ADVANCE FUEL

Towards sustainable advanced biofuels

Context

Advanced biofuels are produced from feedstock such as wood residues, agricultural waste and other non-food biomass. Biofuels have seen rapid development over the past two decades decreasing fossil fuel use in road transportation, cutting greenhouse gas (GHG) emissions, mitigating climate change, and improving energy security; however, their development has stagnated in part due to sustainability concerns including environmental, social and economic impacts.[1]

This policy review addresses these concerns and the role of sustainability criteria to safeguard the sustainable production of advanced biofuels within the bio-based economy.

Sustainability criteria are essential for successful market roll-out

Advanced biofuels and other liquid renewable fuels produced from lignocellulosic biomass such as wood residues, agricultural waste and other non-food biomass could reduce pressure on agricultural commodity markets and lead to higher GHG savings than conventional biofuels produced from biomass. Nevertheless, they are not by definition more sustainable if not produced under the right conditions. Embedding sustainability criteria in policies, standards and certification systems is essential to safeguard the successful, sustainable production and development of advanced biofuels at commercial scale. Policy-makers and investors need assurance that environmental, social, and economic risks are addressed to support the development of a credible and accepted bioenergy supply.

Sustainability criteria and independent third-party certification are considered essential by policy-makers, industries and other private sectors to ensure sustainable production.

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Certification of biomass commodities is small and fragmented

Voluntary sustainability schemes were first developed in the 1990s for food and wood markets to address regulation shortcomings in globalising markets. By 2015, 26% of timber was certified while certification for agricultural commodities has remained substantially smaller, with sugar cane and soy below 4%.[2] The exception is crude palm oil, with 21% certified in 2017, resulting largely from the implementation of binding sustainability criteria and certification in the Renewable Energy Directive (RED I) (2009/28/EC) for biofuels used in transport and other liquid biofuels.

In the EU, biofuels for transport are certified under the RED I; yet these biofuels are still almost entirely produced from agricultural commodities or food wastes such as used cooking oil. Advanced biofuels produced from lignocellulosic biomass use similar feedstocks that are largely used today for electricity and heating (solid biomass). In contrast to liquid biofuels, the estimated market share of certified solid biomass is only around 3%. Solid biomass and biogas used in electricity and heat generation have so far been exempted from EU sustainability criteria. In the absence of harmonised EU requirements, national initiatives developed in countries importing solid biomass, mainly as wood pellets for industrial, large-scale energy generation, while other countries developed voluntary industrial initiatives. Differentiation between national criteria and certification rules could lead to complex certification procedures, high certification cost and barriers to the EU internal market.[3]

A functional, harmonised sustainability framework for solid biomass – regardless of its end-use – is important for the development of advanced biofuels.

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The Renewable Energy Directive recast (RED II), a step forward?

Main sustainability risks and criteria

The new sustainability criteria in the RED II[4] aims to address sustainability concerns that are insufficiently covered in the RED I and other regulations. Table 1 summarises the main risks associated with EU bioenergy consumption identified by the European Commission (EC)[5] and the associated sustainability criteria and other requirements in the RED II.

TABLE 1. **MAIN SUSTAINABILITY ISSUES AND RISKS OF BIOENERGY AND SUSTAINABILITY CRITERIA IN THE RED II**

Issues / risks	Sustainability criteria and other requirements
Sustainability issues and criteria in the RED II (almost exclusively environmental)	
Poor GHG emission performance of certain bioenergy pathways, due to:	
A) Supply chain GHG emissions, including emissions related to direct land use change, biomass cultivation, transport and processing	**Requirements of GHG emission savings:** At least 65% for biofuels, biogas consumed in the transport sector, and bioliquids produced in installations in operation from 1 January 2021; at least 70% for electricity, heating and cooling production from biomass fuels used in installations starting operation from 1 January 2021 until 31 December 2025, and 80% for installations starting operation from 1 January 2026.
B) Biogenic emissions related to changes in carbon stock, particularly in forest and soils	Carbon stock preservation, land criteria (no production on high biodiverse and high carbon stock land). LULUFC requirements and sustainable forest management (SFM) criteria for forest biomass
Indirect emissions related to displacement effects including ILUC	ILUC criteria, cap on food-based biofuels, phase out of high ILUC biofuels by 2030.
Impacts of biomass production on biodiversity, soil and water	Protection of water resources, air & soil, sustainable forest management (SFM)
Distortion of biomass trade due to diverging national sustainability schemes	Sustainability criteria are extended to electricity and heat sectors (small scale installations remain exempted). Harmonization requirements (for biofuels and bioliquids).
Other social and economic issues and risks not covered in RED II sustainability criteria	
Competition with non-energy end-use markets and land use	Land rights, Food price & security, resource efficiency
Working conditions	Workers' rights

