



# H2020 Work Programme

## D4.5 BBECs certification scheme

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This document is the BIOBEC project (contract no. 101023381) corresponding to D4.5 (M30) led by UNIBO. This report summarizes Task 4.5 results, outlining the prospective role of quality certifications, standards, and systems in advancing bioeconomy education within the BIObec project, focusing on the identification of potential certification schemes for future BBECs.

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# Table of contents

<b>ACRONYMS AND ABBREVIATIONS .....</b>	<b>4</b>
<b>EXECUTIVE SUMMARY .....</b>	<b>5</b>
<b>1. INTRODUCTION.....</b>	<b>6</b>
Background and context of the BIObec project .....	6
Purpose of Task 4.5 .....	6
Objectives of this document .....	6
<b>2. METHODOLOGY .....</b>	<b>8</b>
<b>3. CERTIFICATIONS AS A CORNERSTONE OF BIOECONOMY EDUCATION EXCELLENCE .....</b>	<b>9</b>
The role of certification and standardization in elevating bioeconomy education .....	9
The impact of quality certifications on educational and learning services in the bioeconomy.....	10
<b>4. QUALITY CERTIFICATIONS FOR MANAGEMENT SYSTEMS.....</b>	<b>12</b>
<b>5. STANDARDS AND GUIDELINES FOR QUALITY ASSURANCE IN THE EUROPEAN EDUCATION AREA .....</b>	<b>18</b>
Standards and guidelines for quality assurance in the European Higher Education Area (EHEA)....	18
European Quality Assurance reference framework for Vocational Education and Training (EQAVET)	18
<b>6. THE EUROPEAN CREDIT TRANSFER SYSTEM: ECTS AND ECVET .....</b>	<b>21</b>
The European Credit Transfer and Accumulation System (ECTS) .....	21
The European Credit system for Vocational Education and Training (ECVET) .....	22
A comparative overview of ECTS and ECVET systems.....	22
<b>7. ENHANCING RECOGNITION AND TRANSPARENCY OF INDIVIDUALS' QUALIFICATIONS .....</b>	<b>24</b>
The European approach to micro-credentials for lifelong learning and employability .....	24
The Diploma Supplement .....	27
The Open Badge system .....	27
A comparative overview of diploma supplements and open badge systems.....	28
<b>8. THE PATH TO CERTIFICATION EXCELLENCE IN BIOECONOMY EDUCATION.....</b>	<b>30</b>
A comprehensive certification roadmap.....	30
Next steps for enhancing bioeconomy education through certification .....	37
<b>9. FINAL REMARKS .....</b>	<b>39</b>
<b>ANNEXES.....</b>	<b>40</b>

# Acronyms and abbreviations

<b>BBECS</b>	Bio-Based Education Centers
<b>EHEA</b>	European Higher Education Area
<b>EQAVET</b>	European Quality Assurance reference framework for Vocational Education and Training
<b>ECTS</b>	European Credit Transfer and accumulation System
<b>ECVET</b>	European Credit System for Vocational Education and Training
<b>QMS</b>	Quality Management System
<b>EMAS</b>	Eco-Management and Audit Scheme
<b>EOMS</b>	Educational Organization Management System
<b>ESG</b>	Standards and Guidelines for Quality Assurance in the European Higher Education Area
<b>PDCA</b>	Plan-Do-Check-Act
<b>EQAR</b>	European Quality Assurance Register
<b>VET</b>	vocational education and training
<b>UNESCO</b>	United Nations Educational, Scientific and Cultural Organization

## Executive summary

The BIObec project was funded to face the needs brought by diverse developments in the bio-based sector across EU member countries and regions, presenting challenges and opportunities for education and training solutions. The project envisions a flexible framework for Bio-Based Education Centres (BBECs), strategically positioned to meet the dynamic needs of the bio-based industry and local ecosystems. As pivotal knowledge hubs, the BBECs aim to address current and future bioeconomy workforce requirements while aligning with local industry demands.

Task 4.5 within the project is dedicated to designing a standard and qualification scheme that fosters collaboration and replication. It aims to identify potential objectives and roles within the certification scheme, ensuring harmonization with existing schemes to avoid duplication. Task 4.5 focuses on interfacing with the EU European Credit Transfer and Accumulation System (ECTS), and lays the foundations for including European micro-credentials strategy models in BBEC once these are validated by the member states.

This document explores potential designs for a standard and qualification framework by comprehensively reviewing existing quality certifications for management systems and standards. Additionally, it provides insights into relevant standards and guidelines within the European Higher Education Area (EHEA), the European Quality Assurance Reference Framework for Vocational Education and Training (EQAVET), and the aforementioned European Credit Transfer and Accumulation System (ECTS).

The main message of the report is that certification is pivotal for achieving excellence in bioeconomy education within the BIObec project. To uphold the project's goal of educational excellence, continuous evaluation and adaptation of certification processes are fundamental, ensuring they remain responsive to the evolving needs of bioeconomy education. Solutions, on the other hand, need to be tailored to the specific needs and governance structure of each centre. Emphasizing collaboration as a key theme, the report underscores the significance of cooperative efforts between educational institutions, regulatory bodies, and industry stakeholders in creating a resilient and responsive educational ecosystem for the bioeconomy sector.

# 1. Introduction

## Background and context of the BIObec project

The differences in the development of the bio-based sector across EU member countries and regions pose a challenge for creating standardized education and training solutions. However, this diversity offers an opportunity to experiment with innovative approaches in bioeconomy education. The BIObec project aims to establish a flexible framework for Bio-Based Education Centres (BBECs) that can cater to the evolving needs of the industry and local ecosystems at various levels.

The project sought to understand, in WP1, regional bio-based sector needs and define criteria for BBECs to contribute to dynamic ecosystems actively. In this vision, BBECs serve as education and training hubs for a broad audience, focusing on the current and future bioeconomy employees and aligning with local industry demands. They bridge knowledge between various stakeholders, including academia, research organizations, industry, the public sector, and policymakers. BBECs adapt to a changing environment and have a multi-level structure to ensure practical staff training, as outlined in WP2 and WP3.

## Purpose of Task 4.5

The objective of Task 4.5 is to find the possible design of a standard and qualification scheme to support collaboration and replication, identifying potential aims and roles in the certification scheme and its connection with existing schemes to avoid duplications. In particular, the interfacing with the European Credit Transfer and Accumulation System (ECTS) system was intended to be considered.

## Objectives of this document

This document (D4.5) reports the outcome of Task 4.5 with the aim of exploring potential designs for a standard and qualification framework for bioeconomy education centres. To achieve this goal, the Consortium conducted a comprehensive review of existing quality certifications for management systems and standards. Furthermore, this report provides information on standards and guidelines relevant to quality assurance within the European Higher Education Area (EHEA), the European Quality Assurance Reference Framework for



Vocational Education and Training (EQAVET), and the European Credit Transfer and Accumulation System (ECTS).



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## 2. Methodology

A literature review established a comprehensive foundation for this document. This involved an in-depth exploration of existing research, publications, and documentation related to quality certifications, standards, and guidelines in the field of bioeconomy education.

The methodology involved a detailed analysis of the objectives outlined in Task 4.5 and their significance within the broader context of the BIObec project. This step aimed to align the report's focus with the project's goals, ensuring consistency, and, in particular, aligning this task to the BBEC design and governance issues arising in WP2 and WP3.

