement, tailored support mechanisms, and aligned policy environments can foster successful rural bioeconomy pathways and also shows the shortcomings in the approach. The following chapters elaborate on the objectives and outcomes of the regional platforms, derive key insights, and culminate in a practical guidance framework tailored to the needs of regional decision-makers.

The overall aim of the guidance framework presented in this report is to empower local and regional actors to initiate and steer bioeconomy transitions that are aligned with rural development objectives and key principles of sustainable development. The framework is designed as a flexible tool, supporting stakeholders in identifying viable bio-based innovations, connecting them to local development goals, and tracking their impacts. It responds to the need for a hands-on, context-sensitive methodology to advance the circular, inclusive, and sustainable bioeconomy across rural Europe.

2 Objectives of the regional platforms

The establishment of six regional platforms under the SCALE-UP project was driven by the need to create dynamic, locally rooted structures capable of advancing the bioeconomy in rural areas. These platforms were conceived as hubs for stakeholder collaboration, innovation support, and policy alignment, each tailored to the specific socio-economic, environmental, and institutional context of its region. While sharing the overarching aim of fostering sustainable, inclusive, and circular bio-based development, the platforms applied different governance models, engagement strategies, and thematic priorities to reflect local realities. By connecting actors across public, private, academic, and civil society sectors, they provided a fertile environment for co-creation, capacity building, and the identification of viable bio-based solutions. The following sections outline the objectives, structures, and key activities of each platform, illustrating how context-specific approaches can deliver tangible progress toward regional bioeconomy goals.

Mazovia's regional platform, established via the AgroBioCluster coordinated by the UNIMOS Foundation, leveraged an existing regional ecosystem comprising 72 members. Its quadruple helix composition spanned agri-food enterprises, academia, government, and NGOs. Focused on valorizing underutilized biomass in the apple production sector, the platform held trainings, workshops, and multi-stakeholder consultations. Objectives centered on raising bioeconomy awareness, supporting SME innovation, and embedding circular economy principles into rural development. By aligning with the SCALE-UP Bioeconomy MetaCluster and joining the Ingredients for a Circular Economy (I4CE) alliance, the platform reinforced its long-term commitment to regional and interregional collaboration in bio-based development.

The regional platform in **Northern Sweden** was developed through Bioeconomy North, a well-established network of actors focused on forest-based bioeconomy. Over a decade of collaboration provided a solid foundation for multi-level stakeholder engagement. Through steering and thematic groups, the platform actively engaged policy strategists, R&D actors, and forest value chain stakeholders. Activities included workshops, forest excursions, and knowledge-sharing events, emphasizing cross-sectoral collaboration. A core objective of the platform was to strengthen Northern Sweden's bioeconomic framework and attract investment by showcasing available biomass resources and research capacities. The platform will persist post-SCALE-UP through a rotating organizational model. Long-term goals involve mapping regional bioeconomy assets, facilitating joint project development, and engaging in joint outreach activities.

The **Strumica** regional platform in North Macedonia evolved from the BE-Rural project's (2019-2022) stakeholder working group into a robust 10-member platform representing public, private, academic, and civil society stakeholders. Anchored in the municipality's Environmental Department, the platform's priorities include sustainable agricultural waste management and knowledge exchange on composting and bio-based practices. Key activities included regional meetings, training workshops, task force mentoring, and strategic collaborations. A notable milestone was the regional stakeholder meeting in June 2024, which advanced the student competition agenda and supported hands-on exploration of rural bioeconomy solutions. The platform formalized cooperation among members and now serves as a mentoring and advocacy hub within the region.

In **Upper Austria**, the regional platform was embedded within the Food Cluster of Business Upper Austria, a longstanding network supporting food industry innovation. The existing advisory board was utilized as a base to form the regional platform to include bioeconomy topics, resulting in a seamless integration into ongoing stakeholder engagement structures. Meetings were extended to address bio-based innovation, circularity, and sustainability across food and packaging sectors. The platform aimed to enhance awareness, especially among youth, through student competitions, while also supporting project ideation and implementation among SMEs. Sustainable impact is ensured through the continued existence of the Food Cluster and its evolving advisory board with the attached regional platform. This model demonstrated the value of institutional continuity, cross-sectoral cooperation, and stakeholder familiarity in supporting rural bioeconomy development.

Covering four regions, the **French Atlantic Arc** Platform unites agricultural chambers and bio-based construction clusters. The platform coordinates actors in the fibre plant-based building material value chain – particularly flax, hemp, straw, and miscanthus. The aim was to better align primary producers with downstream bio-based industries and to strengthen regional knowledge about biomass

availability. The platform's success is evident in four high-impact regional meetings, a cross-border study tour, and its hackathon with 46 students. Innovation support was delivered through expert task forces and a dedicated entrepreneurship conference. The platform bridged agricultural, industrial, and policy actors and continues to foster strong transregional cooperation for low-carbon, bio-based construction.

In **Andalusia**, the SCALE-UP regional platform created a dynamic ecosystem of innovation, finance, civil society, regional government and industry. Emphasizing co-creation, it tackled barriers to bioeconomy deployment such as regulatory fragmentation and lack of funding access. Sector-specific working groups and thematic sessions drove activities across multiple stakeholder categories. Platform members actively participated in sustainability assessments, training, and the development of innovation support activities. Noteworthy contributions included engaging in the student competition, designing policy recommendations, and leading awareness-raising initiatives. The platform continues to play a central role in Andalusia's EU-oriented Circular Bioeconomy Strategy and in promoting inclusive, olive sector-based innovations.

Each regional platform adapted its structure and activities to fit local contexts while aligning with SCALE-UP's overarching goals. Whether through integrating bioeconomy into existing clusters, mobilizing cross-sectoral collaboration, or formalizing strategic cooperation frameworks, all six platforms demonstrated tangible progress.

