CEE2ACT

Policy Paper

Skills and knowledge transfer to boost the bioeconomy

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Executive Summary

The bioeconomy transition will require a broad set of competencies; not only technical expertise in engineering, green chemistry, and bioprocessing, but also data and value chain analysis, business and marketing strategies, systems thinking, entrepreneurship, and regulatory expertise. A **multidisciplinary** approach to skills development can bridge knowledge gaps, enhance workforce adaptability, and enable achievement of the priorities set out in the EU Bioeconomy Strategy and national bioeconomy roadmaps.

However, developing and transferring knowledge effectively remains a challenge. Successful knowledge transfer requires **structured collaboration**, where the 'sender' and 'receiver' not only exchange knowledge but also ensure its practical application, absorption, and replication. Beyond technical expertise, knowledge transfer must also consider socio-economic and political dimensions, the structure of education systems, public engagement, and the governance frameworks necessary for a sustainable bioeconomy transition.

To accelerate this transition, the CEE2ACT project puts forward the following recommendations for policymakers to strengthen knowledge transfer and build bioeconomy skills in Europe:

- **Build public and political awareness about bioeconomy opportunities**, by integrating the bioeconomy into economic and industrial strategies and emphasising its economic benefits and role in sustainability;
- **Foster multi-actor collaboration** through structured partnerships, innovation hubs, and living labs to bridge research and real-world application;
- **Improve access to financing** by enhancing awareness of funding, expanding financial advisory services in National Bioeconomy Hubs, and leveraging blended finance to attract private investment;
- **Accelerate technical knowledge transfer** via digital learning, regional demonstration hubs, and industry-led training to strengthen expertise in bio-based technologies;
- **Streamline governance for bioeconomy growth** by ensuring cross-ministerial coordination, simplifying regulations, and using regulatory sandboxes to scale innovations.
- **Strengthening education and training** by developing strong programmes and professional training to equip future generations with bioeconomy skills, and showcasing successful bioeconomic models and climate action initiatives to boost engagement.

Introduction

As of 2019, 18 million people were employed in the EU bioeconomy, with almost 80% working in agriculture, and food and drink manufacturing. These sectors are facing pressing environmental and socio-economic challenges, and more efforts are required in Europe to develop and scale up greener and affordable solutions in agriculture, forestry, energy, food and feed sectors. Activities to strengthen bioeconomy-related skills, such as knowledge transfer and capacity building, are crucial to unlocking the bioeconomy potential and fostering cooperation in regions with less innovation capacity in the bio-based economy.

CEE2ACT is centred on empowering and building capacities of policymakers and bioeconomy stakeholders in Central and Eastern Europe (**Bulgaria, Croatia, Czechia, Greece, Hungary, Poland, Romania, Serbia, Slovakia, and Slovenia**). Through CEE2ACT's bottom-up approach, our partners are identifying and acting upon the needs and priorities in these Central and Eastern European countries to co-create roadmaps for bioeconomy strategies. To do so, the **National Bioeconomy Hubs** are bringing together relevant stakeholders through workshops and training sessions, that foster exchange of ideas and common elaboration of national bioeconomy roadmaps.

This policy paper provides good practices, guidance and policy recommendations that support knowledge transfer and skills development in the bioeconomy, based on the CEE2ACT project outcomes.

Knowledge transfer and skills for the bioeconomy: European policy context

Through the EU Bioeconomy Strategy, the European Commission supports initiatives at national and regional levels to develop an efficient and sustainable bioeconomy. In 2022, the European Commission provided a progress report which shows that actions are on track for achieving the main objectives of the Strategy.

However, there are various trade-offs and challenges that need to be addressed, including the need for better management of land and biomass demands, as well as more sustainable consumption patterns. A key challenge is the mismatch between the current workforce and the skills required, necessitating transformation and re-skilling to support the development of emerging bio-based sustainable value chains.

The bioeconomy transition presents opportunities for job creation and economic growth. The Bioeconomy Strategy forecasts that one million new jobs could be created by 2030, supported by the strong and fast-growing start-up ecosystem in the bioeconomy sector. To fully leverage these growth opportunities and associated ecological and societal benefits, it is essential that the bioeconomy workforce is equipped with the right set of skills.

Within the EU Bioeconomy Action Plan, action 2.4 specifically focuses on skills development, aiming to "promote education, training and skills across the bioeconomy". The main objectives of this action are to: 1) support the relevant upgrade, adaptation and development of bioeconomy related training and education to meet future workforce needs for the bioeconomy; 2) increase research, technology, and innovation capacity for the bioeconomy; 3) deliver up-to-date skills intelligence on occupations in the bioeconomy.

