Analytical Annex to the Common Biomass Sustainability Framework Consultation

Contents

Assessment of Costs and Benefits

Summary of Proposal

1. We are consulting to support the development of a common biomass sustainability framework. This annex explores the evidence on the expected impacts, costs and benefits of strengthening and making common minimum sustainability requirements for bioenergy that is subject to government incentive schemes.

2. An intervention of this type is out of scope of the Better Regulation Framework (BRF). The analysis in this document is intended to support engagement with the consultation and we invite respondents to provide any views or relevant evidence relating to this annex.

The Bioenergy Sector

Introduction

3. Biomass is defined as any material of biological origin (including the biodegradable fraction of products, wastes and residues). Biomass feedstocks can include purpose-grown biomass, biomass co-products, residual biomass and biogenic waste.

4. In 2024, biomass generated 10% of the UK's total energy supply across the power, heat and transport sectors. Around one third of biomass (by energy content) was imported. The majority of biomass used for bioenergy is supported by one or more government incentive schemes.

Types of biomass fuel used to generate bioenergy

5. Definitions of feedstocks and feedstock categories are set out in Chapter 2 of the accompanying consultation. To be used to generate bioenergy, feedstocks must be converted into fuels. Depending on their use, some feedstocks require little to no processing (for example, wood fuel can be burned in a domestic wood-burning stove) while others must undergo a range of conversion processes, such as pelletisation, anaerobic digestion, liquefaction, or advanced processes such as gasification. Some fuels (such as biomethane or liquid biofuels) may be produced using a wide range of different feedstocks.

6. Biomass fuels may themselves be used for a wide range of applications. They can be used to generate electricity or heat (including heat for industrial processes), or as transport fuels. Some fuels are used predominantly in one sector, while others can be used for multiple purposes. Table 1 shows the current usage of bioenergy fuels across the UK.

Table 1: 2024 biomass for bioenergy use across the UK[1] (energy content of fuel, TWh)

[1] Digest of UK Energy Statistics (DUKES): renewable sources of energy - GOV.UK Table 6.4

Usage	Source	Terawatt-hours (TWh)
Used to generate electricity	Solid biomass (plant[2] and animal)	71.2
	Biogas (landfill, sewage and anaerobic digestion)	20.9
	Biodegradable energy from waste	22.9
	Bioliquids	0.3
Used to generate heat	Solid biomass (wood, waste wood, plant and animal)	33.8
	Biogas (landfill, sewage and anaerobic digestion)	1.9
	Biodegradable energy from waste	1.7
	Bioliquids	0.1
Used as transport fuels	Bioethanol	10.3
	Biodiesel	16.0
	Aviation turbine fuel	3.2
	Other fuels	2.4
Biogas (biomethane) injected into the grid	Anaerobic digestion	6.7
	Sewage gas	1.2
Total		**192.5**

7. Biomass is a globally traded commodity, with the UK currently relying on both domestic and international biomass supply chains for its bioenergy. Of the fuels above, plant biomass (predominantly wood pellets) and liquid biofuels are the most reliant on imports. Table 2 shows the amount of each bioenergy fuel that was imported in 2024.

Table 2: 2024 imports of bioenergy fuels[3]

Fuel	Total supply (TWh)	% imported
Waste wood	3.5	0%[4]
Wood	12.0	10%
Plant biomass	86.6	56%
Animal biomass	2.8	0%

[2] Plant biomass includes wood pellets, straw, short rotation coppice energy crops, olive pellets, sunflower pellets, oat husks and peanut husks

[3] Digest of UK Energy Statistics (DUKES): renewable sources of energy - GOV.UK Table 6.1. Calculations are based on net imports (imports minus exports). The UK exports some waste wood, wood, plant biomass and liquid biofuels.