3 The SCALE-UP experience: Insights on key aspects of sustainable and inclusive bioeconomy development in six rural areas

This chapter synthesizes the insights gained from the activities of the six SCALE-UP regional platforms and puts them in relation to key dimensions of sustainable and inclusive bioeconomy development. While each region worked within its own specific ecological, social and institutional context, several cross-cutting themes emerged that hold particular relevance for regional decision-makers across Europe seeking to further advance their bio-based sectors. These include the influence of EU and national policy frameworks, the importance of well-designed stakeholder engagement processes, the co-creation of shared objectives and visions, the identification and implementation of bio-based solutions that address broader rural development goals, and the establishment of monitoring mechanisms to track progress and impact. By examining these aspects in a structured way, the chapter highlights both the diversity of approaches taken and the common principles that underpin successful rural bioeconomy transitions.

3.1 Relevance of the overall policy framework

Across the six regions, EU strategies and policies, particularly the Green Deal, the Common Agricultural Policy (CAP), and the Bioeconomy Strategy, serve as foundational drivers, shaping both ambition and practice. They serve as a basis on which each of the regions builds upon, following their own regional priorities.

In **Mazovia**, the Green Deal and CAP were pivotal in steering the direction of regional bioeconomy objectives. The CAP's focus on sustainable farming, innovation, and resource efficiency underpins the goals of Mazovia's regional platform. EU instruments not only guide strategy but offer critical financial support, making EU policy alignment a practical necessity. The inclusion of bioeconomy considerations in the region's Smart Specialisation Strategy (RIS3) is a testament to how deeply integrated EU frameworks are in shaping local plans.

In **Northern Sweden**, while bioeconomy remains largely a national competence due to the country's accession terms with the EU, new EU regulations – such as the Fit-for-55 package and EU Deforestation Regulation – are influencing forest industry actors. There is a discernible tension between national sovereignty over forests and growing EU regulatory influence. This creates challenges in policy coherence, investor certainty, and long-term planning for bio-based development. The platform's coordinated input into the upcoming Swedish bioeconomy strategy can benefit the bioeconomy development in Northern Sweden. A challenge for the future is to harmonize bioeconomy-related policies on a regional level with national and especially also EU-level policies.

Strumica presents a unique case as a non-EU region. While not bound by EU law, the region has voluntarily adopted elements of the EU's rural development policy and bioeconomy frameworks. Documents like the Local Environmental Action Plan (LEAP) for the Municipality of Strumica and the Municipal Waste Management Plan reflect alignment with CAP principles. EU strategies offer a valuable reference point and are integrated into local policy discussions through initiatives like SCALE-UP.

Upper Austria reflects a nuanced alignment where national strategies, such as the Austrian Bioeconomy Strategy, heavily influence direction but with notable gaps – particularly in representing the food industry's interests. Stakeholders often view the strategy as forestry-centric. Nevertheless, European food waste directives and sustainability legislation, including the Corporate Sustainability Directive (CSRD), have encouraged voluntary sustainability reporting and sparked recognition of the bioeconomy's potential among local enterprises. Another key guidance framework for the regional economy is the Upper Vision 2030. It was built based on the Sustainable Development Goals (SDGs) and aims to guide Upper Austria towards a future-ready and sustainable industry region.

The **French Atlantic Arc** highlights a strong alignment with both EU and national-level policies. The RE2020 (Environmental Regulation 2020) building regulation, CAP, and National Recovery Plan strongly support the use of bio-based construction materials. The regional biomass plans and the EU

Bioeconomy Strategy provide guiding objectives, with the bioeconomy seen as instrumental for addressing climate, economic, and social challenges.

In **Andalusia**, policies across the EU, national, and regional levels create a highly supportive environment. The EU Bioeconomy Strategy and CAP facilitate the development of new activities, particularly in agriculture-rich areas. The regional Circular Bioeconomy Strategy and RIS3 further reinforce this direction, linking local economic needs with broader sustainability goals. They are clearly inspired by the EU Bioeconomy Strategy.

Across these diverse contexts, several key trends emerge: the value of harmonising policy levels (local, national, EU), the catalytic role of EU funding instruments, and the growing importance of policy coherence for long-term bioeconomy investment. By driving management planning and data collection at subnational level, EU environmental policy like the Water Framework Directive (WFD) provides a practical basis to inform decision making. For rural regions, these frameworks are not merely theoretical – they serve as both compass and catalyst for action.

3.2 Design and practical implementation of targeted stakeholder engagement processes in the context of the regional bioeconomy platforms

Stakeholder engagement lies at the core of successful bioeconomy development. Each of the six regions implemented tailored approaches to engage relevant actors, leveraging existing networks and creating inclusive environments for dialogue, co-creation, and innovation management. The diversity of methods used highlights the importance of adapting engagement strategies to regional contexts and capacities.

Mazovia built its platform through the long-standing AgroBioCluster, consisting of over 70 members including SMEs, universities, public authorities, and NGOs. Engagement was facilitated through hybrid meetings, consultations, and online tools. The platform emphasized inclusiveness, especially across the agri-food value chain, and addressed engagement challenges by aligning event timing with agricultural cycles. Task forces were created to support innovation, drawing on experts in circular economy, agriculture, and business development. Their engagement was fundamental for activities like the SCALE-UP sustainability screening and the Innovation Support Programme, as it provided a space for consultation, networking, data access, and validation of results.

Northern Sweden prioritized multi-actor engagement through thematic groups, including wood fuel networks and regional bioeconomy strategists. A notable example was the Bioeconomy Parliament in Umeå, which attracted national attention and catalysed regional cooperation. Thematic workshops ensured relevance and practicality, while strategic support was provided through training programs and policy dialogues. This multi-actor approach was key in preparing stakeholders for policy shifts and innovation. The debate about the Swedish forest centres on balancing economic use of forests with ecological sustainability and legal responsibilities, with significant disagreements between national actors, EU institutions, indigenous groups, and environmental organizations. It is desirable to create a forum where debate based on research and increased knowledge of the boreal forest can take place, and above all, to find an approach that enables all parties to engage in constructive dialogue. This was an important lesson from the organisation of the Bioeconomy Parliament, where a careful selection of speakers and issues for discussion was made. From experience, many discussions between the different interest groups on sustainable forestry have not been fruitful. Proper organisation and moderation are essential for success.

