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STAR4BBS recommendations for increasing the uptake and harmonization of CSLs in the European bio-based sector

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Partners short names

TUB	Technische Universitat Berlin
UNITELMA	Università degli studi Unitelma di Roma
UNI	Ente Italiano di Normazione
AUA	Geoponiko Panepistimion Athinon
USC	Universidad de Santiago de Compostela
APRE	Agenzia per la Promozione della Ricerca Europea
NOVA	Institut for politische und Ökologische Innovation GMBH
BB	Better Biomass
BAM	Bundesanstalt fuer Materialforschung und Pruefung
RSB	Roundtable on Sustainable Biomaterials
ISEAL	ISEAL Alliance

Abbrevations

BMT	BIOBASEDCERT Monitoring Tool
BUF	Bioeconomy Utilisation Framework
CSL(s)	Certification Scheme(s) and Label(s)
SCS	Sustainability Certification Scheme
EU	European Union
ESG	Environmental, Social and Governance
GHG	Greenhouse Gas
ISEAL	International Social and Environmental Accreditation and Labelling (Alliance)
LCA	Life Cycle Assessment
LCC	Life Cycle Costing
MBA	Mass Balance Approach
PEF	Product Environmental Footprint
RED	Renewable Energy Directive
SBTi	Science Based Targets initiative
S-LCA	Social Life Cycle Assessment
SME(s)	Small and Medium-sized Enterprise(s)

Executive Summary

Certification schemes and labels (CSLs) are crucial instruments for driving the European transition towards a sustainable and circular bioeconomy[1]. They provide independent assurance of compliance with environmental, social, and economic criteria, thereby fostering consumer trust, market access, investment opportunities, and effective policy implementation.

Despite their importance, the current CSL landscape remains fragmented and often confusing. Different schemes apply diverse criteria, levels of assurance, and approaches to traceability. Adoption is uneven across regions and sectors, whit small and medium-sized enterprises (SMEs) particularly affected by high costs and administrative burdens. In addition, policymakers and scheme owners encounter difficulties with inconsistent data and a lack of harmonisation with broader reporting and monitoring frameworks. Without stronger alignment, these challenges risk limiting the role CSLs can play in enabling systemic change in Europe's bio-based economy.

The STAR4BBS project has addressed these issues by analysing CSLs from multiple perspectives, including governance systems, sustainability and circularity indicators, trade flows, and cost feasibility. The project has also engaged extensively with scheme owners, businesses, policymakers, and other relevant stakeholder groups. In collaboration with the sister projects HARMONITOR and SUSCERT4Biobased, STAR4BBS co-developed the BIOBASEDCERT Monitoring Tool (BMT). This tool provides a structured and transparent mechanism to assess the robustness, comprehensiveness, and effectiveness of CSLs against EU sustainability objectives, creating a shared reference point for policymakers, businesses, and certification scheme owners.

This report translates the project's insights into actionable recommendations for three key stakeholder groups:

1. ***Policymakers and governments*** should firmly integrate robust and effective CSLs into legislation, public procurement, and incentive schemes, adopt EU-wide sustainability criteria, enhance data infrastructures, and provide dedicated support for SMEs.
2. ***Businesses*** should treat certification as a strategic investment rather than a compliance cost, reduce complexity through group certification, integrate sustainability metrics (LCA, S-LCA, LCC) into core processes, and leverage certification for competitive advantage and market access.
3. ***Certification schemes and labels*** should expand coverage of circularity, biodiversity, and social criteria, strengthen outcome-based monitoring, align with global methodologies, increase governance transparency, and lower administrative burdens through modular and digital solutions.

Taken together, these measures can strengthen the credibility, uptake and alignment of CSLs, thereby enabling them to drive systemic change. By standardising practices

[1] José Luis Ares-Sainz, Ana Arias, Nikola Matovic, Luana Ladu, Gumersindo Feijoo, Maria Teresa Moreira. Key governance and sustainability indicators for certification systems: Bridging certification and policy frameworks in the bioeconomy; Sustainable Production and Consumption; Volume 56, 2025, Pages 156-181, ISSN 2352-5509, https://doi.org/10.1016/j.spc.2025.03.017.

and reducing barriers, CSLs can maximise the potential of Europe's bio-based sector. This will contribute to more sustainable production and consumption patterns, as well as broader EU policy goals, such as those set out in the European Green Deal and the EU Bioeconomy Strategy.

1 Introduction

Certification schemes and labels (CSLs) are increasingly recognised as necessary key enablers of the transition to a sustainable and circular bioeconomy in Europe[1,2]. By providing independent and credible assurance that bio-based products comply with environmental, social and economic requirements, they help turn high-level sustainability ambitions into practical, verifiable outcomes. For consumers, CSLs build trust and transparency. For companies, they facilitate access to markets and investment. For policymakers, they represent ready-made governance instruments that can translate policy goals into tangible performance on the ground.

Nevertheless, the current landscape of CSLs is fragmented and often difficult to navigate. Different schemes apply diverse sustainability criteria, levels of assurance, and traceability approaches. Uptake remains uneven across regions and sectors. While small and medium-sized enterprises (SMEs) are particularly affected due to limited resources and expertise, certification can also create difficulties for larger companies. SMEs often face disproportionately high costs and administrative complexity, including fees for audits, membership, and licensing. They may need to adapt management systems, collect and report detailed data, or undergo multiple certifications to access different markets, leading to duplicated efforts and administrative burdens. Larger companies, although generally better equipped, also need to manage diverse certification requirements and complex supply chains.

Finally, policymakers and scheme owners struggle with inconsistent data and a lack of harmonisation with broader reporting and monitoring frameworks. Without greater alignment and usability, these challenges risk limiting the contribution CSLs can make to systemic change in Europe's bio-based economy.

The STAR4BBS project is uniquely positioned to address these issues. Over three years it has examined CSLs from multiple angles, including governance systems, sustainability and circularity indicators, trade flows, and cost and feasibility aspects. It has also engaged widely with scheme owners, businesses, policymakers and other relevant stakeholder groups. Working together with sister projects HARMONITOR and SUSCERT4Biobased within the BIOBASEDCERT cluster, STAR4BBS co-developed the BIOBASEDCERT Monitoring Tool (BMT). The BMT[3] provides a structured and transparent mechanism to assess CSLs against EU sustainability objectives in the bio-based sector. It captures system-level aspects such as governance, assurance, and traceability, evaluates sustainability criteria across environmental, social, circularity, and economic dimensions, and considers outcome-level evidence of sustainability impacts. In doing so, the BMT offers policymakers, businesses, and scheme owners a practical instrument for benchmarking, continuous improvement, and policy integration.

The work carried out under STAR4BBS shed light on various ways to further increase the value of CSLs for the European bio-based sector and accelerate their uptake in

[2] Harvey, W.J.; Black, N.; Essaouabi, S.; Petrokofsky, L.; Rangan, V.; Bird, M.S.; Villar, D.; Waite, M.; Petrokofsky, G. The Impact of Sustainability Certification Schemes and Labels on Greenhouse Gas Emissions: A Systematic Evidence Map. *Sustainability* **2025**, *17*, 792. https://doi.org/10.3390/su17020792.

[3] For further information, please refer to D5.2 "Report on assessment of techno-economic costs and benefits and integrated life cycle costing", that will be available in Zenodo "STAR4BBS Horizon Project: Sustainability Transition Assessment Rules for Bio-Based Systems" after official approval.

support of a transition to a sustainable and fair circular bioeconomy. This document translates these insights into actionable recommendations directed at three key stakeholder groups:

1. ***Policymakers and governments***, who influence regulatory frameworks and market incentives.
2. ***Businesses***, who implement certification and drive innovation across bio-based value chains.
3. ***Certification scheme and labels***, who form the operational core of credible sustainability assurance systems.

