



01 THE CHALLENGE

The 2018 updated European Bioeconomy Strategy addressed Bioeconomy Education with Action 2.4 “Promote education, training and skills across the bioeconomy”. This action aims at reducing skills shortages and skills mismatches across the bioeconomy by supporting development of new and updated curricula which respond to the diverse and evolving needs of stakeholders and sectors in the bioeconomy. **Education is crucial to understand the challenges and embrace the opportunities of the bioeconomy.** Shortening the gap between academia and industries, facilitating collaboration and design of shared curricula is mandatory to align educational paths with labour market opportunities.



In Schools and High Schools

Teaching principles of circularity, acting global and local at the same time (glocal), and raise interest for bio-based careers, will contribute to prepare the new generation to be ready for a quickly evolving labour market.



At Universities

New curricula, already developed, combining life sciences, engineering and marketing, together with an enabling environment for the development of transversal skills, can support students to become bioeconomy entrepreneurs or managers.



In Vocational Training

There is a need to match requirements for skills in primary production, manufacture, transport, and other relevant sectors, involving regional and local actors.

New and improved skills related to bioeconomy can provide to primary production, manufacture, transport, and other relevant sectors, new opportunities for growth, employment and diversification.

The identification of the skills required as well as the implementation of regional hubs for education should be designed by regional and local stakeholders based on the specific needs and resources of the territory.

Life-long learning programme

Skills and competences of workers should be also improved to match the new opportunities, technologies, and procedures that are rapidly emerging in the bioeconomy era through life-long learning.

In addition, entrepreneurs, SMEs and start-ups should be facilitated by dedicated educational programmes to seize the business opportunities represented by the bio-based economy.



Support to bioeconomy education

- The updated 2018 EC Bioeconomy Strategy announced the following actions to promote education, training and skills across the bioeconomy:
 - Map present and future skills;
 - Support projects within Erasmus+, such as Sector Skill Alliances;
 - Deliver up-to-date skills intelligence for vocational education;
 - Generate a pipeline of talented entrepreneurs and innovators via the European Institute of Innovation & Technology;
 - Support collaborative networks, involve higher education institutions, and share best practices.





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HOW COORDINATION AND SUPPORT ACTIONS (CSAs) ADDRESS THE CHALLENGE

Mapping Present and Future Skills:

UrBIOFuture identifies, analyses and categorises the actual gaps in professional competences and skills mismatches in the bio-based sector to provide an improved and efficient alignment and interaction among industry and educational and research institutions, focusing on the needed skills and potential job opportunities in the sector.

GBO (Interreg) and ABBEE (Erasmus+) also conducted surveys aiming to understand the future educational needs of the bio-based industry.



Inventory of Bio-Based Economy Master Course Programmes:

URBIOFUTURE analysed nearly 1,000 educational programs (VET – Vocational Education and Training, Undergraduate, Master and PhD) and produced an interactive searchable map.

BioCannDo established that there is already a large number of (vocational) university course modules that discuss aspects of the bioeconomy. In four countries alone (Finland, Germany, Belgium, Netherlands) the project identified > 300 minor/major modules.

ABBEE (Erasmus+) will conduct an inventory of existing bio-based economy master course programmes across Europe. Bioeconomy is often an add-on to existing programmes, e.g. Master in Circular Economy (Spain) and BioEconomy (Poland).



Educational Programmes and Materials:

In the **BLOOM** project school teachers from ten countries developed and tested (co-creation approach) bioeconomy teaching resources covering a variety of subjects, from food production to chemistry (the School Box) contributing to the development of a Massive Open Online Course (MOOC) boosting bioeconomy knowledge in Schools. In early 2020, **BLOOM** will organise the Teach bioeconomy! online competition for students & STEM (Science, Technology, Engineering and Mathematics) teachers.

The **ABBEE (Erasmus+)** project has initiated the tandem-wise development of educational materials for four bioeconomy master courses, and their embedding in the curriculum of the respective university.

In **GBO** tens of bioeconomy course modules and various MOOCs for secondary, higher and academic education were developed.

BioCannDo organised the Think Biobased Challenge in which higher education students were challenged to develop bio-based educational materials catering to students in primary and secondary level and in vocational schools.

BIOVOICES, in collaboration with the Lazio region (IT) organised the bioeconomy prize, awarding high schools student's business ideas dealing with circular bioeconomy. Educational materials for the teachers and students have been produced and distributed to 500 Schools and 20,000 students.