Strumica fostered cross-sector collaboration by building on the foundation of the BE-Rural project. The platform includes representatives from agriculture, government, academia, NGOs, and the private sector. Engagement methods included workshops, mentorship networks, and student competitions. Despite challenges such as language barriers and stakeholder fatigue, the platform succeeded in strengthening local capacity and fostering innovation through consistent knowledge exchange.

In **Upper Austria**, the regional platform was embedded in the existing Food Cluster network, composed of over 200 members. This pre-existing structure allowed efficient mobilisation of stakeholders and integration of bioeconomy topics into advisory board meetings. Engagement was achieved through regular platform meetings, targeted trainings, and sector-specific events. The focus

was on creating resonance with industry stakeholders by demonstrating the economic value of bio-based approaches and aligning bioeconomy discussions with pressing industry challenges like food waste and resource use. The adaptive, needs-based approach to innovation support that the ISP Task Forces here adopted allowed for meaningful engagement of the SMEs, yielding strategic insights and new connections beyond their local markets.

In the **French Atlantic Arc**, stakeholder engagement was structured in concentric circles – core actors in the steering group and broader involvement through regional meetings and field visits. The platform's focus on bio-based building materials brought together agricultural producers, construction professionals, and regional authorities. Voluntary participation and the strategic alignment of platform activities with regional needs helped maintain high levels of engagement and ownership. The forum and sessions that SCALE-UP hosted at the Bio360 Expo in Nantes in 2025 put several local innovators on an international stage, effectively raising their visibility to potential clients and investors, and providing a chance to test insights and assumptions from the business model design activities.

Andalusia's approach was rooted in voluntary membership and inclusiveness, with events designed to maximize visibility and value for stakeholders. Clustering and financing events tackled key barriers, such as access to funding and innovation uptake. The platform's success in mobilizing over 50 active members reflects its emphasis on shared ownership, practical benefits, and a compelling regional mission centered on the olive sector. The SCALE-UP training sessions formed an important element in the platform activities.

Across all regions, several lessons stand out: using pre-existing networks enhances efficiency, speed and legitimacy; voluntary engagement builds trust and community; targeted events increase visibility and relevance; and continuous, multi-level communication sustains momentum. The hands-on engagement of regional experts – as purveyors of data or reviewers of initial results during the sustainability screening, or as strategic advisors to the innovators during the ISP – increased the reach of the activities and embedded them in their local realities, By adapting methods to local realities and particular needs (e.g. those of the selected innovators in the ISP), each region fostered meaningful engagement that supports long-term bioeconomy development.

3.3 Definition of shared objectives and common visions for bio-based developments in a regional context

The process of defining shared objectives and crafting common visions was pivotal in aligning diverse stakeholders around a cohesive bioeconomy agenda in each region. It built on an initial examination of needs and priorities in the six regions regarding the deployment of bio-based solutions, including an assessment of pressing demands for bioeconomy rollout, the mapping of regional skills and capacities, the potential to connect with existing strategies or roadmaps, and the identification of anticipated barriers and opportunities for implementation. The resulting visions were not imposed top-down but rather emerged from iterative, participatory processes involving consultations, training sessions, surveys, task-force meetings, workshops, and reflection on local strengths and challenges. Biomass assessments and discussions on nutrient recycling, ecological boundaries and biomass solutions were part of this process, and their results framed the subsequent activities to varying extents.

In **Mazovia**, the regional platform's vision centered on embedding the bioeconomy into sustainable rural development through smart specializations. The vision emphasized resource efficiency, support for traditional sectors like apple farming, and the valorization of by-products such as pomace. Six strategic goals were developed collaboratively, ranging from strengthening cooperation to promoting environmentally conscious consumer behaviors.

Northern Sweden's vision was structured through strategic objectives targeting collaboration, infrastructure, funding, and education. A governance framework encompassing rule-setting, implementation and finance, and information-sharing guided these efforts. Stakeholders co-developed a comprehensive strategy document highlighting the need for stable energy supply, digitalization, supportive policies, and skilled labour.

Strumica's shared objectives evolved through iterative discussions in platform meetings. Regional stakeholders formulated a vision of a circular bioeconomy where biomass is fully utilized and nutrient recycling is integrated into agricultural practices. Stakeholders prioritized composting, bio-based value

chains, and collaborative innovation. Youth engagement and awareness raising were integrated into the vision through competitions and school initiatives.

Upper Austria employed a forward-looking visioning exercise using a "trend radar," a tool to map emerging trends and determine their relevance and urgency. Stakeholders articulated a shared goal of establishing a circular and resilient food industry that integrates biogenic by-products into new product lines. This shared objective was framed around maximizing local resources, reducing waste, and promoting regional value creation. The trend radar is used to guide future actions of the Food Cluster towards stakeholders needs. This esnures optimal stakeholder support for accelerating the implementation of bioeconomy.

In the **French Atlantic Arc**, common objectives were refined through multiple working groups and bilateral meetings. Key priorities included integrating agricultural producers into bio-based building value chains, improving knowledge on biomass availability, and advocating for supportive policy frameworks. A stakeholder survey further informed the development of joint policy recommendations.

Andalusia's shared vision focused on unlocking the potential of the olive value chain as a catalyst for rural sustainability. The vision embraced innovation, cross-sector collaboration, and environmental stewardship. It emerged through a robust engagement process with stakeholders from farming, industry, government, and academia. By aligning this vision with the regional Circular Bioeconomy Strategy and smart specialization priorities, the platform ensured long-term relevance and policy alignment.