For each stakeholder group, the document outlines key challenges and provides targeted recommendations based on the analysis of existing certification systems, stakeholder engagement, and value chain assessments conducted during STAR4BBS.

The consolidated set of recommendations in this document represents a practical resource for strengthening the uptake, credibility and alignment of CSLs applicable to the European bio-based sector.

2 Recommendations for increasing the uptake and harmonisation of SCS and labels

This section presents practical, stakeholder-specific recommendations that translate the research carried out in the STAR4BBS project into actionable guidance.

The recommendations target three key stakeholder groups: policymakers, businesses and certification schemes and labels. These groups were selected because of their central role in shaping, implementing and governing sustainability assurance in the European bio-based sector:

- **European policymakers** shape the transition towards a circular bioeconomy in Europe and significantly impact or even determine the role that CSLs can play in that transition. Their legislative, financial, and strategic decisions directly influence market uptake, industry participation, and the overall trustworthiness of sustainability governance.
- **Businesses** are fundamental for the creation of a competitive and sustainable European bio-based sector. Often, companies proactively adopt CSLs to drive innovation, manage risks, and differentiate their products ahead of regulatory requirements. CSLs can support companies to demonstrate regulatory compliance, strengthen their competitiveness and market access, and respond to increasing demands for transparency and accountability.
- **CSLs** provide much-needed functions to ensure that the transition to the bioeconomy is indeed sustainable and fair. They define sustainable production practices and provide assurance of compliance against their standards, but they also meet important functions in terms of the provision of sustainability data, traceability, consumer trust, continuous improvement, etc. These functions are critical in both voluntary market contexts and as a foundation for regulatory frameworks.

The proposed recommendations for each group are tailored to the specific challenges that were identified during the course of the STAR4BBS project. These challenges are further discussed in more detail in the following subsections.

2.1 Policymakers and Governments

The STAR4BBS project identified several challenges that hinder the effective use of CSLs by policymakers and governments, including the high degree of variability in sustainability criteria, the absence of harmonised monitoring and benchmarking initiatives, limited support for SMEs, and insufficient integration of certification into broader policy frameworks.

A first priority is to anchor CSLs more firmly in regulation and legislation. This means explicitly recognising them in policy instruments, linking them to strategic objectives such as the European Green Deal and the EU Bioeconomy Strategy, and making them part of concrete implementation measures. Examples include: incorporating robust sustainability CSLs in public procurement rules, designing tax incentives that reward certified bio-based products, or establishing market-pull instruments such as quotas and subsidies that can be fulfilled or claimed when

providing relevant CSLs. In this way, only credible schemes are rewarded, while coherence across policy fields is strengthened. In this context, policy-makers should also ensure that both dedicated bio-based and bio-attributed (Mass Balance Approach, MBA) feedstocks are covered, in order to increase uptake across markets and enable use of existing large-scale infrastructure.

At the same time, Europe must strike a careful balance. The imperative of climate action demands that we also enable, not just validate, new sustainable solutions. Policy should therefore aim to create a proportionate system where CSLs provide credibility for market scaling, but where their administrative burden is not a barrier to entry for innovative pioneers. This could involve phased certification pathways, support for SMEs, or recognising interim progress towards full sustainability standards.

Another central recommendation is the use of the BIOBASEDCERT Monitoring Tool (BMT), developed within the BIOBASEDCERT cluster. The BMT provides policymakers with a structured and holistic mechanism to assess the robustness, comprehensiveness and effectiveness of CSLs. It covers three complementary levels: the System level (governance, assurance, traceability), the Content Level (sustainability, circularity, social and economic criteria), and the Outcome Level (evidence of sustainability impacts) (see Figure 1). The BMT could inform EU policymakers about how existing CSLs contribute to EU sustainability targets in the bioeconomy, and will support them identifying credible CSLs.

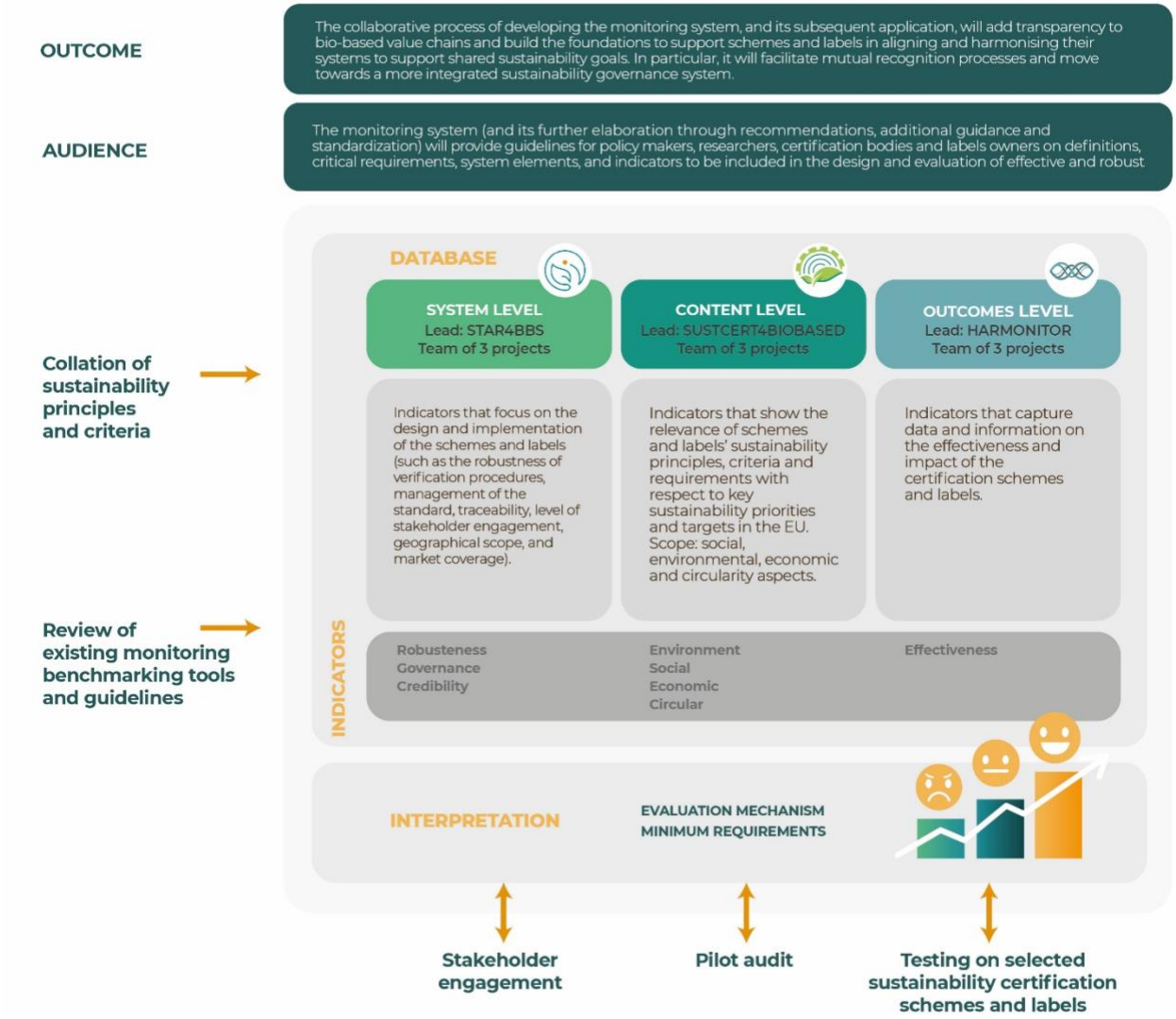


Figure 1: Structure of the BIOBASEDCERT Monitoring Tool (BMT)

Beyond assessment, the BMT can also serve as a reference tool for recognition or endorsement frameworks, informing regulatory design (e.g. the Directive on Empowering Consumers for the Green Transition, or the Digital Product Passport), and guiding public procurement decisions. Importantly, engagement with CSLs during benchmarking should be maintained as a cooperative process rather than a compliance check. In this way, the BMT supports harmonisation, fosters shared understanding between policymakers and scheme owners, and ensures that credible schemes are rewarded while encouraging continuous improvement. A more detailed description of the BMT is provided in Appendix 4.2.