A critical examination of the role of certification and standardization in bioeconomy education was undertaken. This involved assessing the impact of leading quality certifications and exploring their relevance to educational and learning services within the bioeconomy sector.

The methodology included a thorough review of leading quality certifications for management systems. This step aimed to identify and analyse certifications that play a pivotal role in ensuring the quality and effectiveness of management systems within the bioeconomy education framework.

The report delves into the European landscape of quality assurance in education by examining standards and guidelines pertinent to the European Education Area. Special attention was given to the Standards and Guidelines for Quality Assurance in the European Higher Education Area (EHEA) and the European Quality Assurance Reference Framework for Vocational Education and Training (EQAVET).

A comparative analysis was conducted on the European Credit Transfer and Accumulation System (ECTS) and the European Credit System for Vocational Education and Training (ECVET). This investigation highlighted the distinctions between these systems and their implications for bioeconomy education.

The methodology included an examination of the Diploma Supplement, focusing on its role in enhancing transparency and facilitating recognition in the context of bioeconomy education.

The report concludes by discussing the identified next steps based on the insights from the literature review and analyses. These steps are designed to guide future actions and considerations within the BIObec project, and, more generally, for the certification as a support to the development of bioeconomy education.

### 3. Certifications as a cornerstone of bioeconomy education excellence

#### The role of certification and standardization in elevating bioeconomy education

In the dynamic realm of bioeconomy, where innovation and sustainability intertwine, certification and standardization emerge as cornerstones of educational excellence. These mechanisms play a multifaceted role in shaping the landscape of bioeconomy education, ensuring that learners acquire the knowledge and skills necessary to navigate this rapidly evolving field.

At the heart of certification and standardization lies the pursuit of quality assurance. By establishing clear guidelines and rigorous assessment criteria, these measures serve as guardians of educational quality, ensuring that bioeconomy education programs consistently adhere to the highest standards. This unwavering commitment to quality safeguards the integrity of bioeconomy education, fostering trust among learners, employers, and stakeholders alike <sup>1</sup>.

Beyond quality assurance, certification, and standardization, orchestrate the alignment of educational programs with the ever-changing demands of the bioeconomy sector. As technological advancements reshape the industry landscape, these mechanisms ensure that bioeconomy education remains relevant and responsive to these dynamic changes. Learners emerge from certified programs equipped with the skills and knowledge that are immediately applicable and essential for thriving in their bioeconomy careers.

Certification and standardization transcend national borders, fostering the global recognition of bioeconomy qualifications. By harmonizing educational standards and practices, these measures broaden the horizons of bioeconomy graduates, offering expanded career prospects and opportunities for international collaboration. Graduates from certified

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<sup>1</sup> European Commission, Directorate-General for Research and Innovation, Graaf, I., Papadimitriou, A., Peijl, S. et al., Promoting education, training & skills in the bioeconomy – Final report, Publications Office of the European Union, 2022, <https://data.europa.eu/doi/10.2777/367>

programs enjoy the freedom to pursue their aspirations globally, their qualifications recognized and valued in a globalized bioeconomy<sup>2</sup>.

Furthermore, certification mechanisms cultivate a culture of continuous improvement among bioeconomy professionals<sup>3</sup>. These measures incentivize individuals to remain at the forefront of developments, embrace emerging technologies, and adopt best practices. This commitment to continuous learning ensures that the bioeconomy workforce remains agile, adaptable, and equipped to tackle the challenges and opportunities that lie ahead<sup>4</sup>.

In other words, certification and standardization catalyse growth and innovation in bioeconomy education empowering the next generation of bioeconomy leaders.

## The impact of quality certifications on educational and learning services in the bioeconomy

In the bioeconomy sector, where specialized knowledge and skills are paramount, quality certifications influence educational and learning services' credibility, consistency, and global reach. These certifications serve as beacons of excellence, signalling to students, employers, and stakeholders that certified programs adhere to established standards of quality and rigour<sup>5</sup>.

Certification from reputable bodies lends legitimacy to programs, fostering trustworthiness and assurance both from learners and industry points of view.

Moreover, certifications establish clear benchmarks for educational programs, ensuring consistency and high standards in the content, delivery, and outcomes of bioeconomy education. In the rapidly evolving bioeconomy field, maintaining a uniform, high-quality

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<sup>2</sup> Paris, B.; Michas, D.; Balafoutis, A.T.; Nibbi, L.; Skvaril, J.; Li, H.; Pimentel, D.; da Silva, C.; Thanasopoulou, E.; Petropoulos, D.; et al. A Review of the Current Practices of Bioeconomy Education and Training in the EU. *Sustainability* 2023, 15, 954. <https://doi.org/10.3390/su15020954>

<sup>3</sup> Sophie Urmetzer, Jan Lask, Ricardo Vargas-Carpintero, Andreas Pyka, Learning to change: Transformative knowledge for building a sustainable bioeconomy, *Ecological Economics*, Volume 167, 2020, 106435, ISSN 0921-8009, <https://doi.org/10.1016/j.ecolecon.2019.106435>

<sup>4</sup> Kalnbalkite, A.; Pubule, J.; Blumberga, D. Education for Advancing the Implementation of the Green Deal Goals for Bioeconomy. *Environ. Clim. Technol.* 2022, 26, 75–83. DOI: <https://doi.org/10.2478/rtuect-2022-0007>

<sup>5</sup> Kurtzal, Y.; Rinaldi, G.M.; Savini, F.; Sirri, R.; Melin, M.; Pacetti, E.; De Cesare, A.; Fioravanti, M.; Luppi, E.; Manfreda, G.; et al. Improving the Education and Training Policies of the Agri-Food and Forestry Sectors: Identifying New Strategies to Meet the Needs of the Sector and Farm-to-Fork Priorities. *Sustainability* 2024, 16, 1267. <https://doi.org/10.3390/su16031267>

education is important but, at the same time, a difficult task. In this vein, certifications empower institutions and programs to adapt to industry changes while upholding educational excellence. To ensure this alignment, leading certifications often involve collaboration with industry experts and stakeholders. Therefore, these certifications bridge the academic and professional spheres, ensuring that graduates are equipped with the knowledge and skills that are immediately applicable and essential for success in the bioeconomy.

Furthermore, internationally recognized certifications contribute to the global mobility of students and professionals in the bioeconomy sector. Indeed, graduates from certified programs are more likely to be acknowledged and accepted worldwide, enhancing educational institutions' competitiveness and graduates' employability in an industry that frequently involves international collaborations. Hence, these certifications may be seen as passports to global opportunities, allowing graduates to pursue their aspirations without the limitations of geographical boundaries <sup>6</sup>.

Moreover, the certification processes involve ongoing monitoring and assessment, fostering a culture of continuous improvement within educational institutions. This culture motivates institutions to evaluate and enhance their educational offerings regularly, ensuring they remain at the forefront of bioeconomy education, delivering a high standard of teaching <sup>7</sup>.

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<sup>6</sup> Sacchi, S.; Lotti, M.; Branduardi, P. Education for a biobased economy: Integrating life and social sciences in flexible short courses accessible from different backgrounds. *N. Biotechnol.* 2021, 60, 72–75  
<https://doi.org/10.1016/j.nbt.2020.10.002>

<sup>7</sup> Pubule, J.; Blumberga, A.; Rozakis, S.; Vecina, A.; Kalnbalkite, A.; Blumberga, D. Education for advancing the implementation of the bioeconomy goals: An analysis of MASTER study programmes in bioeconomy. *Environ. Clim. Technol.* 2020, 24, 149–159. DOI: <https://doi.org/10.2478/rtuect-2020-0062>

## 4. Quality certifications for management systems

Quality certifications for Bio-Based Education Centres can help demonstrate their commitment to excellence, standards adherence, and high-quality education and training delivery.