In sum, shared objectives were essential to building momentum and coherence across platforms. Regions emphasized bottom-up development, adapted visions to territorial realities, and linked bioeconomy goals to sustainability, innovation, and rural resilience.

3.4 Identification of bio-based solutions that meet specific criteria related to broader rural development objectives

Identifying bio-based solutions that address rural development goals requires a deep understanding of local ecosystems, economic structures, and social contexts. Each region looked for scalable, environmentally sustainable, and economically viable solutions that would create local value and operate within ecological boundaries.

To better align the innovations with rural development goals, SCALE-UP initiated a call for Expression of Interest (EoI), incorporating clearly defined selection criteria aligned with the stated objectives, such as promoting stakeholder inclusion, sustainable resource use, knowledge exchange, food system improvements, regional competitiveness, and alignment with EU and regional bioeconomy policies.

With regard to the condition of regional ecosystems, the SCALE-UP sustainability screening revealed that surface water bodies across all six regions face moderate to high levels of pressure. Soil erosion and other forms of land degradation pose significant risks in two of the six regions. And lastly, some biodiversity concerns emerged by the high number of species classified as endangered or critically endangered in half of the regions (Groenestege et al., 2024). In some cases, the screening results were contended, but overall, rather than presenting an insurmountable barrier to regional bioeconomy development, these findings prompted discussion and more deliberate reflection of sustainability aspects in each region

In **Mazovia**, two standout examples emerged: the Biocircular Apple Farm and the MB Orchard Farm. The former emphasized educational and social innovation by transforming a century-old orchard into a platform for bioeconomy learning and co-creation. The latter developed functional products from apple pomace, such as dried powders for use in health foods. These initiatives address food waste reduction, innovation in agri-processing, and the diversification of rural economies. By helping to raise awareness on the state of the regional environment and addressing some of the sources of negative environmental effects of established economic activities in the region, these innovations can contribute to the establishment of a sustainable bioeconomy in Mazovia.

Northern Sweden focused on mobilizing underutilized resources like logging residues. The Wood Fuel Network organized training sessions and mapped strategic challenges to encourage use of these residues for higher-value applications like biochemicals and biofuels. RESELO, a Swedish technology

startup supported under the ISP primarily by gaining direct access to biomass suppliers in Northern Sweden, produces bio-rubber and other suberin-based products from birch bark. Here, strong regulation is in place that governs the extraction of logging residues and establishes restrictions for environmental protection (e.g. to ensure soil fertility and structure quality). These are well known by local forestry stakeholders, yet as the bioeconomy of Northern Sweden gains further thrust and new actors (e.g. entrepreneurs from other regions in Sweden) get involved, the results of the sustainability screening can be an entry point to spreading the local knowledge on good practices to maintain the ecological integrity of forest ecosystems.

In **Strumica**, the sustainability screening pointed to the importance of adopting adequate management of agricultural residues to improve the state of water bodies in the region and, simultaneously, to avoid increasing the risk of soil erosion and contamination. Strumica's innovations were grassroots and tailored to agricultural needs. The mulching machine innovation supported by Horti Eko promoted sustainable waste reuse as compost, while the Bojane Cooperative created value-added grape products from surplus harvests. These solutions addressed urgent rural issues – protecting soil quality, reducing environmental pressures, and promoting economic diversification.

Upper Austria's selected innovations included Velvety Manufaktur GmbH and HochBROTzentig GmbH. Velvety utilized sunflower press cake to develop solid cosmetic products, demonstrating upcycling of agri-waste and reduced packaging needs. HochBROTzentig, on the other hand, converted stale bread into high-quality spirits, tackling food waste creatively. These solutions not only reduce waste but also stimulate entrepreneurship and promote bio-based transitions in the food and cosmetics sectors. The focus of the supported innovations in Upper Austria is fully aligned with the Austrian Bioeconomy Strategy, which emphasizes the efficient use of biogenic waste, wastewater, and sewage sludge as key raw materials for the bioeconomy. Beyond this, it revealed the commitment of small commercial enterprises to explore the viability of products that do require a non-trivial shift in retailer and consumer behaviour (e.g. local bakeries incorporating spirits into their product palette, consumers developing a taste for spirits produced from waste bread).

In the **French Atlantic Arc**, COPANO developed straw insulation panels for construction, aligning with France's RE2020 goals. Atelier du Biosourcé aimed to create a cooperative workshop for bio-based building materials, ensuring access to production resources for SMEs. Additionally, the Terres de Sources program used hemp cultivation to protect water sources while linking farmers to the construction and cosmetics industries. These innovations are further supported by a favourable regulatory framework (e.g. the National Low Carbon Strategy, the Energy Transition Law for Green Growth and the National Recovery Plan) that encourages eco-construction projects using bio-sourced materials, particularly for insulation. Moreover, at the local level, some authorities are actively contributing to the growth of the bio-based construction sector by procuring such materials in their public building projects, thereby reinforcing market demand and fostering regional innovation (Anzaldúa et al., 2025).

Andalusia's examples included BIOLIZA, which produces biochar and bio-oil from olive waste, and the COMP0LIVE biorefinery, which transforms pruned olive branches into composite materials. These initiatives reflect advanced circular economy thinking, supporting soil regeneration, carbon sequestration, and new rural-industrial value chains. They also underscore the strategic importance of olive biomass in southern Spain and its potential to drive green innovation. By emphasising collaboration through the task force members and platforms like the Andalusian Bioeconomy Platform, the ISP not only addressed immediate challenges faced by innovators but also aligned with long-term strategic goals set forth by regional authorities (e.g. the Andalusian government's Circular Bioeconomy Strategy). This synergy ensures a resilient path forward for developing a thriving circular bioeconomy in Andalusia. Looking ahead, the successful innovations COMP0LIVE and BIOLIZA should be leveraged to attract additional bio-based projects to the region, showcasing Andalusia as an emerging hub for sustainable innovation in the bioeconomy sector (Anzaldúa et al., 2025).