[4] The UK is a net exporter of waste wood

Anaerobic digestion	19.2	0%
Sewage gas	5.0	0%
Landfill gas	8.6	0%
Renewable waste	24.6	0%
Liquid biofuels	30.2	71%
Total	**192.5**	**36%**

Power

8. In 2024, 14.1% (40TWh) of the UK's electricity supply was generated by biomass, with plant biomass (including wood pellets), biogas and renewable waste being the predominant feedstocks[5]. There are around 2,000 biomass power stations, of which 19 are operated by major power producers[6].

9. Biomass electricity generation is currently supported through the Renewables Obligation (RO), Contracts for Difference (CfD), Feed-in Tariffs (FIT) and the Smart Export Guarantee (SEG). Some power stations are also required to report emissions as part of the UK Emissions Trading Scheme (UK ETS).

Heat (including biomass for industrial processes)

10. In 2024, 67% of renewable heat in the UK was generated using biomass (around 37TWh)[7]. Biomass used for heat includes both non-domestic large-scale biomass boilers and combined heat and power (CHP) schemes, and domestic heating such as small biomass boilers, liquid biofuel boilers, or domestic wood-burning stoves. Biomass can also be used to generate heat for industrial processes. Biogas from anaerobic digestion can be used to generate heat via CHP. For biomethane injected to the grid, see below.

11. Biomass heat generation is currently supported through the Domestic and Non-Domestic Renewable Heat Incentive (RHI)[8], and the Boiler Upgrade Scheme (BUS). Small amounts of biomass heat are also supported through the Industrial Energy Transformation Fund (IETF) and the Green Heat Network Fund (GHNF). Some installations using biomass for space heating or industrial processes may also be in scope of the UK ETS.

Transport fuels

12. In 2024, 7.7% of total road and non-road mobile machinery liquid fuel was renewable. The majority of this is made up of biodiesel and bioethanol, which are typically blended into diesel and petrol respectively. Waste feedstocks made up 77%

[5] Digest of UK Energy Statistics (DUKES): renewable sources of energy - GOV.UK Table 6.2
[6] Digest of UK Energy Statistics (DUKES): electricity - GOV.UK Table 5.11; Digest of UK Energy Statistics (DUKES): renewable sources of energy - GOV.UK Table 6.7
[7] Digest of UK Energy Statistics (DUKES): renewable sources of energy - GOV.UK Table 6.4
[8] Now closed to new applicants

of renewable fuel. 7% of all renewable fuel supplied to the UK was produced from UK-origin feedstocks.[9]

13. The majority of renewable transport fuel currently supplied in the UK is used in surface transport and supported by the Renewable Transport Fuel Obligation (RTFO). A small growing amount of aviation fuel was supported by the RTFO in recent years – from 2025 the SAF Mandate obligates the supply of an increasing amount of sustainable aviation fuel (SAF) in the UK aviation fuel mix.

Biomethane

14. Anaerobic digesters can use a variety of feedstocks, such as food waste, processing residues, agricultural residues, crops and sewage sludge to generate biogas. This may then be upgraded to biomethane for injection into the gas grid, representing 1% of total gas demand in 2024[10].

15. Biomethane production is supported by the Non-Domestic RHI[11] and the Green Gas Support Scheme (GGSS) to decarbonise heat. Biomethane is also eligible under the RTFO for use in the transport sector.

Bioenergy with carbon capture and storage (BECCS) and hydrogen

16. Bioenergy with Carbon Capture and Storage (BECCS) can be a carbon-negative technology that removes CO_2 from the atmosphere while producing renewable energy. There are currently no existing BECCS facilities storing CO_2 at commercial scale within the UK. There are various routes for deploying BECCS across different industries. Where these are supported by government, installations will need to comply with biomass sustainability criteria under their sector business model and the upcoming greenhouse gas removal (GGR) standard.

17. Biomass can act as a feedstock for hydrogen production through several pathways, including gasification and biogas reforming. There are currently no commercial-scale operational facilities using biomass to generate hydrogen. Future facilities may be supported under the Hydrogen Production Business Model.