At the same time, **EU-wide sustainability criteria must be established for biomass used in bio-based products.** Based on existing frameworks, such as the Renewable Energy Directive, but adapted to specific requirements in other applications (e.g. materials), these criteria would reduce fragmentation between schemes, provide businesses with a level playing field, and ensure consistency between certification systems and European policy objectives.

Enhancing data infrastructures is also essential. Harmonised customs codes and reporting systems for certified trade flows improve traceability, facilitate enforcement, and support informed policy decisions. Encouraging the anonymous reporting of selected social indicators would further increase transparency and strengthen social life cycle assessments (S-LCA).

In addition, clear rules for the certification of biomass imports are crucial. Imports are often more difficult to certify reliably, which can undermine the credibility of sustainability governance. At the same time, strengthening domestic value chains helps ensure that biomass cultivation and processing in Europe remain competitive. Establishing a level playing field between imported and domestic biomass therefore safeguards both environmental integrity and the resilience of the European bio-based sector.

Greater transparency in supply chains is equally important. Companies should be required to disclose the percentage of certified and bio-based content in product documentation and digital declarations. Credible traceability depends on robust chain-of-custody certification, and clear rules on bio-attributed content are needed to ensure openness and consistent application of mass balance approaches.

Finally, targeted support for SMEs is crucial, as they often face higher certification burdens. Supporting SMEs by providing simplified certification procedures for smaller companies, together with dedicated funding programmes and technical assistance, can help them navigate the certification process and ensure that sustainability standards remain inclusive and accessible to all actors across the bio-based economy.

Combined, these measures can assist policymakers in establishing a transparent, harmonised and effective certification system. This will make Europe's bio-based economy more resilient, inclusive and environmentally sound.

Key challenges and related recommendations for Policy Makers and Governments, elaborated in Star4BBS project, are listed in Table 1.

Table 1: Key Challenges and Recommendations for Policy Makers and Governments

Challenges:	Recommendations
Role of CSLs in regulation and incentives	- Recognise the role of CSLs in regulation and legislation - Integrate certification into public procurement criteria and incentive mechanisms (e.g. tax incentives), ensuring that only credible and robust CSLs are rewarded and policy coherence is strengthened. - Recognise both dedicated bio-based and bio-attributed solutions to increase market uptake and enable transition also through existing infrastructure
Lack of harmonisation and transparency	- Adopt a benchmarking instrument for comparing CSLs across sectors – the web-based version of the BIOBASEDCERT Monitoring Tool might be a valid option to assess scheme compliance with EU sustainability requirements - Apply the BMT as a cooperative tool for dialogue and harmonisation rather than as a narrow compliance check
Fragmented sustainability criteria	- Define EU-wide sustainability criteria for biomass in bio-based products, building on existing EU frameworks (e.g. European Green Deal, Renewable Energy Directive)
Disconnect between sustainability ambitions and policy instruments	- Design market-pull measures (e.g. quotas, subsidies, preferential access to funding) that are explicitly linked to robust certification. - Align policy instruments with sustainability objectives so that incentives drive the uptake of certified bio-based products. - Promote bio-based value chains through market-pull measures like quotas or tax incentives, linked to certifiable sustainability criteria. - Strike a careful balance that enables, not just validates, bio-based products.
Data gaps, inconsistent monitoring of trade flows and certification	- Introduce a harmonised EU classification and reporting system for bio-based and certified products. - Harmonise customs coding and reporting systems to capture certification status, sustainability indicators, and enable better tracking of certified trade flows in collaboration with customs and statistical authorities. - Explore anonymised disclosure of key social indicators to strengthen S-LCA and improve transparency in reporting.
Reliance on biomass imports	- Support domestic value chains from bio-based feedstocks into bio-based products and materials. - Establish clear rules for certification of imported biomass & derived products to ensure a level-playing field between imported and domestic biomass and derived products. - Investigate monitoring of CSLs impact on trade and competitiveness
Limited support for SMEs	- Support SMEs in the certification process by providing simplified certification procedures, targeted funding, and technical guidance, especially in low-margin sectors.
Lack of transparency on certified content in supply chains	- Require businesses to disclose the percentage of certified and bio-based content in product documentation and digital declarations. - Ensure the use of chain-of-custody certification to guarantee credible traceability and transparency. - Establish clear, transparent rules on bio-attributed content to ensure openness and inclusion of the concept of mass balance and attribution

2.2 Businesses

STAR4BBS has shown that many companies, particularly SMEs, face challenges in engaging with certification. These include high complexity and costs, unclear market benefits, and difficulties in embedding sustainability into core business processes.

One way to overcome these barriers is to reduce the costs and complexity of certification. Group certification models and simplified audit formats can make participation more accessible, particularly for SMEs. Experience from agriculture and forestry shows that shared audit schemes can significantly lower financial burdens while maintaining credibility.

At the same time, **certification should be seen not only as a compliance requirement but as a strategic investment**. By integrating sustainability metrics such as life cycle assessment (LCA), circularity indicators and social impact assessments into procurement, reporting and product development, companies can demonstrate accountability, anticipate regulatory requirements and strengthen their competitive position. Treating certification as part of a business strategy ensures that long-term sustainability and market access benefits outweigh short-term compliance costs.

Another priority is to increase transparency and traceability across supply chains. Developing internal systems to verify bio-based content, for example through digital tools or QR-coded product declarations, helps companies ensure credibility and meet customer expectations. Choosing CSLs that are recognised in public procurement frameworks or credible benchmarks maximises business value. In addition, the BIOBASEDCERT Monitoring Tool can support supply chain due diligence, help companies navigate multiple and overlapping labels, and provide comparability without ranking, thereby offering insight without undermining market diversity. Tailored certification strategies that reflect company-specific feedstocks, technologies and risks allow for a more efficient approach. Certification decisions should be informed by comprehensive assessments that combine environmental (LCA), social (S-LCA) and economic (LCC) perspectives.

Finally, businesses should plan for market advantages more explicitly. Certification can open doors to green public procurement, support ESG reporting, and allow companies to claim price premiums in niche markets. Life cycle costing, including environmental externalities, helps firms identify strategies that are not only economically viable but also ecologically sound. Transparent benefit-sharing arrangements further support fair distribution of added value along certified supply chains.

Overall, these measures enable businesses to reduce uncertainty, expand market opportunities and use CSLs as instruments for long-term transformation and competitive advantage in the bio-based economy.

Key challenges and related recommendations for Businesses, elaborated in Star4BBS project, are listed in Table 2.