Together, these examples demonstrate that effective bio-based solutions must be locally grounded, demand-driven, and mindful of system dynamics. Solutions were not only technologically or socially novel, but embedded in community needs, environmental stewardship, and economic opportunity. They were not always easy to find. Some were still in an early stage of development, others were not typically small-scale and community-based and would require large investments.

3.5 Realization of identified development pathways

Turning bioeconomy visions into tangible development pathways requires more than identifying promising innovations – it demands structured yet flexible support systems, funding access, and long-term strategy integration. Each region implemented a set of enablers that included tailored business development, stakeholder capacity-building, and innovation support frameworks. For this, a thorough understanding of the needs of the 12 innovations supported in SCALE-UP was fundamental to carve out quasi-custom support programmes for each of them. The project's standard approach offered business readiness appraisals, a collaborative market assessment using the BRIGAID Market Analysis Framework (MAF+), and exploration of business and investment opportunities. Taking this as a starting point, the ISP was rolled out in a distributed manner, with regional partners receiving the necessary instruction, tools and guidance materials to act as regional nodes that coordinated the support activities and grounded them in the local dynamics. This distributed approach, tested by the programme developers for the first time in SCALE-UP, simultaneously increased the relevance of the assistance and, in most cases, the engagement of the innovators. The latter was particularly important, as no financial support was offered through the ISP.

In **Mazovia**, the AgroBioCluster played a key role in supporting innovators through the ISP. Structured working groups provided mentoring, while targeted sessions helped refine business models and market positioning. Notably, the valorisation of apple pomace led to the development of a viable by-product market. The support model emphasized balancing innovation risks with structured guidance, allowing SMEs to make data-informed investment decisions.

Northern Sweden strengthened its innovation capacity through thematic training sessions and public-private networks. The Wood Fuel Network facilitated collaboration between buyers, sellers, and innovators, helping to identify gaps in the biomass value chain. Training efforts boosted knowledge around regulatory changes, project development, and funding access. Regional stakeholders also began shaping supportive policies, including a regional strategy aligned with the national bioeconomy framework.

Strumica's implementation efforts focused on mobilizing financing and expanding stakeholder networks. With ISP support, the mulching machine innovation prepared a funding application, and the grape-based product initiative refined its go-to-market strategy. A key success factor was mentoring and continuous business development dialogue. Challenges around financing tools were acknowledged, prompting calls for new mechanisms adapted to early-stage innovations.

In **Upper Austria**, public funding played a critical role. The 'Unternehmens-Forschungskooperationsförderung' (UFK) programme supported joint R&D between academia and industry, providing up to 35% funding for projects and 5% bonus for sustainable projects. Events, company visits, and individual coaching helped integrate bioeconomy topics into mainstream business practices. The ISP facilitated two new project ideas and connected stakeholders with funding schemes like VKS (waste avoidance funding), focused on waste minimization in industry.

The **French Atlantic Arc** supported innovation pathways by combining expert task forces, public advocacy, and market analysis. COPANO used the ISP to sharpen its value proposition and develop an expansion strategy. Atelier du Biosourcé benefitted from strategic realignment by merging with a similar initiative in Normandy. Regional stakeholders also began working on a sustainability plan to maintain platform momentum and expand value chains involving local farmers, SMEs, and construction companies.

Andalusia emphasized cross-sector connections and regulatory facilitation. Events on public-private financing clarified available instruments, while the ISP provided innovators with strategic roadmaps and networking support. Key actors in the olive sector were engaged in valorization projects and regulatory alignment efforts. The platform's role in matchmaking, mentorship, and strategic planning was instrumental in realizing impactful rural innovations.

Collectively, the six regions demonstrate how tailored support, funding leverage, and policy integration turn innovation into viable regional development pathways. The ISP served as a unifying mechanism, enabling adaptation to regional contexts and ensuring that solutions progressed beyond their initial stages.

3.6 Effective monitoring of regional bioeconomy activities and their outcomes

Monitoring is fundamental for understanding progress, informing stakeholders, and adjusting strategies in bioeconomy development. Regions adopted diverse approaches, ranging from formal institutional monitoring to platform-led tracking systems, each suited to their administrative and data contexts. Regarding the data used for the sustainability screening, the purpose by design was to exploit available and accessible datasets at regional level (NUTS-3 or next best). Carrying this exercise out early on in the project allowed regional partners and platform members to become acquainted with the current state of environmental data capacity for their region.

In **Mazovia**, the AgroBioCluster initiated cooperation with the Marshal's Office to embed bioeconomy indicators into the Regional Innovation Strategy (RIS) monitoring framework. This ensures that metrics – covering macroeconomic trends, project activities, and EU fund uptake – are regularly tracked. UNIMOS advocates for integrating bioeconomy-specific indicators, aligning them with national sustainability targets and recommendations developed through the SCALE-UP project.

Northern Sweden focused on building official regional statistics through collaboration with Statistics Sweden. These include employment and value-added data for industries using biomass, such as forestry and food. The interactive online tool launched in March 2025 allows stakeholders to monitor changes over time. However, the challenge remains in improving data granularity for sectors partially linked to the bioeconomy.

Strumica employed existing municipal frameworks such as the LEAP and Waste Management Plan to monitor bioeconomy actions. These include indicators for waste collection, nutrient recycling, and environmental performance. The BE-Rural Roadmap was also used as a reference document for tracking outcomes. Institutional cooperation, especially between municipal departments, enhances the relevance and usability of these monitoring systems.