A wide range of skills are needed for a **heterogeneous concept** such as the bioeconomy. However, there is a gap between the specialist and generalist skills needed in the future and those currently offered by higher education and vocational training programmes. The demand for bioeconomy skills is set to grow due to increasing need and demand for sustainability and resilience, as well as the development of new technologies.

In the European Union, the European Skills Agenda serves as the primary initiative to enhance skills, encompassing a five-year plan which focuses on human capital, employment and social policies to help individuals and businesses develop new skills for the green and digital transition. In the framework of the European Skills Agenda, many EU funding instruments are dedicated to upskilling and reskilling, such as InvestEU, the Just Transition Fund, the Recovery and Resiliency Facility, and European Structural and Investment Funds (mainly the European Social Fund Plus and the European Regional Development Fund).

There are a wide range of EU initiatives targeting skills development at various levels, including the EU Commission Pact for Skills (one of the pillars of the European Skills Agenda), and the Erasmus+ Blueprint Programme on Sector Skills Alliances. At the sectoral level, the Blueprint for Sectoral Cooperation on Skills offers skills forecasting and measures to satisfy specific skills needs for different sectors. However, a comprehensive EU framework enhancing bioeconomy skills is still lacking.

Recent policy developments are placing the bioeconomy at the centre of Europe's ecological transition and competitiveness. In March 2024, the Commission proposed actions to boost biotechnology and biomanufacturing, forming the basis for a potential EU Biotech Act, confirmed by the von der Leyen Commission.

To support businesses, the **Biotech and Biomanufacturing Hub** was launched in January 2025, simplifying regulations and accelerating market access. The Commission also acknowledges the role of large-scale and regional skills partnerships to enhance upskilling and re-skilling in the sector.

Additionally, structured stakeholder exchanges will drive the adoption of AI and Generative AI (**GenAI4EU**) in biotech.

As part of its 2024 EU presidency, Hungary announced a 2028 partnership to strengthen the bioeconomy in Central and Eastern Europe.

In the framework of the EU Bioeconomy Strategy, different platforms have been set up, such as the **European Bioeconomy Policy Forum** and the **Knowledge Centre for Bioeconomy**, to facilitate the exchange of knowledge and good practices. Regional policy-makers can find specific recommendations and best practices to accelerate the bioeconomy transition on the **Interreg Europe Policy Learning Platform**.

CEE2ACT approach: needs-based matchmaking to empower Central and Eastern European countries

Central and Eastern European (CEE) countries share common challenges in advancing the bioeconomy, including **limited public awareness, low policy prioritisation, funding constraints, and weak business participation**. While each country's bioeconomy priorities vary based on the economic significance of sectors such as forestry, commodity crops, and animal production, a lack of coordinated efforts often slows progress.

Drawing from the experiences of countries with established bioeconomy strategies - Germany, the Netherlands, Spain, Finland, and Austria - CEE2ACT fosters knowledge exchange to help **align stakeholders, promote collaboration, and navigate common barriers**. These contributing countries offer insights into **social dialogue, stakeholder engagement, and policy integration**, which are crucial for CEE countries striving to involve the private sector and utilise available funding mechanisms effectively.

CEE2ACT's knowledge transfer strategy follows a structured approach: first, partners identify and validate challenges and needs with stakeholders; next, they categorise key knowledge elements to strengthen know-how and capabilities; and finally, they monitor progress and conduct evaluations to identify gaps and refine strategies. Across CEE countries, common priorities include strengthening governance frameworks, improving financing mechanisms, and fostering industry-driven innovation. More specifically, the CEE2ACT's **National Bioeconomy Hubs** emphasise:

- **Governance and policy alignment**, addressing regulatory gaps, tax structures, and sustainability-focused budget allocations.
- **Awareness and skills development**, embedding bioeconomy principles in education, leadership programmes, and workforce training.
- **Inspiration through real-world examples**, highlighting successful business cases, practitioner-led initiatives, and effective storytelling to drive adoption.
- **Targeted technology transfer**, supporting industry-specific workshops, incubation programmes, and cross-sectoral innovation.

Building Knowledge Transfer Skills for the Bioeconomy

The CEE2ACT target countries are well-positioned to advance their bioeconomy potential, leveraging their unique strengths while addressing shared challenges. Through **National Bioeconomy Hubs, stakeholder engagement, and in-depth regional assessments**, CEE2ACT has identified key areas where strategic action can drive progress:

Raising Awareness and Engagement: Public and political awareness is essential for scaling bioeconomic solutions. Strengthening communication about the economic and environmental benefits of the bioeconomy, alongside structured knowledge transfer systems, can increase public interest and build stronger policy support. Encouraging collaboration across government, industry, and academia fosters a shared vision and more coordinated actions.