Table 2: Key Challenges and Recommendations for Businesses

Challenges:	Recommendations:
High complexity and cost of certification, especially for SMEs	- Join group certification models or seek simplified audit formats to reduce costs and complexity, particularly for SMEs.
Difficulties integrating sustainability indicators into business strategies	- Integrate sustainability metrics (e.g. LCA, circularity) into internal reporting and procurement to enhance accountability and competitiveness, as a baseline for business strategy. - Understand certification as the strategic investment it is, not just a compliance cost, as long-term sustainability and market access benefits outweigh marginal fees.
Lack of transparency on CSL benefits and impact	- Develop internal traceability systems (e.g. digital tools) to verify bio-based content and ensure certification compliance. - Select CSLs recognised in policy, public procurement or credible benchmarks to ensure alignment with market and regulatory expectations. - Implement tailored certification strategies that reflect your specific feedstocks, technologies, and sectoral risks (e.g. EN 18027-based tools). - Base certification decisions on comprehensive life-cycle assessments (LCA), including social (S-LCA) and economic (LCC) aspects. - - Use the BMT to support supply chain due diligence, navigate overlapping labels, and provide comparability without ranking.
Unclear market advantages (e.g. price premiums, procurement incentives)	- Account for price premiums in financial planning and advocate for transparent distribution of added value in certified supply chains. - Use life cycle costing including environmental externalities to identify economically and ecologically optimal strategies.

2.3 Certification Schemes and Labels

The STAR4BBS project identified several challenges that hinder the effective use of CSLs in the development of a competitive and sustainable European bio-based sector (Table 3).

There is a high degree of variability in the requirements of different sustainability standards. This is not surprising given the differences in the scope of the CSLs (including sector, geography and stage in the supply chain) but is also strongly linked to the absence of a clear regulatory framework for the bio-based sector. Without a consistent policy driver, such as the Renewable Energy Directive in the energy sector, companies and policymakers face difficulties in determining which sustainability criteria to prioritise. Over time, as regulation for the European bio-based sector becomes more defined, CSLs that are closely aligned with policy requirements will gain importance, supporting harmonization, potential recognition between schemes, and a more coherent pathway toward the bioeconomy.

In addition to harmonisation in existing sustainability criteria, the STAR4BSS project has identified the need to **increase the coverage in some sustainability aspects of high priority in Europe, particularly circularity**. Very few CSLs include criteria on cascading use and end-of-life treatment. Other areas needing more attention include social aspects such as food security and labour rights, as well as biodiversity. CSLs that expand their coverage in these areas would be seen as more comprehensive.

The STAR4BSS project recommends that CSLs move towards outcome-based criteria and more alignment on performance monitoring methodologies. Greenhouse gas (GHG) emissions are a top EU priority but related criteria (and methodologies for monitoring and reporting) were highly inconsistent across the CSLs analysed during the project. For GHG emissions, STAR4BBS recommends aligning to the robust methodologies used in global frameworks such as the Product Environmental Footprint (PEF), the Greenhouse Gas Protocol or SBTi. For circularity, CSLs should consider adopting existing indicators, like the Bioeconomy Utilisation Framework (BUF)[4], the Circular Footprint Formula[5], or the Ellen MacArthur Foundation's (EMF) Circulytics[6]. CSLs should seek to adopt life cycle assessment principles as much possible, and enable certification not only for dedicated bio-based, but also for bio-attributed feedstocks, enabling flexibility, market access and smoother transition pathways.

STAR4BBS also recommends CSLs to pay attention to how their systems are governed, how their standards are developed and revised, the type of assurance system in place, and the role of independent oversight bodies, as these elements are crucial for ensuring credibility and trust. Benchmarks of CSLs often assess the credibility of these operational practices, and the BIOBASEDCERT Monitoring Tool co-developed by STAR4BSS is no exception. Alignment with the ISEAL Code of Good Practice is recommended.

[4] **Bioeconomy Utilisation Framework (BUF):** BUF is a framework designed to evaluate the cascading use and overall efficiency of biomass in bio-based value chains.
[5] **Circular Footprint Formula:** The Circular Footprint Formula is an EU-recommended methodology for quantifying circularity and end-of-life performance of products.
[6] **Ellen MacArthur Foundation's (EMF) Circulytics:** Circulytics is a tool developed by EMF to measure the circular economy performance of companies and products.

Beyond benchmarking, CSLs can actively use the BIOBASEDCERT Monitoring Tool as an internal improvement instrument. The BMT allows scheme owners to evaluate their system architecture, identify blind spots (e.g. traceability gaps, oversight mechanisms, claims governance), and prepare for regulatory engagement. The STAR4BBS testing showed that CSLs benefit most when they engage early and transparently in benchmarking as a cooperative process, rather than treating it as a narrow compliance check.

Transparency is critical. CSLs should implement regular evaluations using tiered assessment models that involve third-party input. Contributing data to tools like the BIOBASEDCERT Monitoring Tool enhances comparability and policy alignment. Active participation in platforms such as the BIOBASEDCERT Roundtable fosters collaboration, harmonisation of methodologies, and shared learning among scheme owners.

Finally, administrative complexity and high costs remain barriers, particularly for smaller economic actors. Modular certification models, simplified audits, and digital tools can lower entry barriers and increase accessibility. By adopting these improvements, CSLs can become more effective, inclusive, and scalable, ultimately reinforcing their role in supporting a transparent and high-impact bio-based economy in Europe.

Key challenges and related recommendations, as elaborated in Star4BBS project, are listed in Table 3.

Table 3: Key Challenges and Recommendations for CSLs

Challenges:	Recommendations:
Lack of harmonisation, transparency and alignment with key sustainability themes	- Align schemes with core European sustainability criteria, guided by frameworks such as the ISEAL Code of Good Practice - Use impact-based, LCA-aligned indicators to support robust benchmarking and comparability across CSLs. - Improve consumer communication through harmonised labelling, storytelling, and visual tools.
Gaps in indicator set – in particular for circularity, end-of-life and social indicators	- Identify indicators that help to capture circularity, cascading use and end-of-life (e.g. based on BUF, Circular Footprint Formula or EMF's Circulytics). - Expand social sustainability coverage, including food security, biodiversity, and labour rights, in certification core criteria. - Support transparency by integrating basic cost-benefit guidance or standard templates for economic impact assessment. - Provide indicators & methodology that allows both dedicated bio-based as well as bio-attributed solutions.
Weak outcome/impact measurement and limited improvement incentives	- Report regularly on scheme performance using a tiered evaluation model with independent validation. - CSL owners should commit to reviewing and updating their schemes (provide data to the BMT) every 3–5 years, including input from independent third-party stakeholders.
Diverse assurance rules and inconsistent data availability	- Increase transparency on governance, claims, and traceability, ensuring information is accessible to all stakeholders. - Collaborate via harmonisation platforms (e.g. BIOBASEDCERT Roundtable) to align methodologies and share learning.
Blind spots in governance, traceability, and assurance	- Use the BMT as a structured framework to evaluate system architecture, identify blind spots (e.g. traceability gaps, oversight mechanisms, claims governance), and prepare for regulatory engagement. - Engage early and transparently in benchmarking, benefiting from cooperative dialogue and continuous improvement rather than narrow compliance checks
High complexity and cost of certification, especially for SMEs	- Lower barriers for smallholders and SMEs through modular compliance models, simplified audits and digital tools

3 Conclusions

The STAR4BBS project has shown that certification schemes and labels are a cornerstone for advancing a sustainable and circular bio-based economy in Europe. They provide independent assurance, build consumer trust, and support compliance with EU sustainability objectives. At the same time, the project has revealed persistent challenges that require further attention: fragmented sustainability criteria, inconsistent monitoring practices, high costs for SMEs, and limited alignment between certification systems and policy frameworks. Without targeted action, these barriers risk slowing down the sector's transition.