In **Upper Austria**, the Food Cluster used a CRM-based tagging system to monitor how often topics like bioeconomy, sustainability, and circularity were discussed during company visits. Event participation and survey feedback also served as informal indicators of stakeholder interest. The platform proposed developing KPIs with input from members, using periodic surveys and direct consultations to gauge change in practices and awareness.

The **French Atlantic Arc** emphasized biomass observatories and ecological boundary assessments. The national observatory ONRB and emerging regional tools track biomass availability and use hierarchies. Local observatories, often connected to regional climate councils, assess impacts of new practices on resources like water and biodiversity. Monitoring here is deeply linked to spatial planning and regulatory oversight of agricultural biomass usage.

Andalusia's strategy involved creating a Monitoring Committee under the regional Circular Bioeconomy Strategy. The committee's mandate includes tracking economic performance, environmental boundaries, and social inclusion metrics. Insights will inform regional planning and investment decisions. Emphasis is placed on integrating bioeconomy metrics with those used for agriculture and circular economy policies to avoid siloed data collection.

Across all regions, a key insight is the importance of embedding bioeconomy monitoring within broader regional development and innovation systems. While technical challenges remain – especially regarding standardization and integration – initiatives are underway to ensure bioeconomy progress is visible, measurable, and actionable at all governance levels.

4 Summary: Lessons learned from regional platform activities

This section synthesizes the collective lessons learned from the activities of six regional platforms engaged in the SCALE-UP project. These insights reflect diverse experiences and contexts but converge around common principles and actionable takeaways. The following bullet points summarize the key lessons:

- Strong pre-existing networks significantly accelerate stakeholder engagement and foster trust-based collaboration.
- Voluntary participation and bottom-up governance approaches ensure higher commitment and ownership among stakeholders. Also, clear and clearly communicated benefits for stakeholders and innovators are essential. Government participation is a clear asset.
- Tailoring stakeholder engagement to local contexts – e.g. focus on local biomass and natural resources and scheduling around agricultural seasons, using familiar platforms – improves participation and continuity.
- Thematic task forces and structured, yet flexible support programs such as the ISP are critical for advancing practical outcomes and developing viable business models. Joint assessments of biomass availability, collecting information packages, ecological boundaries and nutrient recycling options were important pillars in this process.
- Training sessions (on technical aspects) and network access both within and across regions in Europe were seen as incentives that could boost the engagement of innovators and other regional actors in the bioeconomy.
- The main needs of the innovators supported in SCALE-UP fell into five categories:
    - Market research: including identification and analysis of megatrends, assessment of local resources, capacities and infrastructures, scoping of the regulatory framework, and identification of challenges and enablers along the value chain
    - Team development: including training, skills and knowledge enhancement
    - Technical development: including new developments in plastic-free packaging, best practices in bio-based product development, raw material supply and biomass logistics
    - Business Strategy development: including ideation and concept development, business modelling, product range expansion, marketing communication, intellectual property rights and patents, access to funding and finance
    - Networking: including setting up connections with primary producers and local stakeholders, engaging community members in co-creation and ideation activities, facilitating partnership building, practical examples from other regions
- While the MAF+ provides a good framework for early-stage, primarily commercially oriented spin-offs, start-ups and sole entrepreneurs that are not necessarily versed on business development and market analysis concepts, its current offer shows limitations when it comes to matching the needs of a wider spectrum of innovators. According to the feedback received, the framework served the purpose as it was used flexibly and with a strong orientation towards the needs of the beneficiaries, but not all of the work originally conceived would have been valuable. The regional partner, as leader of the task force, took thus a direct and practical approach to identify the priority needs at the start of the programme period and swiftly proceeded to take action to address them. This meant going beyond business model design and market research, and into more technical studies, expert advice (sounding board), and access to regional networks of bioeconomy actors (e.g. in Northern Sweden) or seeking potential customers in new markets through the network contacts of partners in other SCALE-UP regions (e.g. Upper Austria and Spain).
- A common and well-defined understanding of terminology is essential when engaging stakeholders from diverse sectors. This became evident during the implementation of the MAF+ in France, where frequent questions emerged about the interpretation of specific terms and

highlighted the difficulty of aligning perspectives among participants from diverse professional backgrounds, where the same word may have different interpretations.

- While in some countries the policy framework is overall supportive, in others it presents both opportunities and constraints. For example, regional stakeholders in Sweden have concern that, sustainability criteria under the Renewable Energy Directive (RED) may restrict the use of forest biomass, especially relevant in regions like Northern Sweden, highlighting that even in supportive contexts, regulatory conditions can pose challenges to bioenergy market growth. Policy shifts are necessary to promote sustainable consumption, including by making bio-based products and services affordable. In most cases, products and services with a serious sustainability and/or social orientation stand at a competitive disadvantage to conventional counterparts (e.g. small-scale, environmentally friendly production is often more costly and results in higher price points).
- Stable sources of accessible support on specialised aspects of bio-based innovation (legal advice, access to finance, negotiation skills) are particularly necessary to increase the competitiveness of enterprises in the Social and Solidarity Economy.
- Strong policy and market signals are necessary for biomass holders to shift to alternative (i.e. higher value added) uses, generating clear incentives and reducing perceived risks.
- Policy alignment across EU, national, and regional levels enhances coherence and increases access to funding and regulatory support for bioeconomy development.
- Visioning processes grounded in participatory methods (e.g. workshops, assessments, surveys, trend radar tools, LEGO Serious Play workshops) lead to regionally embedded, shared development goals.
- Demonstration of economic viability and environmental co-benefits is essential to sustain interest from SMEs and investors, especially during economic downturns.
- Bio-based solutions that align with circular economy principles and rural development needs – such as valorization of agricultural residues – tend to gain faster acceptance and adoption. Especially when the solutions fit into existing ways of forestry, farming and construction.
- Regions benefit from connecting traditional sectors (e.g. agriculture, construction) with emerging bio-based innovations to promote inclusive and cross-sectoral growth. Especially with the presence of strong rural based stakeholders.
- Effective monitoring systems should be integrated into existing regional innovation frameworks (e.g. RIS3) to ensure data relevance and support adaptive management.
- Peer learning and cross-regional exchanges help replicate successful strategies and foster a broader Community of Practice. This turned to be particularly important for the ISP, where the broad regional coverage helped innovators access international markets and showed that networks exchange and peer learning can create real value for entrepreneurs (Anzaldúa et al., 2025). Also, international training sessions helped in this respect.
- Sustainable impact requires embedding bioeconomy objectives in long-term regional strategies, backed by supportive policy frameworks and institutional mechanisms.
- The cross-regional capacity-building activities implemented in the frame of SCALE-UP showed that funding is key when it comes to initiating, maintaining and scaling up activities. Designing a blended financing approach that combines public and private contributions can be a means to secure and sustain funding (cf. Mader et al., 2025).