Intersections between feedstocks, applications and government incentive schemes

18. The bioenergy sector is heterogeneous and covers a wide range of feedstocks and technologies. A single installation may span multiple sectors or be eligible for multiple incentive schemes – for example, an anaerobic digester could in theory have been eligible for support from several schemes including the RO, the RHI, the GGSS or the RTFO. Available data does not always make it possible to estimate how many installations may be supported by multiple incentive schemes.

19. A single installation may use one primary feedstock or several. Different feedstocks are subject to different sustainability requirements, meaning one installation may

[9] Renewable Transport Fuel Obligation (RTFO) statistics 2024: Fifth provisional release - GOV.UK
[10] Digest of UK Energy Statistics (DUKES): natural gas - GOV.UK Table 1; Digest of UK Energy Statistics (DUKES): renewable sources of energy - GOV.UK Table 6.4
[11] Now closed to new applicants

need to be familiar with and report against multiple sets of criteria, while others may only need to understand the criteria for a single feedstock.

20. A single installation may produce one output or several. For example, a biomass combustion-fuelled power station produces electricity only, while a CHP generator produces both heat and electricity. An anaerobic digester may produce a combination of heat, electricity or biomethane. Most biomass incentive schemes focus on one sector only.

21. It should also be noted that a single business may run multiple installations, in one or multiple sectors. In some cases, this may lead to administrative savings (for example, only needing to familiarise with an incentive scheme once), while for other tasks (such as collecting installation data) the savings are limited, as they must be done for each installation separately.

22. The UK Emissions Trading Scheme (UK ETS) sets a limit on emissions, creating a carbon price for the power sector, heavy industry and aviation. Currently under the UK ETS, sustainability criteria are applied to bioliquids, and it is expected that they will also be applied to solid and gaseous biofuels in due course. This means that a proportion of bioenergy installations who participate in other government incentive schemes will also be required to comply with UK ETS rules.

The future of the bioenergy sector

23. Bioenergy is expected to continue to play an important role in the UK's energy system, and we expect the overall demand for sustainable biomass to continue at similar levels into the 2030s to support decarbonisation targets set under the sixth carbon budget. However, the relative mix of biomass applications may begin to evolve as more nascent technologies such as BECCS, advanced aviation fuels, and biomass-derived hydrogen develop throughout the appraisal period.

Strategic Case for Intervention

Problem under consideration

24. Sustainable biomass is a low-carbon energy source that can be used across the economy to replace fossil fuels and deliver negative emissions. There exist a number of government incentive schemes to encourage its use where appropriate, including the Renewable Transport Fuel Obligation (RTFO), the Sustainable Aviation Fuel (SAF) Mandate, Contracts for Difference (CfD), and the Green Gas Support Scheme (GGSS).

25. There is no single internationally accepted definition of 'low carbon' or 'sustainable' biomass. In order for biomass to be considered sustainable, it must comply with the relevant **sustainability criteria** defined in scheme-specific legislation or contracts. Biomass incentive schemes within the UK use broadly similar sustainability criteria but vary in their exact requirements.

26. A 2021 Call for Evidence[12] and subsequent stakeholder engagement highlighted a need for **standardisation** across sectors, particularly in how life cycle greenhouse gas (GHG) emissions are calculated. Concerns were also raised around the nature of sustainable biomass, and **areas where sustainability criteria could go further** to minimise wider environmental and social harm from the biomass supply chain.

27. A National Audit Office report[13] in 2024 considered aspects of monitoring, reporting and verification (MRV) arrangements used in government incentive schemes, with a focus on the electricity sector. It recommended that government evaluate the **effectiveness of existing MRV arrangements**. In response, government undertook additional engagement to develop recommendations and improvements to MRV arrangements more broadly.

Rationale for intervention

28. Sourcing biomass unsustainably can lead to a range of social and environmental **negative externalities[14]**:

    - **Carbon emissions:** Although emissions associated with the combustion of biomass fuel are considered carbon neutral under global accounting rules, life cycle emissions could potentially exceed the savings from avoided fossil fuel use. This could occur if for instance the biomass is harvested unsustainably, or if supply chain emissions are high, leading to **carbon leakage** (where emissions are simply shifted elsewhere rather than reduced) and net carbon emissions.
    - **Environmental harm:** Unsustainable sourcing of biomass can lead to negative environmental consequences (such as water pollution or loss of biodiversity) through land use change, poor land management and overexploitation of land.