To address these challenges, STAR4BBS developed a comprehensive set of recommendations for three central stakeholder groups. **Policymakers and governments** are called upon to firmly embed CSLs into regulatory and economic frameworks. This means recognising robust schemes in legislation, linking them to procurement and incentive schemes, and defining EU wide sustainability criteria to reduce fragmentation. Enhancing data infrastructures such as harmonised customs codes and traceability systems will improve monitoring of certified trade flows, while targeted support for SMEs through simplified certification processes, technical guidance, and financial instruments is essential to ensure inclusiveness across the bio-based economy. All of this should be implemented in a careful balance that enables, and not just validates, all bio-based solutions.

While policymakers set the framework conditions, **businesses** carry a decisive role in operationalising sustainability along value chains. Certification should not be seen as a mere compliance cost but as a strategic investment. Group certification models and simplified audits can reduce the administrative burden, particularly for SMEs. By integrating sustainability metrics such as life cycle assessment (LCA), social LCA (S-LCA), and life cycle costing (LCC) into procurement, product development, and reporting, companies can strengthen accountability and competitiveness. Transparent internal systems for traceability and alignment with recognised schemes further build credibility and unlock opportunities in green public procurement and ESG driven investment.

Certification schemes and labels themselves must also evolve to remain relevant and impactful. They should broaden their criteria to better capture circularity, biodiversity, and social dimensions such as food security and labour rights. Outcome based monitoring aligned with international methodologies like the GHG Protocol, SBTi, or additional indicators, e.g. on circularity, will enhance comparability and policy relevance. Equally, the inclusion of both dedicated bio-based and bio-attributed approaches within certification frameworks will help accelerate market acceptance and investment in sustainable biomaterials. At the same time, governance transparency, cooperative benchmarking through the BIOBASEDCERT Monitoring Tool, and lower entry barriers via modular, digital, and simplified certification solutions will make CSLs more inclusive and effective.

Together, these recommendations provide a roadmap for improving the credibility, accessibility, and harmonisation of CSLs. Policymakers gain reliable instruments for translating EU sustainability goals into practice, businesses acquire tools to strengthen

competitiveness and resilience, and certification schemes become more transparent, impactful, and inclusive.

By implementing these measures, CSLs can evolve from fragmented instruments into catalysts for systemic change. They will accelerate the transition to a resilient, fair, and sustainable European bioeconomy and contribute directly to overarching EU policy goals, including the European Green Deal, the Circular Economy Action Plan and the EU Bioeconomy Strategy.

4 Appendix

4.1 Appendix – Challenges, Recommendations, Quotes and Sources by Stakeholder Group

This appendix consolidates the detailed evidence base that underpins the recommendations presented in the main report.

It brings together the key challenges, recommendations, quotes and sources identified in STAR4BBS, structured by stakeholder group (policymakers, businesses, CSLs). Each quote is directly linked to its original source, ensuring transparency and traceability.

The tables provide a comprehensive overview and serve as a reference for further analysis, policy design and stakeholder dialogue. They complement the Executive Summary and recommendations by documenting the underlying research results in a systematic format.

Table 4: Key Challenges and Recommendations for Policy Makers and Governments with supporting quotes and sources

Challenges	Recommendations	Work Package	Quote	Source
Lack of harmonisation and transparency	Adopt a benchmarking instrument for comparing CSLs across sectors – the web-based version of the BIOBASEDCERT Monitoring Tool might be a valid option to assess scheme compliance with EU sustainability requirements	WP1/WP4	"Certification Schemes (SCS) and labels can help verify sustainability claims and promote transparency and accountability, but lack of harmonization and transparency can create confusion and increased costs for businesses and consumers."	STAR4BBS D1.1 Report on policy sustainability targets; Cluster Policy Brief – Final Policy Brief of the BIOBASEDCERT Project Cluster
Fragmented sustainability criteria	Identify EU-wide sustainability criteria for biomass used in bio-based products, building on the existing criteria in place (e.g. RED).	WP1/WP3	"Existing schemes and labels tend to overlook various crucial aspects when assessing sustainability, including end-of-life options and circularity [...] and social and economic impacts [...] Higher transparency, robustness and harmonization of SCS and labels are therefore needed, providing a holistic and accurate level of assurance and sustainability coverage."	STAR4BBS D1.4 Report on existing monitoring schemes
			"The BMT enables a comprehensive assessment of CSLs, from the way they operate (system level), the sustainability performance they require for certification (content level), and how they monitor change overtime (outcome level). The BMT was specifically designed around EU sustainability goals and priorities."	STAR4BBS D3.4 Sustainability requirements for the monitoring system
			"The majority of requirements from certification schemes are not aligned with LCA methodology, i.e. they are not LCA indicators or do not require	STAR4BBS D3.2 Report on additional indicators of monitoring system

			an impact assessment through the use of LCA indicators."	
			"The economic dimension was almost not considered in the certification standards..."	STAR4BBS D3.2 Report on additional indicators of monitoring system
Disconnect between sustainability ambitions and policy instruments	Promote bio-based value chains through market-pull measures like quotas or tax incentives, linked to sustainability criteria. Encourage integration of certification into public procurement criteria, ensuring only credible, robust CSLs are rewarded.	WP1	"Notably, most (policy targets) can be considered general and/or are not legally binding. The few specific policy targets were mostly related to energy, ..."	STAR4BBS D1.1 Report on policy sustainability targets
Data gaps, inconsistent monitoring of trade flows and certification	Introduce a harmonised EU classification and reporting system for bio-based and certified products. Harmonise customs coding and reporting systems to capture certification status, sustainability indicators, and enable better tracking of certified trade flows in collaboration with customs and statistical authorities. Explore anonymised disclosure of key social indicators to strengthen S-LCA and improve transparency in reporting. – –	WP2/WP5	"The trade volume of bio-based products and the extent of sustainability certifications remain inadequately monitored. Policymakers are encouraged to incentivise the systematic tracking of trade flows and certification levels. Collaboration with customs authorities and statistical agencies to introduce differentiated HS/CN codes for bio-based products would facilitate improved monitoring."	Cluster Policy Brief – Final Policy Brief of the BIOBASEDCERT Project Cluster
			"The approach and methodology developed to collect volumes of biogenic feedstocks shows that a standardised approach to quantifying production and trade figures is not possible. [...] For many feedstocks, especially residues, data are not available in common databases. [...] Harmonisation of data from multiple sources and plausible assumptions are key."	STAR4BBS D2.1 Concept and methodology for collecting volumes of biogenic feedstock
			"Companies were unwilling to disclose this kind of data..."	STAR4BBS D5.2 Report on assessment of techno-economic costs and

				benefits and integrated life cycle costing
Reliance on biomass imports	Support domestic value chains from bio-based feedstocks into bio-based products and materials. Establish clear rules for certification of imported biomass & derived products to ensure a level-playing field between imported and domestic biomass and derived products. Investigate monitoring of CSLs impact on trade and competitiveness.	WP2	"Key findings show that the EU is heavily dependent on imports for many bio-based raw materials, with major global producers such as China, India, Brazil, Indonesia and the US playing a key role. […] However, data limitations prevent a comprehensive assessment of individual feedstocks and products."	STAR4BBS D2.4 Report on volumes of biogenic feedstocks and bio-based products and material
Limited support for SMEs	Support SMEs via funding, simplified certification tiers, and technical guidance, especially in low-margin sectors.	WP2/WP5	"Smaller firms and smallholder farmers often face greater challenges in achieving and maintaining certification due to higher relative costs and limited access to the necessary resources and training."	STAR4BBS D2.5 Impact assessment of SCS on market access and trade
			"The burden of certification is typically higher for small-size companies, including high investment costs, market uncertainty, price volatility and perceived lack of economic benefits."	STAR4BBS D5.2 Report on assessment of techno-economic costs and benefits and integrated life cycle costing
Lack of transparency on certified content in supply chains	Businesses could be requested or incentivized to disclose the percentage of certified and bio-based content in product documentation and digital declarations. Establish clear, transparent rules on bio-attributed content to ensure openness and inclusion of the concept of mass balance and attribution.	WP5	"Incorporating questions on bio-based content and certification into material shipment and trade documents would enhance data accessibility and reliability, benefitting industries and countries alike."	Cluster Policy Brief – Final Policy Brief of the BIOBASEDCERT Project Cluster