These lessons form a vital input to the development of future guidance and policy recommendations for supporting bioeconomy initiatives at regional and EU levels.

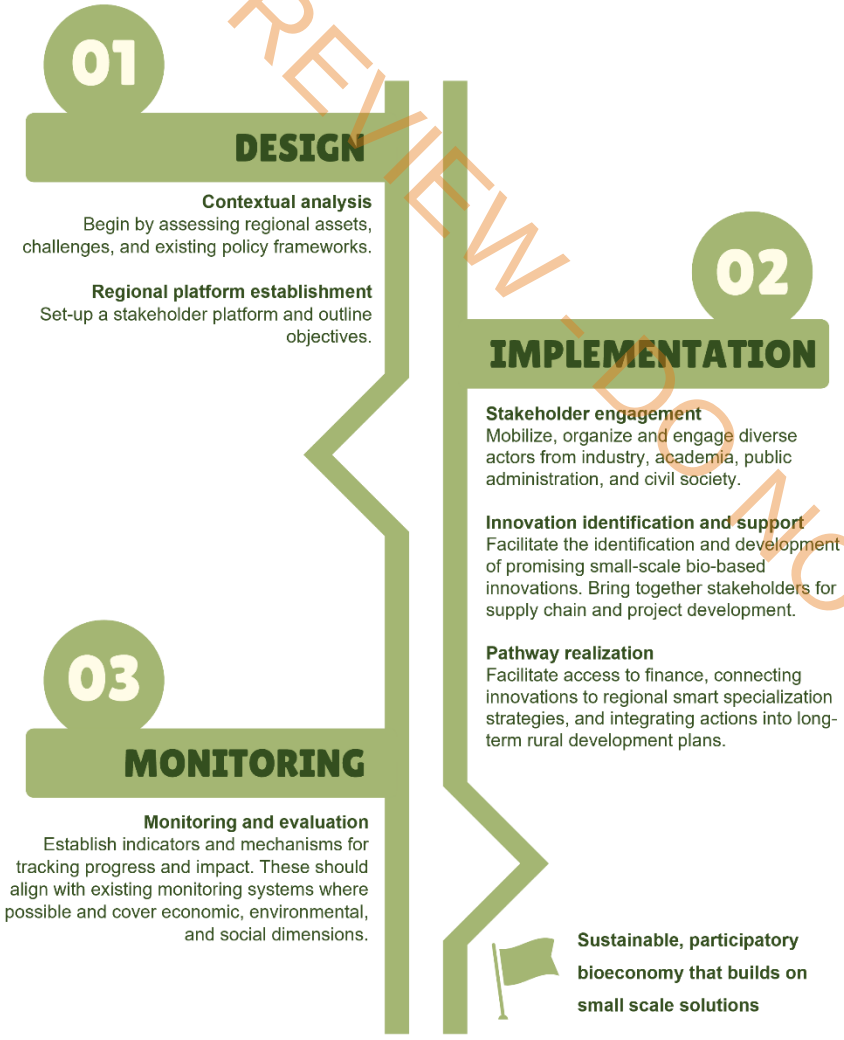
5 Linking bio-based solutions to rural development goals and principles of sustainable development: Guidance framework for regional decision-makers

This chapter presents a practical guidance framework to assist regional and local decision-makers in designing, implementing and monitoring small-scale bio-based solutions that contribute to sustainable rural development. It builds directly on the evidence and insights generated in the SCALE-UP project and connects these to broader EU strategies, including the EU Bioeconomy Strategy, the EU Rural Action Plan, and the EU Green Deal.

The guidance framework emphasizes adaptability and inclusiveness. It does not prescribe a single pathway but offers a structured, participatory process for identifying the most suitable options based on regional characteristics. It promotes circularity, resilience, inclusiveness and sustainability as guiding principles for decision-making.

In practice, the framework helps decision-makers balance local aspirations for scaling up bio-based production with sustainability imperatives and navigate the complexity of bioeconomy governance. By translating strategic visions into concrete actions, it supports the development of rural regions as hubs for innovation and sustainability in Europe's bio-based future. The framework comprises five interlinked components organized into three phases, each containing a concrete series of individual work step, as depicted in Figure 2.

Figure 2: The three phases in the SCALE-UP Guidance Framework (own elaboration)



Phase 1 – Design

1. **Contextual analysis:** Begin by assessing regional assets, challenges, and existing policy frameworks. This step includes stakeholder mapping, resource availability assessments, and identifying regulatory or infrastructural bottlenecks.
    - Assess biomass potential and existing infrastructure using available data sources.
    - Conduct an initial PESTEL analysis, which looks at relevant political, economic, social, technological, environmental and legal conditions in the local context.
    - Assess the region's ecological boundaries to inform stakeholder discussions on future regional development pathways, e.g. by using the Sustainability Screening tool applied in the SCALE-UP project (cf. Groenestege et al., 2024).
    - Map key stakeholders across public, private, academic, and civil society sectors.
    - Identify ongoing projects, strategies (e.g. RIS3), and policy instruments relevant to bioeconomy.