    Although existing biomass incentive schemes already have criteria that aim to minimise these negative externalities, the science is complex and evolving with respect to our understanding of the scale and nature of environmental impacts from biomass use. It will be important to ensure that criteria continue to reflect the latest evidence over time and are mitigating new or emerging risks.

29. Complex and variable sustainability criteria can lead to **information failure** and **distortion in market power**:

    - **Information failure:** a lack of transparency in sustainability data being publicly available and comparable between biomass feedstocks and applications leads to inefficient decision-making by government and industry, and undermines confidence in biomass sustainability.

[12] Role of biomass in achieving net zero: call for evidence - GOV.UK
[13] The government's support for biomass - NAO report
[14] Externalities: These occur when an activity imposes costs or produces benefits for economic agents not directly involved in the deal. For example, pollution not covered by regulation may be profitable for a perpetrator but impose real costs on others who are not directly involved in the market. Source: The Green Book (2022) - GOV.UK

- **Distortion in market power:** a single biomass feedstock may have many potential conversion routes that mean it can be used in multiple sectors of the economy (for example, energy crops may be converted into bioethanol for use in the transport sector, or undergo combustion to produce heat or electricity). A range of factors determine how biomass is allocated to an end-use. Existing policies use broadly similar sustainability criteria, but diverge to manage sector-specific risks. In addition, we expect to see new criteria emerge in the future to take account of new technologies such as BECCS. Where the same biomass feedstock is subject to different criteria depending on its application, this could inadvertently lead to market distortion, where certain sectors are able to benefit from advantageous sustainability criteria.

Implementing a minimum set of criteria that applies across all biomass applications will ensure that requirements (and performance against them) are clear and transparent to industry and the public, and that where policies decide to go further than the minimum, they are able to consider any potential market impacts.

Policy objectives

30. The objectives of the common framework are to:

    - Develop consistent biomass sustainability criteria and ensure effective delivery across different biomass applications in line with latest evidence.
    - Ensure government only supports biomass that meets sustainability criteria to support its net zero objectives.

31. These objectives will be achieved through the development of minimum sustainability criteria under the common framework taking into consideration a wide range of factors and **overarching principles** as set out in the consultation. These include:

    - Maximise carbon benefits from bioenergy use
    - Minimise wider environmental harm associated with bioenergy supply chains
    - Alignment with wider government objectives and policies for related sectors
    - Alignment with criteria used in other countries or regions e.g. EU Renewable Energy Directive (RED)
    - Deliverability
    - Costs to government, businesses and consumers