While the specific certifications may vary depending on the type and focus of the centres, some of the leading quality certifications can be useful for the generality of educational centres.

Below, we describe prominent quality certifications applicable to learning centres in the bioeconomy sector.

**ISO 9001:2015** - Quality Management System (QMS) certification: ISO 9001 is a globally recognized standard that sets out the criteria for a quality management system. It is the world's most widely used QMS standard and applies to organizations of all sizes and activities, including education, being not product-specific and focusing on the processes and systems contributing to product and service quality.

The primary objective of ISO 9001 is to ensure that an organization consistently provides products and services that meet stakeholders' requirements while also addressing statutory and regulatory requirements<sup>8</sup>.

Key components and principles of ISO 9001 include:

- *Customer focus:* Organizations should focus on understanding and meeting the needs of their stakeholders.
- *Leadership:* Leaders should set the tone for quality and create a culture of continuous improvement.
- *Engagement of people:* All staff should be involved in improving the organization's quality.
- *Process approach:* Organizations should manage their activities as processes.
- *System approach to management:* Organizations should manage their interrelated processes as a system.
- *Continual improvement:* Organizations should continually strive to improve their QMS.

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<sup>8</sup> [ISO 9001:2015 - Quality management systems — Requirements](#) (Accessed 26 February 2024)

Achieving ISO 9001 certification involves thoroughly assessing a Bio-Based Education Center quality management system by a certification body to ensure compliance with the standard's requirements. Once certified, a BBEC demonstrates that focus on setting and achieving objectives aligns well with the educational centre's mission and goals. It helps ensure that the centre's activities are directed toward achieving its educational objectives and delivering value to learners.

**EMAS** - The Eco-Management and Audit Scheme is a voluntary environmental management initiative crafted by the European Commission to foster ongoing enhancements in the environmental practices of companies and various organizations. EMAS equips these entities with a comprehensive management system that empowers them to assess, enhance, gauge, and disclose their environmental performance. EMAS's tangible results and influence are manifested in reduced environmental footprints, heightened operational efficiency, and the provision of trustworthy information on matters related to the environment<sup>9</sup>.

EMAS certification holds several significant advantages for a Bio-Based Education Center.

- *Environmental Responsibility*: Given the focus of Bioeconomy on sustainability and environmentally friendly practices, EMAS certification demonstrates a commitment to environmental responsibility. It showcases that the training centre takes environmental considerations seriously and actively works towards minimizing its environmental impact.
- *Credibility*: EMAS certification is recognized globally for its rigorous standards. When a Bio-Based Education Center holds this certification, it adds credibility to its programs and activities. It signals to stakeholders, including students, partners, and funding organizations, that the centre adheres to high environmental standards.
- *Continuous Improvement*: EMAS is centred around continuous improvement in environmental performance. For a Bio-Based Education Center, this means an ongoing commitment to optimizing its operations and practices in alignment with sustainable bioeconomic principles. This focus on improvement can lead to more efficient resource use and reduced environmental impacts.
- *Competitive Advantage*: EMAS certification can set a Bio-Based Education Center apart from its competitors. It can be a unique selling point that attracts students, research

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<sup>9</sup> [Eco-Management and Audit Scheme \(EMAS\) \(europa.eu\)](https://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&language=en&code=sdg_12_8_1) (Accessed 26 February 2024)

collaborations, and funding opportunities. Many organizations and individuals today prioritize sustainability and may prefer to engage with certified institutions.

- *Stakeholder Engagement*: EMAS encourages transparency and engagement with stakeholders. By involving students, staff, local communities, and other relevant parties in the environmental management process, the training centre can build stronger relationships and foster a sense of shared responsibility for sustainability goals.
- *Resource Efficiency*: Implementing EMAS often involves assessing resource consumption and finding ways to reduce it. This can lead to cost savings for the training centre, making it more financially sustainable in the long run.
- *Regulatory Compliance*: EMAS certification ensures that the training centre complies with environmental regulations and requirements. This reduces the risk of legal issues related to environmental non-compliance.
- *Educational Value*: A Bio-Based Education Center with EMAS certification can use its own practices and experiences as valuable case studies for students. It provides a real-world example of how environmental management systems can be applied in the field of bioeconomy.

**ISO 21001:2018** is an international standard that specifies the requirements for an Educational Organization Management System (EOMS). It was developed to provide a framework for educational institutions to effectively manage their processes, enhance the quality of education and learning outcomes, and meet the needs and expectations of their stakeholders.

Key features and components of ISO 21001 include:

- *Context of the Organization*: Educational institutions must identify and understand their internal and external context, including the needs and expectations of learners, teachers, regulatory bodies, and other interested parties.
- *Competence and Training*: ISO 21001 strongly focuses on ensuring that staff members, including teachers and administrators, are competent and receive appropriate training to perform their roles effectively.
- *Learning Environment*: Educational institutions must create and maintain a conducive learning environment that supports achieving educational objectives.

- *Support Services*: The standard addresses various support services, such as administrative functions, facilities management, and information and communication technology (ICT) support, to ensure they contribute to the quality of education.
- *Teaching and Learning Processes*: ISO 21001 emphasizes the need for well-defined teaching and learning processes, including curriculum development, assessment of student performance, and continuous improvement.
- *Monitoring and Evaluation*: Educational institutions are expected to establish mechanisms for monitoring and evaluating their educational processes and performance to identify areas for improvement.
- *Continual Improvement*: ISO 21001 is based on the Plan-Do-Check-Act (PDCA) cycle, a continuous improvement process.

ISO 21001 applies to various educational organizations, including schools, colleges, universities, training centres, and other institutions that provide formal or non-formal education. ISO 21001 is compatible with other ISO management system standards, such as ISO 9001 (Quality Management), allowing organizations to integrate their management systems for more comprehensive and efficient management practices <sup>10</sup>.

ISO 21001 will be replaced by ISO/AWI 21001, currently under development.

**ISO 29993:2017** is an international standard that specifies requirements for "Learning services outside formal education." This standard outlines guidelines and criteria for organizations that provide learners with non-formal education and training services. It aims to ensure the quality and effectiveness of these services and provides a framework for organizations to meet the needs and expectations of learners and other stakeholders. ISO 29993:2017 is designed to help learning service providers improve the quality and effectiveness of their services. It covers a wide range of topics, including:

- *Definition of Learning Services*: The standard defines learning services outside formal education as services that support learners in acquiring knowledge and skills for personal, educational, or professional purposes. These services can be provided by various

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<sup>10</sup> [ISO 21001:2018 - Educational organizations — Management systems for educational organizations — Requirements with guidance for use](#) (Accessed 26 February 2024)

organizations, including training providers, coaching centres, e-learning platforms, and more.

- *Learner-Centred Approach*: ISO 29993 strongly emphasizes the learner's perspective. When designing and delivering learning services, organizations must consider learners' needs, preferences, and expectations.
- *Competence of Instructors and Facilitators*: The standard addresses the qualifications and competence of instructors, trainers, and facilitators who play a key role in delivering learning services.
- *Learning Environment*: It outlines requirements for the physical and digital learning environments, including facilities, equipment, and technology, to ensure they are conducive to effective learning.
- *Content and Delivery*: ISO 29993 covers the development and delivery of learning content, including curriculum design, materials, and delivery methods, to ensure they meet educational objectives.
- *Assessment and Evaluation*: The standard addresses the assessment of learner performance and the evaluation of the effectiveness of learning services. It emphasizes the need for fair and transparent assessment practices.
- *Learner Support*: Organizations must provide appropriate support services to learners, including counselling, guidance, and resource access.
- *Quality Assurance*: ISO 29993 encourages organizations to establish processes for quality assurance and continuous improvement of their learning services.