Phase 2 – Implementation

2. **Stakeholder engagement:** Mobilize, organize and engage diverse actors from industry, academia, public administration, and civil society. Engagement should be continuous and adapted to local contexts. Use tools such as workshops, and regional stakeholder platforms to share experience, co-design shared visions and development objectives.
    - Set up regional platforms that are embedded within regional authority structures, to strengthen ownership, facilitate knowledge exchange, and boost policy impact.
    - Organize a kick-off meeting with representatives of all stakeholder groups and define shared objectives.
    - Develop a stakeholder charter (terms of reference or covenant) outlining roles of private and public stakeholders, expectations and collaboration principles
    - Establish a coordination body to manage the platform. Set up thematic working groups based on regional priorities (e.g. agri-waste, fiber crops, forestry).
    - Facilitate participatory visioning workshops and training sessions to share experiences.
    - Maintain regular communication via newsletters, online platforms, and bilateral meetings.
    - Organize dialogues with stakeholders and environmental experts to address ecological boundaries; develop a code of conduct for sustainable bio-based production.
    - Consider cost-sharing mechanisms, where initial operational and coordination expenses are supported through public subsidies or project grants, gradually transitioning to stakeholder co-financing. Explore EU, national, and regional funding instruments, private sponsorships, and in-kind contributions to ensure long-term platform viability.

3. **Innovation identification and support:** Facilitate the identification and development of promising small-scale bio-based innovations. Bring together stakeholders for supply chain and project development. Support mechanisms include tailored mentoring, feasibility assessments, and links to funding opportunities. The Innovation Support Programme applied in SCALE-UP offers practical guidance.
    - Create understanding of the existing bio-based business models and find ways for new partnerships. Facilitate collaboration along the entire value chain.
    - Launch an open call or mapping exercise to identify potential bio-based innovations.

- Provide tailored mentoring to selected innovators (e.g. feasibility checks, business planning).
- Support co-creation between innovators and end users through pilot projects or prototypes. Establish regional Task Forces on Market Assessment and Business Model Design (cf. Anzaldúa et al., 2020).
- Identify existing funding streams at EU, national, regional level (e.g. Horizon Europe, CAP, Interreg, EAFRD, ERDF, LIFE Programme) that can be tapped and connect innovators to relevant public and private funding opportunities.
- Facilitate peer exchange with other regions or initiatives for learning and replication.
- Document promising solutions and integrate them into platform communication efforts.

4. **Pathway realization:** Facilitate access to finance, connecting innovations to regional smart specialization strategies (RIS3), and integrating actions into long-term rural development plans. Key success factors include cross-sector partnerships, entrepreneurial capacity, and policy coherence.
   - Prepare investment-ready project portfolios for selected solutions. Ensure alignment with policy frameworks.
   - Support application processes for funding (e.g. provide matchmaking support, guidelines on proposal writing, eligibility, budgeting, and consortium agreements).
   - Embed selected actions in local development strategies or municipal plans.
   - Define a roadmap with milestones, responsible actors, and long-term sustainability plans.

Phase 3 – Monitoring

5. **Monitoring and evaluation:** Establish indicators and mechanisms for tracking progress and impact. These should align with existing monitoring systems where possible (e.g. RIS3, CAP indicators) and cover economic, environmental, and social dimensions.
   - Select indicators that reflect economic, environmental, and social impacts (cf. Groenestege et al., 2024).
   - Integrate indicators into existing monitoring systems (e.g. RIS dashboards, CRM tools).
   - Set up a baseline and define data collection methods (e.g. surveys, administrative data).
   - Conduct regular evaluations and stakeholder feedback sessions and revise strategic objectives if necessary.
   - Publish regular updates or fact sheets to communicate progress and adjust strategies.
   - Ensure transparency and accountability through accessible reporting mechanisms.

6 Conclusions

The SCALE-UP project has demonstrated that bio-based solutions, when implemented thoughtfully and inclusively, can serve as powerful levers for sustainable rural development. Across six diverse European regions, regional platforms have provided fertile ground for identifying innovations, connecting actors, and aligning rural bioeconomy initiatives with wider EU strategies. These experiences confirm that the bioeconomy is not merely a technical or economic agenda, but also territorial and societal one, rooted in local contexts, cultures, ecosystems, and governance arrangements.

A key insight emerging from SCALE-UP is the central role of platforms and networks. Successful deployment of bio-based innovations depends on the ability to convene and engage actors from all sectors, co-create visions, and align support instruments with actual needs on the ground. This engagement must go beyond consultation: it must involve co-design, shared responsibility, and sustained interaction. Tools such as thematic task forces, participatory assessments, and tailored support programmes like the ISP proved essential in this regard. Equally important were training activities, peer exchanges, and visibility events that gave stakeholders a sense of ownership and purpose.

The findings also underline the value of flexibility. Bioeconomy pathways differ by region – they respond to different types of biomass, infrastructure, market opportunities, and socio-political conditions. There is no one-size-fits-all model. Instead, the guidance framework presented in this report provides a structured yet adaptable process for designing, implementing and monitoring small-scale bio-based solutions. It enables regional authorities and stakeholders to build on their specific strengths while remaining aligned with broader sustainability and policy objectives.

Finally, the SCALE-UP experience points to important next steps. To consolidate progress and scale impact, regional actors must integrate bioeconomy actions into long-term strategies, secure funding streams, and institutionalize monitoring and coordination mechanisms. Policymakers at EU and national level can support these efforts by maintaining funding commitments, reducing administrative burdens, and promoting coherent regulatory frameworks. Above all, the lessons captured in this report call for sustained investment in place-based capacity building to equip rural regions across Europe with the tools, networks, and knowledge they need to drive the bio-based transition forward.

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