Table 5: Key Challenges and Recommendations for Businesses with supporting quotes and sources

Challenges	Recommendations	Work Package	Quote	Source
High complexity and cost of certification, especially for SMEs	Join group certification models or seek simplified audit formats to reduce costs and complexity, particularly for SMEs.	WP2/WP5	"Smaller firms and smallholder farmers often face greater challenges in achieving and maintaining certification due to higher relative costs and limited access to the necessary resources and training."	STAR4BBS D2.5 Impact assessment of SCS on market access and trade
			"The certification-related challenges encountered by smaller companies include high investment costs, market uncertainty, price volatility, and perceived lack of economic benefits."	STAR4BBS D5.2 Report on assessment of techno-economic costs and benefits and integrated life cycle costing
			"Even though certification fees and audit costs represent a relatively minor share for total firm costs, the technical adaptation costs can be substantial – especially for smaller-scale firms."	STAR4BBS D5.2 Report on assessment of techno-economic costs and benefits and integrated life cycle costing
Difficulties integrating sustainability indicators into business strategies	Integrate sustainability metrics (e.g. LCA, circularity) into internal processes and procurement to enhance accountability of companies, as a baseline for business strategies.	WP3/WP5	"Integrating sustainability metrics (e.g. LCA, circularity) into internal processes enhances accountability and helps businesses align with EU policy and certification expectations. However, most certification schemes perpetuate-based rather than impact-based, limiting their strategic utility."	STAR4BBS D3.2 Report on additional indicators of monitoring system
			"The economic dimension is also crucial: Smallholders typically operate with narrow financial margins, making it difficult for them to invest in advanced technologies, monitoring	STAR4BBS D3.4 Sustainability requirements for the monitoring system

			tools, or agricultural practices that don't offer immediate economic returns."	
			"Even though certification fees and audit costs are relatively small, certification should be viewed as a long-term strategic investment rather than a mere compliance cost."	STAR4BBS D5.2 Report on assessment of techno-economic costs and benefits and integrated life cycle costing
Difficulties integrating sustainability indicators into business strategies	Integrate sustainability metrics (e.g. LCA, circularity) into internal processes and procurement to enhance accountability of companies, as a baseline for business strategies.	WP3/WP5	"Integrating sustainability metrics (e.g. LCA, circularity) into internal processes enhances accountability and helps businesses align with EU policy and certification expectations. However, most certification schemes perpetuate-based rather than impact-based, limiting their strategic utility."	STAR4BBS D3.2 Report on additional indicators of monitoring system
			"The economic dimension is also crucial: Smallholders typically operate with narrow financial margins, making it difficult for them to invest in advanced technologies, monitoring tools, or agricultural practices that don't offer immediate economic returns."	STAR4BBS D3.4 Sustainability requirements for the monitoring system
			"Even though certification fees and audit costs are relatively small, certification should be viewed as a long-term strategic investment rather than a mere compliance cost."	STAR4BBS D5.2 Report on assessment of techno-economic costs and benefits and integrated life cycle costing
Lack of transparency on CSL benefits and impact	Develop internal traceability systems (e.g. digital tools) to verify bio-based content and ensure certification compliance. Select CSLs recognized in policy, public procurement or credible benchmarks for alignment with market and regulatory expectations. Implement tailored	WP3	"Voluntary sustainability certification schemes and labels (CSLs) can be important tools in the transition towards a circular bioeconomy. However, economic actors are often overwhelmed by the high number of CSLs and their different approaches	STAR4BBS D3.4 Sustainability requirements for the monitoring system

	certification strategies that reflect your specific products, technology, and sectoral risks (e.g. EN 16757-based tools). Strengthen communication of CSLs' comprehensive effects (environmental, social, LCA).		they use, and it is well known that CSLs vary significantly in terms of their robustness and effectiveness."	
			"Most certification schemes focus primarily on sustainable performance through a practice-based approach [...] Few schemes are aligned with LCA methodology or use impact-based indicators, which limits their effectiveness for strategic integration and communication of benefits."	STAR4BBS D3.2 Report on additional indicators of monitoring system
			"The evidence base shows significant knowledge gaps in terms of specific certification schemes and labels, most sectors and products, and most parts of the lifecycle. These deficiencies represent a missed opportunity to acknowledge/log impacts of certification on GHG emissions."	STAR4BBS D3.1 Report on impact and contribution of existing CSLs
Under market advantages (e.g. price premiums, procurement incentives)	Account for price premiums in market strategies but avoid over-reliance; prioritise certification models that support economically and ecologically optimal strategies.	WP5	"Therefore, if price premium is particularly important, in general a price premium constitutes a highly significant parameter [...] but in all cases associated with common industrial practice is highly influential for the benefit of products with some shortfall without a premium."	STAR4BBS D5.2 Report on assessment of techno-economic costs and benefits and integrated life cycle costing
			"The acquisition of a price premium is one of the main motives for certification. [...] However, variability and context-specific factors make it difficult to rely on premiums as a consistent driver."	STAR4BBS D5.2 Report on assessment of techno-economic costs and benefits and integrated life cycle costing

		“The LCC assessment leads to the elucidation of the broader sustainability impact of certification. While product-level studies show lower external environment costs, the overall effect was always a lower, highlighting the need for integrated economic and ecological evaluation.”	STAR4BBS D5.2 Report on assessment of techno-economic costs and benefits and integrated life cycle costing

Table 6: Key Challenges and Recommendations for CSLs with supporting quotes and sources

Challenges	Recommendations	Work Package	Quote	Source
Lack of harmonisation, transparency and alignment with key EU sustainability themes	Align schemes with core European sustainability goals, guided by frameworks such as the ESA Code of Good Practice. Use impact-based LCA-aligned indicators to support robust benchmarking and comparability across CSLs. Improve consumer communication through harmonised labelling, storytelling, and visual tools.	WP1/WP3	"However, the rapid proliferation of the certification schemes and labels tends to questioning their effectiveness and robustness [...] In addition, existing schemes and labels tend to overlook various crucial aspects when assessing sustainability, including end-of-life options and circularity [...] and social and economic impacts."	STAR4BBS D1.4 Report on existing monitoring schemes
			"Most certification schemes are not aligned with LCA methodology and rely on practice-based rather than impact-based approaches [...] This limits their ability to support strategic decision-making and policy development."	STAR4BBS D3.2 Report on additional indicators of monitoring system
			"The environmental and social dimensions were the most assessed [...] while the economic and circularity indicators were underrepresented. Harmonised communication tools, storytelling, and visual elements can improve consumer understanding and trust."	STAR4BBS D3.2 Report on additional indicators of monitoring system
			"The environmental and social dimensions were the most assessed among the certification standards (46%–42%), followed by sustainable governance (11%) and circularity (9%). The economic dimension was almost not considered in the certification standards."	STAR4BBS D3.2 Report on additional indicators of monitoring system