**ISO 29993:2017** is intended to apply to many organizations and providers offering non-formal learning services, including public and private entities. It can help these organizations demonstrate their commitment to quality education and training and enhance the satisfaction of learners and other stakeholders <sup>11</sup>.

**ISO 29994:2021** is an international standard that outlines the requirements for distance learning services, in addition to the requirements specified in ISO 29993:2017. It is applicable to any distance learning services that are addressed to learners themselves as well as to

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<sup>11</sup> [ISO 29993:2017 - Learning services outside formal education — Service requirements](#) (Accessed 26 February 2024)

sponsors who are acquiring the services on behalf of the learners. ISO 29994 covers a wide range of topics, including accessibility and usability of distance learning services, learner support services, assessment of learner outcomes, and management of distance learning services. In cases where distance learning services are provided by an organization that delivers other methods of learning services, this standard only applies to distance learning services <sup>12</sup>.

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<sup>12</sup> [ISO 29994:2021 - Education and learning services — Requirements for distance learning](#) (Accessed 26 February 2024)

## 5. Standards and guidelines for quality assurance in the European education area

### Standards and guidelines for quality assurance in the European Higher Education Area (EHEA)

The European Higher Education Area (EHEA) encompasses a comprehensive framework of principles and recommendations to ensure quality assurance in higher education, both internally and externally. It is important to note that EHEA does not serve as quality standards or dictate specific methodologies for implementing quality assurance processes. Instead, they offer valuable guidance, focusing on key areas essential for effective quality provision and fostering conducive learning environments within higher education institutions. Considering the Standards and Guidelines for Quality Assurance in the European Higher Education Area (ESG) within a broader context that also encompasses qualifications frameworks, the European Credit Transfer and Accumulation System (ECTS), and the diploma supplement is crucial. These complementary elements promote transparency, comparability, and mutual trust within the EHEA. ESGs are used by quality assurance institutions and agencies as a reference document for internal and external quality assurance systems in higher education. In addition, they are used by the European Quality Assurance Register (EQAR), which is responsible for registering quality assurance agencies that comply with these standards and guidelines.

### European Quality Assurance reference framework for Vocational Education and Training (EQAVET)

The European Quality Assurance reference framework for Vocational Education and Training (EQAVET) originated from the European Parliament and Council's 2009 recommendation, aiming to establish a comprehensive framework supporting quality assurance in Vocational Education and Training (VET) throughout Europe<sup>13</sup>.

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<sup>13</sup> <https://ec.europa.eu/social/main.jsp?catId=1536&langId=en> (Accessed 26 February 2024)

EQAVET revolves around a quality assurance and improvement cycle, encompassing planning, implementation, evaluation/assessment, and review/revision. It also incorporates a set of descriptors and indicators applicable to quality management at the VET system and VET provider levels.

EQAVET does not enforce a specific quality assurance system or approach. Instead, it offers a framework based on common principles, indicative descriptors, and indicators. These elements assist in evaluating and enhancing the quality of VET systems and VET provision across the continent.

The EQAVET framework comprises ten reference indicators designed to assist in evaluating and enhancing the quality of national/regional VET systems during the implementation of the EQAVET Framework<sup>14</sup>.

Indicator 1: Relevance of quality assurance systems for VET providers

Indicator 2: Investment in the training of teachers and trainers

Indicator 3: Participation rate in VET programs

Indicator 4: Completion rate in VET programs

Indicator 5: Placement rate of graduates from VET programs

Indicator 6: Utilisation of acquired skills at the workplace

Indicator 7: Unemployment rate in the country

Indicator 8: Prevalence of vulnerable groups

Indicator 9: Mechanisms to identify training needs in the labour market

Indicator 10: Schemes used to promote better access to VET and provide guidance to (potential) VET learners

The same indicators can be used to measure the quality of provision at the system and provider level.

### **The EQAVET indicative descriptors: system level**

The EQAVET indicative descriptors assist Member States in evaluating the effectiveness of their quality assurance system(s) and measuring the extent of progress achieved. These descriptors are versatile, suitable for assessing both initial and ongoing VET, and are relevant across various learning environments, encompassing school-based programs and work-based learning, including apprenticeship schemes.

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<sup>14</sup> <https://ec.europa.eu/social/main.jsp?catId=1570&langId=en> (Accessed 26 February 2024)

Each of the four phases of the quality cycle—Planning, Implementation, Evaluation, and Review—has distinct indicative descriptors tailored to provide targeted insights into the quality assurance process. [Annex 1](#) provides a comprehensive list of indicative descriptors for each phase of the quality cycle at the system level.

### **The EQAVET indicative descriptors: provider level**

Within the EQAVET Framework, there are indicative descriptors designed to assist VET providers in evaluating their quality assurance approach and assessing the progress made in enhancing the quality of provision. These descriptors are versatile, suitable for both initial and ongoing VET, and are relevant across various learning environments, encompassing school-based programs and work-based learning, including apprenticeship schemes.

Distinct indicative descriptors are associated with each of the four phases of the quality cycle: Planning, Implementation, Evaluation, and Review. [Annex 2](#) provides a comprehensive list of indicative descriptors for each phase of the quality cycle at the provider level.

## 6. The European credit transfer system: ECTS and ECVET

In the dynamic and internationally interconnected world of higher education, the European Credit and Accumulation System (ECTS) and the European Credit System for Vocational Education and Training (ECVET) stand as two pillars of excellence, fostering mobility and recognition across Europe. While both systems aim to enhance the comparability and transferability of qualifications, they cater to distinct educational pathways, namely higher education and VET.

ECTS, the cornerstone of higher education in Europe, serves as a standardized credit accumulation and transfer system. It facilitates the seamless movement of students between institutions, enabling them to build upon their academic journeys across borders. Each ECTS credit represents a defined workload, ensuring that learning outcomes are comparable and consistent across different programs and institutions <sup>15</sup>.

ECVET, on the other hand, focuses on streamlining vocational education and training programs, aligning them with industry standards and requirements. It standardizes assessing and recognizing skills, knowledge, and competencies, empowering students to transition seamlessly from VET to employment. Each ECVET credit represents the acquisition of specific competencies, ensuring that learners are equipped with the skills and knowledge demanded by the workforce <sup>16</sup>.

ECTS and ECVET form a comprehensive framework for promoting learning mobility and recognition across diverse educational pathways in Europe. They empower students to pursue their aspirations and contribute meaningfully to the continent's knowledge-based economy.

### The European Credit Transfer and Accumulation System (ECTS)

ECTS is a tool of the European Higher Education Area (EHEA) for making studies and courses more transparent, thus helping to enhance the quality of higher education.