Infoeducation Materials:

BIOWAYS developed serious games, quizzes, educational videos, multimedia presentations and educational printed materials informing on the benefits of the bioeconomy. Part of this material, implemented in seven different languages (English, Estonian, Slovak, Italian, Spanish, Greek, and Portuguese) was specifically targeting the younger generation, aiming to create awareness about the bioeconomy.

BioCannDo produced English versions of a lesson series on bio-based topics for primary schools and a hands-on experiment to create bio-based plastic (shown at large events).

CommFABnet produced a toolkit containing educational material on Bioeconomy topics, targeting youngsters aged 5-16 years, to be used in classrooms across Europe.





Life-long learning

BIOVOICES organised 70 Mobilisation and Mutual Learning (MML) workshops to stimulate, inspire and facilitate the collaboration among stakeholders. In the context of these workshops a series of good practices (e.g. buffet of ideas) was used to facilitate the mutual learning and trigger the discussion.

InnProBio trained public procurement practitioners in three countries on bio-based procurement. Results include a comprehensive "toolset" presenting information on various aspects of bio-based products, such as e.g. what they are, what their potential benefits are, how bio-based products are linked to the circular economy and circular procurement, and how it can be determined if they are truly sustainable.

Beyond Coordination and Support Actions (CSAs)

Beyond the ongoing and completed (CSA) projects discussed above, there is a pipeline of current and forthcoming initiatives and prospects that aim to promote education, training and skills across the bioeconomy, addressing different educational needs e.g. those of primary biomass feedstock producers. Examples include:

- Projects like Askfood (ERASMUS+ Knowledge Alliance programme), NEXTFOOD (H2020), BioEnergyTrain (H2020), FIELDS (Erasmus+ Sector Skill Alliance blueprint) and BoostEDU (Erasmus+).
- BIOCIRCE, an interdisciplinary program jointly offered by 4 primary universities in Italy in collaboration with the most relevant non-academic players in the bioeconomy field.¹
- The European Bioeconomy University: a new alliance of six leading European universities in the area of the bioeconomy joining forces in research, teaching/education, and innovation towards a common goal.²
- Future EU tenders (Bioeconomy University Curricula, service contract, Q1 2020) and EU calls (BBJ JU 2020 call, creating bio-based education hubs)
- Other BBI JU initiatives (PhD Training Network, BISC-E Biobased Innovation Student Challenge Europe), etc.

03 MAIN OUTCOMES FROM THE COORDINATION AND SUPPORT ACTIONS (CSAs)

- First insights in the present and future skills needed across the bioeconomy;
- Ongoing work on mapping university-level bio-based economy master course programmes;
- Development of educational programmes and materials for all levels of education;
- Info-education and edutainment materials targeting the younger generation;
- Training materials developed for public procurement professionals.
- In parallel with the traditional educational paths, new formats are emerging like mutual learning and knowledge sharing, collaborative learning and co-creation, transfer of good practices. These seem to be very effective to drive the transition towards bioeconomy, especially when targeting beneficiaries that are already active in the market.

04 GAPS TO BE ADDRESSED

- Education plays an important role in driving the structural change toward a more sustainable production, consumption and lifestyle. Currently sustainability and circular bioeconomy are not sufficiently addressed by traditional school curricula.
- Poor connection among different programmes (Erasmus+, Interreg, H2020, BBI JU); Insufficient collaboration, networking and knowledge sharing on bioeconomy topics between **educational** providers;
- **Competences and skills needed** to exploit the opportunities offered by the bioeconomy are still underexplored. Poor connection with the sector-specific labour market needs and to the future demand for skilled workforce along the entire value chain;
- Bioeconomy education at **universities** is still very limited, technology-driven rather than interdisciplinary and not cross-sectoral.
- Need to explore where bioeconomy principles and contents can be integrated into already **existing educational** curricula to enrich the skills and competences of the students increasing their employability;
- Lack of education curricula targeting potential beneficiaries like primary producers, procurers, entrepreneurs, start-ups, and policy makers, about opportunities offered by the bioeconomy tailored to their needs, language, time availability, delivery preferences, etc;
- **Regional** authorities need support in the identification of educational skills based on the local resources and needs;
- **Transversal skill and competences** are increasingly needed for a complex and rapidly evolving sector like bioeconomy;
- To compete in the bioeconomy, companies need skilled workforce. How to make the younger generation interested in bioeconomy studies and careers to fulfil the growing demand of talents?