			"Circularity analysis had the fewest examples in the literature [...] This is a more recent type of assessment compared to environmental and social sustainability."	STAR4BBS D1.1 Report on sustainability indicators for the monitoring and Life Cycle Assessment
Gaps in indicators – in particular circularity, end-of-life and social indicators	Identify indicators that help to capture circularity, cascading use and end-of-life, based on RED II, Circular Economy Action Plan, etc. Expand sustainability assessment scope beyond environmental dimensions by integrating basic socioeconomic and social indicators for economic impact assessment.	WP3/WP5	"Although most economic models have been limited for assessing social sustainability, the research also faces evidence of a paucity. Challenges include lack of standardised methodology and difficulty collecting primary data."	STAR4BBS D1.1 Report on sustainability indicators for the monitoring and Life Cycle Assessment
Weak outcome / impact measurement and limited improvement incentives	Report regularly on scheme performance using a tiered evaluation model with independent validation. CSL owners should commit to reviewing and updating their schemes every 3–5 years, including input from independent third-party stakeholders. –	WP1/WP4	"The experience with existing benchmarking methodologies, such as the GSSI Global Benchmark Tool, demonstrates the importance of regular reviews and updates. Refining the framework criteria and reducing redundancy ensures the benchmarking process remains relevant and aligned with evolving sustainability priorities."	STAR4BBS D1.4 Report on existing monitoring schemes
			"To drive improvement in the schemes, the new monitoring systems should identify gaps and relevant requirements [...] Providing schemes with clear guidance on identifying areas for improvement will facilitate their sustainability journey."	STAR4BBS D1.4 Report on existing monitoring schemes
Diverse assurance and inconsistent data availability	Enhance transparency on governance, claims, and traceability, making information accessible to all stakeholders. Collaborate via harmonisation platforms (e.g. BIOBASEDCERT tool) to align methodologies and share learning.	WP1/WP4	"Some schemes rely on the minimum country level regulations or national legal systems. Hence these certification schemes follow different criteria depending on the country, making it difficult to have homogenous international criteria."	STAR4BBS D3.1 Report on existing international and EU SCS and tests for feedstock and bio-based materials & products

			"The availability and accessibility of data plays a significant role in the effectiveness of benchmarking methodologies. Highlighting the need for continuous data management and harmonisation."	STAR4BBS D1.4 Report on existing monitoring schemes
			"The new monitoring systems should collaborate via harmonisation platforms like BIOBASEDCERT Benchmark Tool to reduce redundancies and share learning."	Cluster Policy Brief – Final Policy Brief of the BIOBASEDCERT Project Cluster
High complexity and cost of certification, especially for SMEs	Lower barriers for smallholders and SMEs through modular approaches, simplified audits and digital tools.	WP3	"Most of the minimum requirements identified in D3.3 involve monitoring, indicator calculations, and data plan development. These activities require specific technology, training, and financial support, which is especially beyond the reach of smallholders."	STAR4BBS D3.4 Sustainability requirements for the monitoring system
			"It can be concluded that future studies should focus on developing monitoring tools and practices, harmonise data sets, and reduce redundancies, through such as simplified consistent processes, training packages, and stakeholder input."	STAR4BBS D3.4 Sustainability requirements for the monitoring system
			"CSLs are encouraged to provide training on applicable circular strategies such as waste management [...] This might require the design of simplified, low-cost monitoring tools to collect the necessary data."	STAR4BBS D3.4 Sustainability requirements for the monitoring system

4.2 BIOBASEDCERT Monitoring Tool (BMT)

The following section is reproduced and adapted from the Final Policy Brief of the BIOBASEDCERT Project Cluster[7]. While the BMT (BIOBASEDCERT Monitoring Tool) has already been introduced in the main body of this report, this appendix provides a more detailed description of its purpose, levels, and application.

The aim is to give readers an in-depth understanding of the BMT's structure, target audience, and testing process, complementing the summary presented earlier. This extended description also includes insights from the cluster-wide stakeholder engagement and the collaborative Roundtable Platform, which were central to the tool's development and validation.

4.2.1 Purpose and Target Audience

The BMT was developed by the BIOBASEDCERT Cluster to address challenges such as confusion, divergence, and mistrust among stakeholders by creating a harmonised, overarching monitoring system. The tool provides coherence and clarity for policymakers while supporting the continuous improvement of CSLs. The BMT is intended to benefit various stakeholders, including EU policymakers, CSL owners, industry, civil society organisations, and researchers. For EU policymakers, the tool offers insights into the credibility and robustness of existing CSLs across markets, assesses how these CSLs contribute to EU sustainability priorities for the bioeconomy, and identifies CSLs that could fulfil regulatory requirements similar to RED III. For CSL owners, the BMT can support and incentivises them to improve their systems by identifying potential areas for improvement. The BMT could also facilitate the harmonisation of CSLs in terms of shared sustainability and governance criteria. Furthermore, the BMT is publicly accessible, enhancing its utility for groups such as civil society organisations and researchers. Its development included collecting stakeholder feedback through online workshops and in-person consultations. The tool aims not to compare CSLs but to conduct individual assessments, highlighting opportunities for CSL owners to enhance the ambition levels of their schemes. During the development process, two rounds of testing were conducted on in total nine CSLs, including seven certification schemes and two ISO 14024-compliant (Type I) ecolabels in close collaboration with associated CSL owners. These tests aimed to refine the tool's applicability, usability, and clarity while analysing the coverage of its requirements and deriving targeted recommendations for CSLs. The findings and recommendations were shared with the participating CSLs to encourage improvements in future standard revisions.

4.2.2 Description of the BMT Levels

The BMT comprises three distinct levels. Each BIOBASEDCERT project led the development of one of the levels: System Level (STAR4BBS), Content Level (SUSTCERT4BIOBASED), and Outcome Level (HARMONITOR). These levels assess the robustness, comprehensiveness and effectiveness of CSLs.

[7] For further information, please refer to the final policy brief of the BIOBASEDCERT Cluster. Joint Deliverable for HORIZON–CL6-2021-ZEROPOLLUTION-01-07. Output of the joint work of HARMONITOR (D1.2), STAR4BBS (D7.9) and SUSTCERT4BIOBASED (D5.3).

4.2.2.1 System Level

The System Level focuses on operational and procedural aspects of CSLs. It addresses four key categories: scheme governance and management, standard-setting, assurance, and traceability and claims. This level captures how a scheme is managed, evaluates the transparency and inclusivity of its standard-setting processes, assesses the reliability and independence of its assurance mechanisms, and examines the robustness of traceability and claims. Testing of this level revealed diverse practices among the assessed CSLs, with many demonstrating mature governance and assurance frameworks. However, differences were noted in transparency, stakeholder input, and documentation of traceability and claims. Ecolabels often relied on external certifications for assurance, limiting internal procedural details available for assessment. Recommendations included formalising multi-stakeholder participation, strengthening oversight mechanisms, and enhancing traceability and claim verification procedures.