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<sup>15</sup> <https://education.ec.europa.eu/education-levels/higher-education/inclusive-and-connected-higher-education/european-credit-transfer-and-accumulation-system> (Accessed 26 February 2024)

<sup>16</sup> <https://www.cedefop.europa.eu/en/projects/european-credit-system-vocational-education-and-training-ecvet> (Accessed 26 February 2024)

Disparities among national higher education systems can give rise to challenges in recognizing qualifications and international mobility opportunities. One way to tackle this matter is by improving the understanding of learning outcomes and program workload. European Credit Transfer and Accumulation System (ECTS) also facilitates the integration of diverse learning approaches, such as university-based and work-based learning, within the same study program or across lifelong learning endeavours.

## The European Credit system for Vocational Education and Training (ECVET)

The key objective of ECVET, as intended in the 2009 ECVET Recommendation, was to facilitate the transfer, recognition, and accumulation of assessed learning outcomes of individuals aiming to achieve a qualification. ECVET could, therefore: - help transfer and recognize learning that has taken place during a stay abroad (geographical mobility); and - support lifelong learning, by allowing people to transfer and accumulate learning outcomes achieved in different contexts within their country to build up recognized qualifications, update or upgrade them. ECVET was designed as a European credit transfer system that should be flexible enough to accommodate the characteristic features of European VET systems. To achieve this, ECVET was based on common principles concerning the design of qualifications and arrangements for credit transfer and accumulation. One of these key principles is structuring qualifications into units of learning outcomes.

## A comparative overview of ECTS and ECVET systems

The European Credit System for Vocational Education and Training (ECVET) and the European Credit Transfer and Accumulation System (ECTS) are valuable tools for promoting the comparability and transferability of qualifications across Europe. However, they are designed for different target audiences and have different strengths and weaknesses<sup>17</sup>. ECVET is focused on standardizing learning outcomes in vocational education and training programs. It uses an ECVET credit unit, equivalent to one ECTS credit. ECVET is not directly used for certification purposes but to develop and deliver VET programs. The use of ECVET is voluntary

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<sup>17</sup> ECTS and ECVET fact sheet: [https://www.active-leisure-alliance.eu/sites/default/files/sites/active-leisure-alliance.eu/files/documents/BLUEPRINT%20IO6\\_Application%20of%20ECVET%20and%20ECTS%20to%20New%20Qualifications.pdf](https://www.active-leisure-alliance.eu/sites/default/files/sites/active-leisure-alliance.eu/files/documents/BLUEPRINT%20IO6_Application%20of%20ECVET%20and%20ECTS%20to%20New%20Qualifications.pdf) (Accessed 26 February 2024)

for VET institutions in Europe. ECTS is focused on facilitating the accumulation and transfer of credits across European higher education institutions. It uses an ECTS credit unit, which has a variable value depending on the program and institution. ECTS is often used for the award of diplomas and degrees. The use of ECTS is mandatory for higher education institutions in Europe.

The following table (Tab. 1) compares ECVET and ECTS. Both systems are designed to promote the comparability and transferability of qualifications across Europe. However, they have different purposes, target audiences, and implementation mechanisms.

Table 1. ECVET and ECTS comparison. Source: own analysis.

Feature	ECVET	ECTS
<b>Purpose</b>	To standardize the recognition of learning outcomes across vocational education and training (VET) programs in Europe	To facilitate the accumulation and transfer of credits across higher education institutions in Europe
<b>Target Audience</b>	Students and trainees in VET programs	Students and researchers in higher education
<b>Credit Unit</b>	ECVET credit	ECTS credit
<b>Credit Value</b>	1 ECVET credit is equivalent to 1 ECTS credit	The value of an ECTS credit can vary depending on the program and institution
<b>Learning Outcomes</b>	ECVET focuses on the acquisition of specific skills, knowledge, and competencies	ECTS focuses on the completion of courses and modules
<b>Certification</b>	ECVET is not directly used for certification purposes	ECTS is often used for the award of diplomas and degrees
<b>Applications</b>	ECVET is used to develop and deliver VET programs	ECTS is used to structure and manage higher education programs
<b>Governance</b>	ECVET is governed by the European Commission and the European Training Foundation (ETF)	ECTS is governed by the European Union's Bologna Process
<b>Implementation</b>	The use of ECVET is voluntary for VET institutions in Europe	The use of ECTS is mandatory for higher education institutions in Europe
<b>International Recognition</b>	ECVET is recognized in many countries outside of Europe	ECTS is recognized in many countries outside of Europe
<b>Cost</b>	No inherent costs	No inherent costs

## 7. Enhancing recognition and transparency of individuals' qualifications

In today's dynamic and competitive global landscape, learning centres face the challenge of effectively recognizing and showcasing the achievements of their learners. Traditional methods, such as transcripts and diplomas, often provide a limited and static view of a learner's competencies and experiences. Learning centres can leverage open badges and diploma supplements to address this gap and enhance the value of learning programs. Open badges offer a flexible and portable means of recognizing a more comprehensive range of skills, knowledge, and experiences. At the same time, diploma supplements provide a comprehensive overview of a learner's educational journey. By fully embracing the potential of open badges and diploma supplements, learning centres can revolutionize how they recognize, validate, and showcase the achievements of their learners, empowering them to thrive in a globalized and knowledge-driven economy.

### The European approach to micro-credentials for lifelong learning and employability

The European Skills Agenda, approved on July 1, 2020, introduced a new initiative for a European approach to micro-credentials. Similarly, the Commission's Communication on achieving the European Education Area by 2025, endorsed on September 30, 2020, highlighted the Commission's commitment to developing a European Approach to micro-credentials<sup>18</sup>. This initiative aims to broaden learning opportunities and enhance the role of higher education, vocational education, and training institutions in lifelong learning by offering more adaptable and modular learning options.

In response, the European Commission proposed a Council Recommendation on Micro-credentials for lifelong learning and employability<sup>19</sup>. The recommendation aims to establish a shared definition and approach to ensure the quality, transparency, and adoption of micro-credentials.

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<sup>18</sup> <https://education.ec.europa.eu/education-levels/higher-education/micro-credentials> (Accessed 26 February 2024)

<sup>19</sup> <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52021DC0770> (Accessed 26 February 2024)

A micro-credential serves as a documentation of the learning outcomes achieved by a learner through a small amount of learning. These outcomes are evaluated against transparent and well-defined standards.

The European approach to micro-credentials provides a universal definition applicable across educational sectors and the workforce. It aligns with the societal mission of education and training institutions, encompassing higher and vocational education and training (VET) institutions, nonformal providers, employers, and labour market actors.

The key foundation for trust in micro-credentials is transparency. Micro-credentials must be clearly labelled, incorporating elements that enable learners, education and training institutions, quality assurance agencies, and employers to comprehend the value and content of micro-credentials, facilitating meaningful comparisons.

Critical information included in micro-credentials comprises:

- Identification of the learner
- Title of the micro-credential
- Country/Region of the issuer
- Awarding body
- Date of issuing
- Learning outcomes
- Notional workload required for achieving the learning outcomes (in ECTS credits, wherever feasible)
- Level (and cycle, if applicable) of the learning experience leading to the micro-credential (EQF, QF-EHEA), if applicable
- Type of assessment
- Form of participation in the learning activity
- Type of quality assurance used to underpin the micro-credential

When creating and issuing micro-credentials, it is imperative to adhere to several essential principles:

1. Quality Assurance: Micro-credentials undergo both internal and external quality assurance processes within the system responsible for their production.