Enhancing Technological Capacity: Scaling the bioeconomy depends on locally adaptable technologies and strong innovation ecosystems. Strengthening partnerships between universities, research institutions, and businesses enables faster technology transfer and real-world application of bio-based solutions. Investing in research-driven innovation accelerates the development of scalable and competitive bioeconomy models.

Improving Access to Financing: Financial barriers remain a major obstacle to bioeconomy expansion. Providing clear, structured guidance on funding opportunities through the National Bioeconomy Hubs can empower the stakeholders to navigate investment landscapes more effectively. Streamlining access to EU and national funding programmes will help businesses and innovators scale sustainable bioeconomic solutions.

Strengthening Education and Training: A skilled workforce is fundamental to the bioeconomy's success. Expanding bioeconomy-focused education and training ensures that professionals have the technical, business, and policy expertise needed for sustainable development. Showcasing successful bioeconomy models and integrating bio-based learning into existing curricula strengthens engagement and adoption.

Optimising Governance and Collaboration: A well-coordinated governance framework is essential for aligning policies, fostering inter-ministerial cooperation, and promoting inclusive decision-making. Structured knowledge exchange mechanisms can improve policy integration, stakeholder engagement, and long-term bioeconomy strategy implementation.

Recognising the unique context of each country, tailored approaches can build on existing achievements and address **specific priorities**:

Bulgaria: 🏛️ Strengthen collaboration among stakeholders and research infrastructures
Croatia: 🤝 Foster bioeconomy partnerships and coordination
Czechia: 📣 Increase policy prioritisation and public awareness
Greece: 🔬 Expand R&D, sustainable bio-resources, competitiveness in bio-based products
Hungary: 🤝 Share best practices and develop Social Readiness Levels
Poland:📣 Strengthen communication on bioeconomic benefits and cross-sectoral cooperation
Romania: 💰 Improve financing access and broaden societal awareness
Serbia: 📣 Promote bioeconomy awareness and innovation access
Slovakia: 💰 Improve stakeholder collaboration and funding access
Slovenia: 🔬 Invest in R&D and knowledge-driven business innovation

Offering a framework to build strengths from multiple angles, the CEE2ACT project created the **"Menu Approach"**. This approach provides a flexible and inclusive context to support the bottom-up efforts.

Through workshops, study tours, online training, and peer-to-peer learning, CEE countries can adapt strategies to their specific contexts while benefiting from regional collaboration and shared learning. By focusing on these opportunities, policymakers and stakeholders can further build momentum toward a sustainable and thriving bioeconomy, demonstrating leadership and unlocking the full potential of the region.

Visualisation of the CEE2ACT - Knowledge Transfer "Menu Approach"

The Knowledge Transfer activities have been well-documented, and materials are publicly available here: **Knowledge Transfer Series.**

Highlights have included:

- **International Webinar 'Gearing up for Knowledge Transfer in the Circular Bioeconomy'**

The event focused on learning from others in the circular bioeconomy, addressing implementation challenges, financial barriers, and legal hurdles.

- **Workshop series on building capacity and technical elements in 10 CEE countries**

Our second workshop series focused on building capacity and technological aspects, also covering collaboration, governance and process-based challenges. Participants validated the CEE2ACT **e-solutions**.

- **Peer-to-Peer Webinar 'Sharing for Knowledge Transfer in the Circular Bioeconomy'**

This session allowed for learning from peers on topics of best practices, shared challenges, and capacity gaps in bioeconomy knowledge transfer.

- **International Site Visit at Wageningen University**

The Site Visit was an interactive activity that helped build motivation and inspiration for circular bioeconomy development. The 80 participants included CEE2ACT partners and key stakeholders from the 10 Hubs established in Central and Eastern European countries.

Recommendations for policy makers

Ensuring that knowledge moves effectively across sectors - bridging gaps between policymakers, industry, academia, and civil society - is essential for translating innovation into practical solutions, unlocking investment, and scaling sustainable business models.
This requires **structured mechanisms, continuous collaboration, and strategic investments** to create a dynamic ecosystem where knowledge is not just shared but **actively applied**. CEE2ACT has identified key areas where policy efforts can reinforce knowledge transfer, accelerate capacity building, and enable stronger bioeconomy roadmaps in Central and Eastern European countries:

1. Build public and political awareness about bioeconomy opportunities
For bioeconomy strategies to gain momentum, political leadership and public engagement must be actively cultivated. Ensuring that the bioeconomy is recognised not just as part of an environmental agenda, but also as an **engine for economic resilience and self-reliance in key areas such as energy, food security, and industrial competitiveness** will be essential in securing long-term commitment from policymakers and the public.
Governments can take a leading role in making the **bioeconomy a priority across ministerial portfolios**, embedding it into discussions on energy security, crisis resilience, and industrial modernisation. At the same time, the wider public needs **compelling and evidence-based communication** that clearly demonstrates the impact of bio-based innovations on everyday life.
Case studies, storytelling, and real-world examples from successful bioeconomy initiatives can serve as powerful tools for shaping public perception and increasing demand for sustainable products and practices.
By mainstreaming bioeconomy narratives in economic and industrial policies, decision-makers can create the political and societal momentum necessary for systemic transformation.