¹ Master Biocirce in Italy involves four Italian universities from North to South (University of Turin, University of Milan Bicocca, University of Bologna and University of Naples Federico II), with the support of three of the main Italian bioeconomy players (Novamont, GFBiochemicals and Science Park of Lodi) and the Italian leading banking Group Intesa Sanpaolo.

² EBU is an initiative of Universities of Hohenheim, Bologna, and Eastern Finland, AgroParisTech, BOKU Vienna, and Wageningen University and Research.



05 RECOMMENDATIONS

- **Facilitate the networking, knowledge sharing and collaboration** among different programmes, projects and initiatives (like the European Bioeconomy Network), as well as among universities (such as the European Bioeconomy University).
- **Stimulate the debate around education in bioeconomy** towards an improved educational system better responding to the bioeconomy evolutions, involving industrial players, regional authorities, Member States, education providers and other relevant stakeholders.
- To address the evolution of the bioeconomy labour market, **new skills and competences should be identified**, to make sure that the future **workforce responds to the real (and updated) needs** of all bioeconomy sectors (primary production, industry, etc.). These skills should include **transversal competences** that are needed to address the complex challenges of the bioeconomy.
- **New formats** for the delivery of bioeconomy education **should be explored** to better respond to the different emerging needs, **exploiting the good practices implemented by different projects and initiatives**. Examples are Mobilization and Mutual Learning (MML), Living Labs, co-creation of knowledge and the integration of bioeconomy into existing curricula and programmes.
- To maximise the opportunities offered by all areas of the bioeconomy and contribute to the creation of an innovation ecosystem, **new educational paths** targeting feedstock providers, policy makers (including public procurers), intermediaries, entrepreneurs, multipliers (like teachers and media) **should be implemented**.
- **Education needs and curricula should be designed and implemented at regional level**, to better tailor the focus on the specific regional resources and conditions; nevertheless, **an integrated vision** of the educational framework **should be designed centrally** (at European level) and deployed locally (even with the support of dedicated projects supporting the regions in this process).
- School activities, starting very early (primary school or before) are fundamental **to grow a future generation knowledgeable and sensitive to environmental issues** through info-education programmes (using appealing channels and tools such as games, social media, competitions, videos, and live events). This will help rise a generation that is **informed, inspired and interested in bioeconomy**, thus attracting talented youngsters towards education and career in this domain.





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COORDINATION AND SUPPORT ACTIONS (CSAs) IN A NUTSHELL

Acronym/logo	Programme	Duration	Website
 UrBioFuture careers, education & research	BBi JU	May 2019 - Apr 2020	www.urbiofuture.eu
 BioCannDo	BBi JU	Oct 2016 - Sep 2019	www.allthings.bio
 BIOWAYS	BBi JU	Oct 2016 - Sep 2018	www.bioways.eu
 bloom	H2020	Nov 2017 - Oct 2020	www.bloom-bioeconomy.eu
 InnProBio FORUM FOR BIO-BASED INNOVATION IN PUBLIC PROCUREMENT	H2020	Mar 2015 - Feb 2018	www.innprobio.eu
 ABBE Bioeconomy Education	Erasmus+	Sep 2018 - Aug 2021	www.abbee.eu
 GRENZELOOS BIOBASED ONDERWIJS	Interreg	Nov 2016 - Oct 2019	www.biobasedonderwijs.eu
 BIOVOICES CONNECTING BIO-BASED FORCES FOR A SUSTAINABLE WORLD	H2020	Jan 2018 - Dec 2020	www.biovoices.eu

07

RESOURCES

School Box – a collection of bioeconomy related resources for educators. **BLOOM project**
<https://bloom-bioeconomy.eu/schoolnetwork/schoolbox/>

Boosting Bioeconomy Knowledge in Schools. Free online course. **BLOOM project**
<https://bloom-bioeconomy.eu/2019/01/28/bloom-mooc/>

How to promote education, training and skills across the bioeconomy. **BLOOM Project**
<https://bloom-bioeconomy.eu/2019/10/31/promote-education-training-skills-across-bioeconomy/>

Education and training for the Bioeconomy in Europe - Human Capital for the Bioeconomy.
Prepared by Gerlinde van Vilsteren c.s. for the European Bioeconomy Stakeholder Panel
Meeting, Helsinki, 8 July 2019

Interactive searchable map of educational programs. **URBIOFUTURE project**
https://www.urbiofuture.eu/educational_programmes/

Updated Bioeconomy Strategy (2018)
https://ec.europa.eu/knowledge4policy/publication/updated-bioeconomy-strategy-2018_en

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