2. **Transparency:** Micro-credentials should be quantifiable, comparable, and easily understood. Clear information regarding learning outcomes, workload, content, level, and the learning offer must be provided.
3. **Relevance:** Design micro-credentials as distinct, targeted learning accomplishments. Learning opportunities leading to micro-credentials should be regularly updated to address identified learning needs.
4. **Valid Assessment:** Assess micro-credential learning outcomes against transparent standards.
5. **Learning Pathways:** Micro-credentials facilitate flexible learning pathways, allowing for stacking, validating, and recognizing micro-credentials from different systems.
6. **Recognition:** Recognition should signal the value of learning outcomes, enabling a broader offering of such small learning experiences in a comparable manner across the EU.
7. **Portability:** Micro-credentials are owned by the credential-holder (learner) and can be easily stored and shared through secure digital wallets (e.g., Europass).
8. **Learner-Centred:** Micro-credentials are tailored to meet the specific needs of the target group of learners.
9. **Authenticity:** Micro-credentials should contain sufficient information to verify the identity of the credential holder (learner), the legal identity of the issuer, and the date and location of micro-credential issuance.
10. **Information and Guidance:** Incorporate information and guidance on micro-credentials into lifelong learning advisory services.

Various terms such as digital badges, open badges, online certificates, alternative credentials, nano-degrees, micro-masters, and modular qualifications are often used interchangeably with or instead of the term micro-credential.

The proposal establishes a European approach recommending that Member States apply a common EU definition, standard elements to describe micro-credentials, and key principles for the design and issuance of micro-credentials, develop the eco-system for micro-credentials, and deliver on the potential micro-credentials to support lifelong learning and employability.

BBECs will monitor these developments to ensure alignment. Once further progress has been made in this direction, BBEC aims to offer these micro-credentials in line with the established standards and principles.

## The Diploma Supplement

The Diploma Supplement is created by higher (and upper) education institutions in compliance with the standards established by the Commission<sup>20</sup>, the Council of Europe, and the United Nations Educational, Scientific and Cultural Organization (UNESCO). It is also an integral part of the Europass framework transparency tools<sup>21</sup>.

The main purpose of the Diploma Supplement is to facilitate the recognition of academic qualifications. For graduates, it serves as a crucial tool within the European Higher Education Area, ensuring that their degrees are acknowledged by higher education institutions, public authorities, and employers both domestically and internationally.

It contains information confirming:

- the type and level of qualification awarded
- the institution that issued the qualification
- the content of the course and results gained
- details of the national education system

## The Open Badge system

Open badges are digital representations of an individual's accomplishments, skills, or knowledge. These digital credentials are crafted for easy sharing and verification online, presenting a portable and standardized means of acknowledging and displaying achievements. These digital images, known as open badges, are found on websites, social media profiles, and online portfolios. They typically come enriched with metadata, offering information about the issuer, badge criteria, and the date of issuance. Each badge is affiliated with an issuer, usually an organization or institution, with clearly defined criteria, ensuring transparency and accountability. Designed to be portable across diverse platforms, open

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<sup>20</sup> <https://education.ec.europa.eu/education-levels/higher-education/inclusive-and-connected-higher-education/diploma-supplement> (Accessed 26 February 2024)

<sup>21</sup> <https://europa.eu/europass/en/learn-europe/diploma-supplement> (Accessed 26 February 2024)

badges accompany individuals throughout their online presence, ready to be shared with employers, educational institutions, or other stakeholders. Their verifiability allows anyone to authenticate a badge by checking its associated metadata, lending credibility to the represented skills or achievements.

The open badge framework is decentralized, permitting multiple organizations and platforms to issue and recognize badges. This flexibility fosters a varied ecosystem of badge issuers and earners. Some systems enable badge stacking, showcasing related skills, and badges can be structured into pathways, illustrating a progression of learning or achievements.

Widely employed in education, professional development, and online learning, open badges offer a more nuanced and adaptable method of acknowledging and communicating skills and accomplishments than traditional certificates or diplomas.

The 1EdTech<sup>22</sup> (formerly IMS Global Learning Consortium) oversees the standards for open badges, striving to enhance digital learning and educational technology interoperability. The standard governing open badges is known as the "Open Badges Specification." This specification ensures consistency across different badge systems and platforms, outlining the structure of the digital badge, including embedded metadata. The current version of the Open Badges Specification is 2.0.

Implementing an Open Badge system in a learning center yields numerous benefits for the institution and its learners. The Open Badges Specification forms the basis for a standardized and interoperable digital badge ecosystem, facilitating recognition and validation of skills and achievements across diverse contexts for learners, employers, and educational institutions alike.

## A comparative overview of diploma supplements and open badge systems

Diploma supplements and Open badges can be used to provide learners with a more detailed and personalized record of their accomplishments. The two systems share some similarities but have some important differences. The main difference is that open badge systems are more flexible and can be used to recognize a broader range of accomplishments. They can

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<sup>22</sup> <https://www.msglobal.org/aboutims.html> (Accessed 26 February 2024)

also be more portable than diploma supplements. While open badges focus on granular recognition of specific skills and are easily shareable across digital platforms, diploma supplements provide comprehensive information about the overall qualification achieved by an individual, offering a standardized format for international understanding of academic credentials. Both contribute to improving transparency and recognition in the education and employment sectors.

This table (Tab. 2) highlights the key similarities and differences of these two valuable credentials, providing a deeper understanding of their respective strengths and applications.

Table 2. Diploma Supplement and Open Badge System comparison. Source: own analysis.

Feature	Diploma Supplement	Open Badge System
<b>Purpose</b>	To provide a comprehensive overview of a learner's education	To recognize and celebrate learners' achievements
<b>Format</b>	Document	Digital credential
<b>Content</b>	Skills, knowledge, and experiences gained through education	Skills, knowledge, experiences, or commitments gained through various learning activities
<b>Issuance</b>	By educational institutions	By organizations or individuals
<b>Portability</b>	It can be integrated with learning management systems (LMSs)	Can be shared and displayed on websites and social media
<b>Recognition</b>	Recognized by employers and educational institutions	Recognized by employers and educational institutions
<b>Scalability</b>	Can be used to recognize a wide range of accomplishments	Can be used to recognize a wide range of accomplishments

## 8. The path to certification excellence in Bioeconomy Education

The bioeconomy sector is rapidly evolving, demanding a highly skilled and adaptable staff to drive innovation and sustainability. In this dynamic landscape, certification schemes emerge as cornerstones for ensuring the quality, comparability, and recognition of bioeconomy education. To effectively implement certification schemes, training centres require a clear and actionable roadmap. This roadmap should guide them through adopting, integrating, and evaluating certification schemes, enabling them to achieve the desired outcomes of enhancing education quality, improving learner outcomes, and gaining industry recognition.

### A comprehensive certification roadmap

Training centres require a clear and actionable roadmap to incorporate certification schemes effectively. This roadmap should guide them through adopting, integrating, and evaluating certification schemes, enabling them to achieve the desired outcomes of enhancing education quality, improving learner outcomes, and gaining industry recognition.

- **Self-assessment.** The first step is thoroughly evaluating the training centre's current practices and capabilities. This includes assessing the quality of instruction, curriculum alignment with industry standards, and the availability of resources for implementing certification schemes.
- **Define certification goals.** The training centre clearly outlines the specific goals it aims to achieve through certification. These goals could include enhancing the quality of education, improving learner outcomes, or gaining recognition from industry partners.
- **Identify suitable certification schemes.** The training centre clearly outlines the specific goals it aims to achieve through certification. The chosen schemes should align with the training centre's goals and the needs of its learners. The rigour, credibility, and reputation of the certification bodies offering these schemes are considered.
- **Develop a certification plan.** A detailed certification plan is crafted, outlining the steps involved in implementing the selected certification schemes. This plan should include timelines, resource allocation, and contingency measures for potential challenges.