2. Foster multi-actor collaboration
Stronger collaboration between research institutions, businesses, and policymakers is essential to ensure that knowledge is not only generated but also applied where it matters most. Embedding **structured, continuous collaboration mechanisms** within National Bioeconomy Hubs is an effective way to facilitate **targeted matchmaking between innovators and industry players**.
Cross-sector partnerships can accelerate the adoption of bio-based technologies, ensuring that solutions developed in research labs find their way into commercial applications.
Equally important is the development of **living labs and demonstration sites**, where policymakers, businesses, and researchers can test bioeconomy innovations under real market conditions. These platforms enable **practical learning, reduce uncertainty around new technologies, and strengthen investor confidence**, making it easier for businesses to take the leap into sustainable transformation.

Recommendations for policy makers

3. Improve access to financing

National Bioeconomy Hubs have a crucial role in facilitating access to funding and investment by acting as advisory centres, connecting stakeholders with financing opportunities and providing guidance on navigating grant applications, venture capital, and blended finance models. Building **investment readiness** is equally important - providing businesses with the knowledge and skills to **engage with investors, present viable business cases, and secure long-term funding**.

De-risking investment in the bioeconomy is another priority. Encouraging **public-private partnerships and blended finance approaches**, where public funding lowers the risk for private investors, can increase capital flows into bio-based innovation. Creating investment matchmaking events that bring together bioeconomy entrepreneurs and financial institutions can further help close the gap between promising ideas and the funding needed to realise them.

4. Accelerate technical knowledge transfer

The success of the bioeconomy transition depends on the **availability and accessibility of technical knowledge**. A robust knowledge transfer system requires **regional bioeconomy demonstration hubs**, where industry players, policymakers, and researchers can develop, test, and refine technical solutions in real-world conditions. Investing in **digital knowledge-sharing platforms and shared infrastructures** can further expand access to practical guidance, ensuring that expertise on bio-based solutions reaches all relevant actors - farmers, processors, manufacturers, and policymakers alike.

Stronger partnerships between research institutions, industry, and policymakers can ensure that scientific advancements translate into commercially viable technologies, accelerating the scaling of bio-based solutions. Establishing specialised **training programmes tailored to industry needs** - from precision agriculture to sustainable packaging solutions - can further **build technical expertise across value chains and strengthen bioeconomy labour markets.**

5. Streamline governance for bioeconomy growth

Developing **inter-ministerial bioeconomy coordination bodies** can ensure policy coherence and strategic alignment across sectors, creating a clearer roadmap for bioeconomy development. Aligning national policies with EU frameworks - such as the Green Deal and Circular Economy Action Plan - can further unlock additional funding and support mechanisms, reinforcing long-term bioeconomy objectives.

Simplifying regulatory pathways for bio-based innovations is another crucial step. Unclear or outdated regulatory frameworks often create bottlenecks for new bioeconomy solutions, delaying market entry. Establishing **regulatory sandboxes** - controlled environments where innovative bio-based technologies can be tested under real but monitored conditions - can **reduce uncertainty, encourage responsible innovation, and accelerate commercialisation**.

Ensuring that governance structures are flexible and responsive to emerging challenges will allow CEE countries to adapt their bioeconomy strategies over time, keeping pace with technological advancements, market trends, and shifting policy landscapes.

Recommendations for policy makers

6. Strengthening education and training

Expanding bioeconomy-focused education and training ensures professionals have the technical, business, and policy expertise needed for sustainable development. Integrating **bio-based learning into curricula** and offering specialised programmes will build a strong foundation for future generations.

Highlighting **successful bioeconomy models and climate action initiatives** can enhance engagement. Hands-on training through industry partnerships, internships, and workshops will connect theory with practice. By **aligning education with market needs** and fostering partnerships between academia, industry, and policymakers, we can create a workforce equipped to drive sustainable change.

A Knowledge-Driven Pathway to a Thriving Bioeconomy

The transition to a circular bioeconomy is not just about developing new technologies - it is about ensuring that knowledge is actively transferred, applied, and refined across sectors. Strengthening knowledge transfer requires a deliberate, structured approach prioritising **collaboration, financial access, technical expertise, and governance alignment**. By embedding these principles into national and regional bioeconomy strategies, Central and Eastern European countries can position themselves at the forefront of bioeconomy innovation, driving sustainable economic growth while addressing key environmental and societal challenges.

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