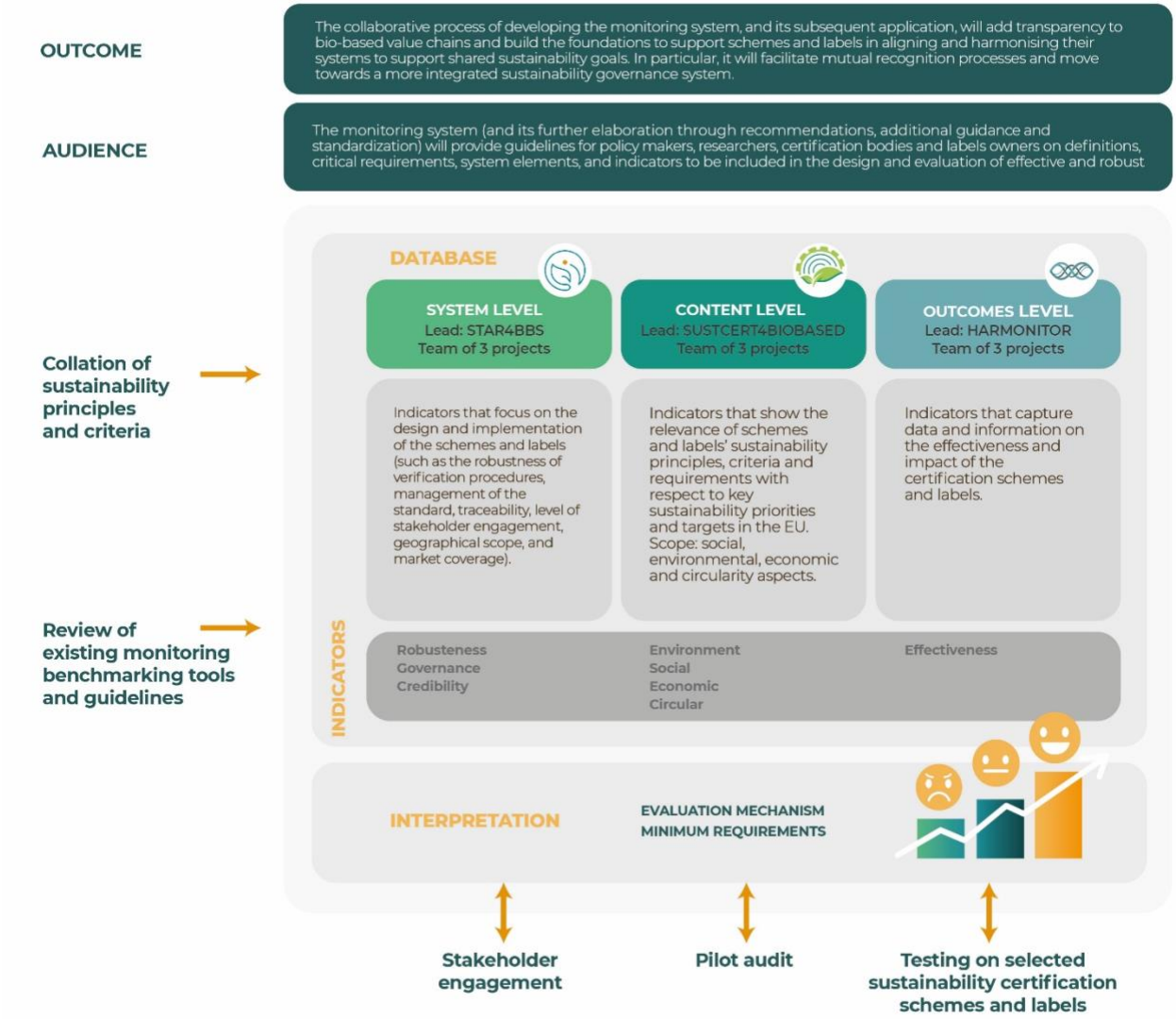
4.2.2.2 Content Level

The Content Level assesses sustainability criteria under four overarching categories/dimensions: environment, circularity, social, and economic. Requirements are classified into mandatory, basic, and advanced levels. Mandatory requirements are those requirements expected to be covered currently by existing, credible schemes. They align with current legislation and established sustainability protocols, while basic requirements provide more prescriptive details, and advanced requirements are aspirational goals for continuous improvement. Applicable feedstocks and value chains actors are defined for each requirement to ensure the assessment remains relevant for the scope of each CSL. A significant challenge in designing this level was accommodating both sustainability certification schemes and ISO 14024-compliant ecolabels, which differ in scope and requirement phrasing. Ecolabels mostly refer to third-party sustainability certifications like RSPO, FSC, and Bonsucro to ensure the sustainable sourcing of biomass. Social and economic aspects, other than consumer wellbeing, are generally outside the scope of ecolabels. Testing revealed high coverage of mandatory requirements among CSLs. The coverage of basic requirements varied significantly between the different CSLs, while most advanced requirements were found to be scarcely covered, as expected. Tested CSLs demonstrated strong coverage in Environmental and Social dimensions but had less focus on Circularity and Economic aspects. Recommendations for the Environmental dimension include more explicit requirements on GHG emission reporting, renewable energy use and energy use efficiency. For the Social dimension, it is advised to more explicitly address fair contract practices, the provision of social security benefits, and maternity leave. Regarding the Circularity dimension, it is recommended to include requirements beyond waste management, such as reuse or recycling of residual flows, resource efficiency, and, for bio-based end products, designing products for high-quality recyclability and incorporating product-life extension strategies. For the Economic dimension, CSLs are advised to implement more specific requirements on business plans and economic risk management.

4.2.2.3 Outcome Level

The Outcome Level assesses the effectiveness of a scheme's requirements and outcomes based on provided data and evidence from literature. This involves benchmarking, interviews with CSL owners, and structured analysis to evaluate whether CSLs yield positive, neutral, or negative impacts. Indicators were adapted to

each CSL type (certification schemes or ecolabels), ensuring fair and relevant comparison. Testing revealed varied coverage of outcome-level indicators and impact monitoring practices. While CSLs generally strive for continuous improvement through standard updates informed by certificate holder performance, stakeholder input, and evolving policy priorities, ecolabels focus on hotspot analyses to target areas with the highest potential for environmental gains. Increasing attention is being paid to outcome monitoring, particularly regarding greenhouse gas emissions in supply chains, with some schemes integrating data verification into audit procedures. However, many CSLs report performance indicators (e.g. number of certified operators) rather than measurable sustainability outcomes. Data availability remains a key barrier, with single-crop or long-established schemes reporting more detailed progress than multi-crop schemes and ecolabels because of greater complexity and data gaps. Confidentiality concerns often limit analytical depth, especially in areas with few certificate holders. Regular evaluation of long-term sustainability impacts also remains limited. Independent studies are typically restricted to specific commodities and geographical areas or larger, more established schemes. Recommendations include investing in digital infrastructure, strengthening data-sharing mechanisms, and collaborating with research institutions and NGOs to enhance the measurement and communication of sustainability impacts.



4.2.3 Collaborative Roundtable Platform for Certification Schemes

The diversity of bioeconomy sectors, coupled with the crucial role of CSLs in supporting policy targets and addressing varying market and stakeholder demands, underscores the importance of close collaboration and continuous exchange among CSLs, policymakers, and other relevant stakeholder groups. Effective development and implementation of CSLs across the EU bioeconomy require such comprehensive engagement. To facilitate this collaboration, the BIOBASEDCERT cluster established a dedicated Roundtable Platform for CSLs and other relevant stakeholders. This Platform served as a forum for discussing proposed assessment tools, criteria, and indicators, as well as providing feedback and input on the BMT. Relevant trends and pertinent topics within the bio-based industries and sustainability certification domains were also explored. The Platform provided an informal structure for discussions on the design, market application, and adoption of CSLs.

4.2.4 Structure and Activities

The Platform incorporated approximately twelve certification schemes alongside various certification bodies and other entities. It hosted several meetings, each focused on a specific topic of interest, as determined by the inputs of the Roundtable participants. Key sessions included discussions on emerging trends in policies and

industries relevant to CSLs, as well as an in-person event with representatives from DG GROW, DG RTD, DG ENV, and DG CLIMA. These sessions explored the role of certification in future policy frameworks.

4.2.5 Achievements and Way Forward

The successful establishment of the collaborative Platform for CSLs received widespread recognition from the Roundtable members, who expressed strong support for its continuation beyond the conclusion of the BIOBASEDCERT projects. Currently, various options and concepts for extending the Roundtable, including a co-ownership model for CSLs, are under discussion among members. The development of this collaborative Roundtable Platform has proven instrumental in fostering dialogue and cooperation among stakeholders, ensuring the effective implementation of CSLs in the bio-based sectors. Moving forward, its continuation represents a promising opportunity to further strengthen policy and market integration within sustainability certification frameworks.

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