- **Obtain stakeholder buy-in.** Key stakeholders, including training centre staff, faculty, students, and industry partners, are engaged to secure their support for the certification initiative. This will foster a sense of ownership and ensure the implementation process is inclusive and well-coordinated.
- **Establish a dedicated certification team.** A dedicated certification team to manage the implementation process has to be formed. This team should have the expertise, authority, and resources to oversee the certification journey.
- **Train staff and faculty.** Comprehensive training on the adopted certification schemes is provided to staff and faculty. This training should cover the evaluation criteria, assessment processes, and documentation requirements.
- **Adopt standardized documentation.** Standardized documentation practices are implemented to guarantee consistency and accuracy throughout the certification process. This includes developing templates for assessment reports, learner portfolios, and certification applications.
- **Establish communication channels.** Clear and effective communication channels are established to disseminate information about the certification process to learners, staff, and stakeholders. Regular updates and reminders will promote transparency and foster a sense of engagement.
- **Continuously monitor and evaluate.** A system for continuously monitoring and evaluating the effectiveness of certification schemes is implemented. This includes collecting feedback from learners, employers, and stakeholders to identify areas for improvement and refine the certification process.

Table 3 dives deep into the certifications each centre holds or seeks, reflecting their unique specialities and educational goals. The table emphasizes each centre's focus on quality and relevance in their chosen certifications, mirroring their diverse expertise range.

Table 4 acts as a companion, unveiling each centre's roadmap towards the ecological transition. It details planned phases, implementation strategies, and anticipated outcomes, demonstrating how each centre positions itself within the broader sustainability landscape.

Together, these tables paint a picture of the multidimensional approach taken by the centres to promote ecological transition. It highlights their commitment to providing current, relevant education and training that equips individuals with the skills needed to confront the challenges of our time.

Table 3. Type of certification in the BBECs

TYPE OF CERTIFICATION	BBEC Mediterranean	BBEC Finnish	BBEC Danish	BBEC Irish	BBEC CE Europe	BBEC German
		* No specific certification scheme for the BBEC itself, instead the involved educational institutions will follow their own certification schemes				
<b>MANAGEMENT SYSTEMS</b>						
<b>Quality certification</b>						
<i>ISO 9001:2015</i>	Maybe	No*	Maybe			Maybe
<i>EMAS</i>		No*	Maybe			Maybe
<b>Quality certifications for education and learning services</b>						Yes
<i>ISO 21001:2018</i>		No*	?			No
<i>ISO 29993:2017</i>		No*	?			No
<i>ISO 29994:2021</i>		No*	?			No
<b>CREDIT SYSTEM</b>						
<i>ECTS</i>	Yes	No*	Maybe	Yes	Yes	Yes
<i>ECVET</i>	Yes	No*	Maybe			Maybe
<b>TRANSPARENCY OF INDIVIDUALS' QUALIFICATIONS</b>						
<i>DIPLOMA SUPPLEMENT</i>	Maybe	No*	Maybe	Yes	Yes	Yes
<i>OPEN BADGE</i>	Yes	No*	Maybe			Maybe

Table 4. Certification roadmap in the BBECs.

STEP	BBEC Mediterranean	BBEC Finnish	BBEC Danish	BBEC Irish	BBEC CE Europe	BBEC German
<b>1. Self-assessment</b>	The center is in the planning phase, focusing on virtual platform development and stakeholder engagement without established quality assurance measures yet. Strengths include a strong partnership network and a virtual model, while weaknesses involve establishing a recognized quality framework.	All involved institutions will follow their own self-assessments	The partnership of educational institutions will use their methods for self assessment			As the BBEC intends to be part of the university, it adopts the certification system of the university. Currently, the University has a quality management system for studies and teaching. As part of a monitoring process, the degree programs are regularly reviewed with the participation of external experts.
<b>2. Define certification goals</b>	Goals include enhancing the quality of bioeconomy education and establishing the center as a key player in the field, aiming to provide structured educational frameworks and improve quality assurance in bioeconomy education, aligned with the center's mission.	All educational institutions will define their own certification goals	The partnership of educational institutions will use their certification goals			Through the certification, we would aim to assure quality in the courses and activities of the BBEC, obtain institutional reputation and meet the regulatory requirements and accreditation standards for funding and partnerships.  We also aim to improve the curriculum and offer relevant courses for the students.
<b>3. Identify suitable certification schemes</b>	The approach will include integrating various courses from various institutions, with certifications mirroring those provided by the respective entities. Using ECTS and the Diploma Supplement is prevalent, indicating these frameworks will be instrumental. Additionally, adopting microcredentials, potentially through an open badge system, is under consideration.	The educational institutions will identify suitable certification schemes in addition to the existing ones	The partnership of educational institutions have own certification schemes that eventually will be combined	In a functioning Irish BBEC it is expected to incorporate courses offered by multiple institutions and the certification would necessarily reflect those of the institutions in question. However ECTS and Diploma Supplement are widely used in Ireland and we expect these to be used. It is also possible that microcredentials and open badge systems are adopted.		<ul style="list-style-type: none"> <li>- System Accreditation from the German Accreditation Council</li> <li>- ISO 21001:2018</li> <li>- ECTS</li> <li>- Diploma Supplement</li> <li>- Open Badge</li> </ul> <p>Potentially:</p> <ul style="list-style-type: none"> <li>- Online Learning Quality Certification (OLQC) for online courses</li> </ul>
<b>4. Develop certification plan</b>	Strategy will focus on coordinating diverse certification schemes. The objective is to ensure that the offered programs are harmonized with the existing	Each educational institution's certification plans will be followed and developed further	A certification plan will be developed based on the the partnership of educational institutions			1. Assessment and analysis of gaps based on vision and strategy of the BBEC

	standards, thereby facilitating a seamless integration of certifications from different institutions.					<ul style="list-style-type: none"> <li>2. Plan certification scheme for the BBEC within a timeline taking into account resources</li> <li>3. Training of staff involved in the process</li> <li>4. Implementation of certification procedures</li> </ul>
<b>5. Obtain stakeholder buy-in</b>	Engaging educational institutions, industry partners, and stakeholders through highlighting the certification's role in employability and sector needs, addressing resistance with pilot programs and success showcases.	Three educational institutions presenting vocational education and bachelor, master and doctoral levels				<p>Key stakeholders:</p> <ul style="list-style-type: none"> <li>- Faculty and staff</li> <li>- Students</li> <li>- Industry partners</li> <li>- Regulatory bodies</li> </ul>
<b>6. Establish a dedicated certification team</b>	A focused team from partners institution led by a director with specific roles in certification development.	Each educational institution has own certification team	Core team of the teams from partnering educational institutions working already on certifications.			Core team of the BBEC working together with the administrative staff of the university working already on certifications.
<b>7. Train staff and faculty</b>	Training on bioeconomy education and certification standards, ensuring team familiarity with requirements and providing ongoing professional development opportunities.	Training for the staff will be organised when necessary	Train the trainer is a key in the Danish BBEC			<p>Some key elements of the training program:</p> <ul style="list-style-type: none"> <li>- Certification requirements training. If there is an additional certification, a person of the BBEC should take the respective training.</li> <li>- Use of internal training at the university to support the certification related activities for the core team of the BBEC.</li> <li>- Continuous meetings during the implementation</li> </ul>