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Binding sustainability criteria and voluntary schemes

To contribute to the renewable energy targets and to be eligible for EU support from 2021-2030, bioenergy must comply with the RED II sustainability criteria. Similar to the RED I, proof of compliance can be done through voluntary schemes that are approved by the EC or by reporting to national authorities, though national system options are rarely used. A voluntary scheme sets sustainability standards with indicators and their management; the certification is conducted by an independent organisation recognised by the voluntary scheme and covers the full supply chain – from feedstock to final product.

There are 14 voluntary schemes and one national scheme approved by the EC for proof of compliance with RED I sustainability criteria.[6] The new criteria for forest and agricultural biomass and broader coverage of end-use sectors with transport, electricity and heat in the RED II will require an adjustment of these voluntary schemes to the new requirements.

Towards effective and harmonised certification

The RED II sustainability criteria are minimum requirements addressing the main issues and risks related to bioenergy; this legal framework and the criteria are not expected to change in the coming years. However, voluntary schemes have the flexibility to include additional or stricter sustainability criteria. Based on stakeholder interviews, literature reviews and an evaluation of existing voluntary schemes and national legislation, a list of recommended sustainability criteria is provided in Table 2.

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TABLE 2. **ADVANCEFUEL'S RECOMMENDED SUSTAINABILITY CRITERIA FOR BIOENERGY**

Sustainability categories	Waste and residues	Agricultural biomass	Forest biomass	Compared to RED II
Environmental criteria:				
GHG emissions saving	•	•	•	Similar
Sustainable forest management			•	More stringent
Carbon stock preservation	•	•	•	More stringent
Biodiversity conservation		•	•	More stringent
Protection of air, soil and water	•	•	•	More comprehensive
Prevention of ILUC risks		•	•	Similar to definitions in the delegated ILUC regulation
Environmental category:				
Land use, land use change and forestry			•	Similar
Verification of sustainability compliance:				
Chain of custody	•	•	•	Similar
Risk-based approach			•	Additional
Socio-economic criteria: binding to imported feedstocks				
Labour rights	•	•	•	Additional
Land rights		•	•	Additional
Food security		•	•	Additional
Resource efficiency	Monitoring of efficient biomass use	Additional		

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Conclusions

Advanced biofuels demonstrate high GHG emission savings, indicate a low risk of causing ILUC and are less likely to compete directly for agricultural land used for the food and feed production. The promotion and deployment of advanced fuels play an important role in the decarbonisation of transport and the development of low-carbon transport technologies beyond 2020. A well-functioning sustainability framework with effective sustainability criteria and certification is essential to a successful market roll-out of advanced biofuels.

The new criteria in the RED II for forest and agricultural biomass and broader coverage of end-use sectors are important for the development of advanced biofuels that use similar types of feedstocks to biomass heating and electricity. Furthermore, advanced biofuels are often produced in multi-output biorefineries and could profit from a harmonised sustainability framework. During the transposition of the RED II to national policies and the update of voluntary schemes to the new requirements of the RED II, it is essential to recognise the importance of advanced biofuels as well as bio-based chemicals and new materials that are likely to become more prominent in the future.

For more information see the following ADVANCEFUEL reports:

- Review of existing standards and certification schemes
- Sustainability criteria & certification for lignocellulosic biorefineries

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References

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