						stage of the BBEC with the core team
<b>8. Adopt standardized documentation</b>	Developing and maintaining accurate certification documentation through a structured document control system, ensuring consistency across the learning center.	Already existing standardized documentation will be followed by the educational institutions				<p>The most important element in this phase is to adhere to the procedures that are already in place at the university and try to follow the same pathways. A documentation framework for the certification scheme should be developed if needed and followed.</p> <p>Also, continuous monitoring and improvement would be important for the adoption of standardized documentation.</p>
<b>9. Establish communication channels</b>	Communicate progress and updates and gather feedback through a virtual platform, newsletters, and social media, leveraging partnerships for broader reach.	Internal meetings with the educational institutions as well as the other key stakeholders will be organised. Furthermore, already existing channels will be used.	The hub of educational institutions will develop communication channels – internally and externally			<p>We plan to use the same communication channels that are working at the university. This includes regular team meetings, email communication, the use of collaboration platforms internally.</p> <p>With external stakeholders, besides meetings, we could establish formal channels for collecting feedback and evaluation and encourage two-way-communication.</p>
<b>10. Continuously monitor and evaluate</b>	Development of specific Key Performance Indicators (KPIs) centered on the effectiveness, acceptance, and impact of the certifications awarded. The assessment will be conducted on a regular basis to ensure that the certifications remain relevant, meet industry standards, and fulfill educational objectives.	Key Performance Indicators: Compliance with certification standards Stakeholder satisfaction Resource utilization (efficiency and effectiveness) Continuous improvement initiatives	Key Performance Indicators: - Compliance with certification standards - Stakeholder satisfaction - Resource utilization (efficiency and effectiveness) - Continuous improvement initiatives			Key Performance Indicators: - Compliance with certification standards - Stakeholder satisfaction - Resource utilization (efficiency and effectiveness) - Continuous improvement initiatives

These tables showcase the diverse approaches BBECs are taking to achieve certification, highlighting their unique contexts, goals, and their shared purpose of improving bioeconomy education and training. This variation in strategies reflects the dynamic nature of bioeconomy education certification, showcasing ongoing developments and the potential for innovative models in the future.

The roadmaps detail varying stages of planning and implementation across centers. Several BBECs are adopting or considering quality management systems like ISO 9001:2015 and educational service quality certifications (e.g., ISO 21001:2018), demonstrating their commitment to upholding high standards. This trend suggests a move towards aligning with international benchmarks to ensure quality and effectiveness in bioeconomy education. A clear distinction exists between centers relying on existing institutional frameworks and those forging their own paths.

Across all centers, the emphasis on securing stakeholder buy-in, forming dedicated certification teams, and implementing continuous monitoring and evaluation underlines the importance of stakeholder engagement, tailored team structures, and continual improvement to adapt to evolving educational and industry standards.

The variances in certification schemes and roadmaps reflect both challenges and opportunities in harmonizing standards and practices within the bioeconomy sector. Notably, micro-credentials and open badges present an innovative approach to recognizing a wider range of skills and learning outcomes, catering to the dynamic needs of learners and employers in the ever-evolving bioeconomy.

## Next steps for enhancing bioeconomy education through certification

To further disseminate the findings and recommendations of the report, it's crucial to engage with key stakeholders across the bioeconomy landscape. Sharing the report with these stakeholders will foster a deeper understanding of the significance of certification schemes and encourage their wider adoption.

Furthermore, developing compelling case studies and testimonials is essential to amplify the report's impact. These success stories from training centres that have successfully implemented certification schemes will be powerful examples, inspiring others to follow suit.

These narratives will motivate training centres to embrace this crucial aspect of bioeconomy education by showcasing the tangible benefits of certification.

Comprehensive training workshops and seminars are paramount to empowering training centres with the knowledge and skills to implement certification schemes effectively. These sessions will delve into the intricacies of certification schemes, covering topics such as the diverse types of schemes available, the application process, and the advantages of utilizing open badges. These workshops and seminars will facilitate the seamless and successful implementation of certification programs by equipping training centres with the necessary expertise.

Advocating for appropriate changes is crucial to ensure that policy frameworks are conducive to adopting certification schemes. This could involve measures such as financial incentives, streamlined application processes, and recognition of the value of certified training programs. Such policy changes would make it more attractive for training centres to pursue certification, bolstering the overall quality and comparability of bioeconomy education.

Developing a comprehensive certification roadmap is essential to provide a clear and actionable roadmap for training centres seeking to incorporate certification schemes. This roadmap will outline the key steps involved, the resources required, and the timeline for implementation. The certification roadmap will guide training centres towards seamlessly integrating certification schemes into their operations by providing a structured approach.

Ongoing monitoring and evaluation are indispensable to gauge the effectiveness of certification schemes in enhancing the quality of bioeconomy education. This involves assessing the impact of certification schemes on learners' skills and knowledge, employment outcomes, and innovation within the bioeconomy sector. By tracking the outcomes of certification, stakeholders can identify areas for improvement and refine existing measures to ensure that certification schemes consistently contribute to advancing bioeconomy education.

By implementing these comprehensive next steps, the bioeconomy sector can embark on a journey of continuous improvement, ensuring that its educational standards align with the evolving industry's demands. This collaborative effort will foster a highly skilled and qualified staff capable of driving innovation and sustainability at the forefront of economic development.

## 9. Final remarks

The certification landscape, explored in this report as part of the BIObec project, is critical in pursuing excellence within bioeconomy education. Certifications play a pivotal role in validating the quality of education, providing a framework for standardization, and aligning with industry benchmarks. The importance of certification as a cornerstone in improving the educational experience for learners cannot be overstated. To achieve the project's overarching goal of educational excellence, it is important to align certifications with industry needs and the organisational nature of education initiatives, ensuring they meet recognized standards and contribute to the continuous improvement of educational services. Recognizing that the educational landscape is dynamic, our BBECs must remain committed to ongoing evaluation and adaptation of certification processes to meet the evolving needs of bioeconomy education. Collaboration is a key theme, emphasizing the need for cooperative efforts between educational institutions, regulatory bodies, and industry stakeholders. By fostering such partnerships, we can create a robust and responsive educational ecosystem attuned to the bioeconomy sector's demands.

The report highlights the significance of certifications such as the Diploma Supplement and Open Badge systems in enhancing the recognition and transparency of individual qualifications. These systems contribute to better employability and facilitate mobility for learners within and beyond the bioeconomy sector.

Within the European context, the European Credit System (ECTS and ECVET) stands out as a framework that can significantly contribute to credit transfer, learning recognition, and mobility across educational sectors. Their integration into the BIObec project is not merely a suggestion but a strategic imperative for ensuring a seamless and standardized approach to education in the bioeconomy.

Moving forward, it is necessary to devise a future roadmap that delineates the gradual adoption, implementation, stakeholder engagement, and ongoing assessment of identified certifications. This approach will ensure a smooth integration of certifications into BBECs design and activity planning, contributing to enhancing bioeconomy education.

In conclusion, this report presents an invitation for collaborative efforts. It is a shared responsibility to leverage the identified certifications, enhance their implementation, and collectively contribute to the ongoing progress of bioeconomy education within the

framework of the BIObec project. This could also be reflected in future collaboration on the ground of certification among the network of BBEC developing as a result of the project.

## Annexes

[Annex 1](#) - The EQAVET indicative descriptors: system level

[Annex 2](#) - The EQAVET indicative descriptors: provider level