Preferred option and Theory of Change

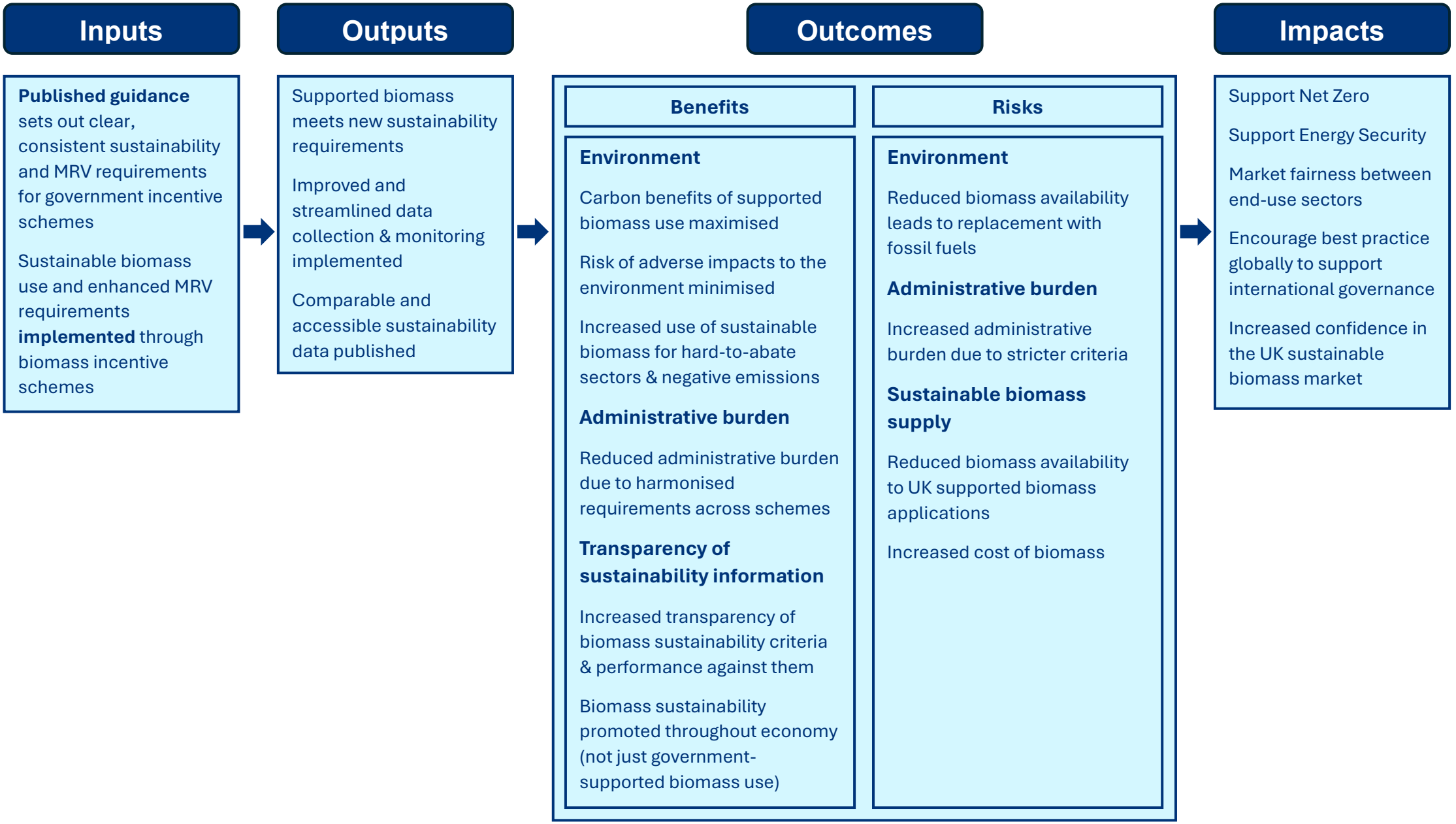
32. The preferred implementation option is to deliver the framework through a **policy document**, which would then be implemented by relevant biomass incentive schemes via an appropriate mechanism (which may be contractual or legislative). This ensures a prompt and clear direction of travel for industry and policymakers while incorporating flexibility and the ability to respond to latest scientific evidence.

33. The sustainability criteria set out in the common framework will be based on existing criteria that are already implemented in government incentive schemes, with changes made to harmonise between sectors and/or strengthen the criteria where required.

34. The Theory of Change below illustrates the logical process behind how the intervention is expected to lead to its final impacts. Impacts are dependent on a number of assumptions and risks relating to factors outside of the control of this policy intervention:

    - The future global supply and demand of biomass feedstocks are very uncertain but have a significant influence on whether the potential risks to biomass availability and costs are realised. These risks could have a negative influence on the impacts set out in the final column.
    - The number and ambition of future incentive schemes (which are subject to separate decisions) will define the overall magnitude of impact of the common framework compared to the counterfactual.
    - We assume that existing evidence allows government to set the criteria such that future incentive schemes will be able to implement the common sustainability framework to achieve positive environmental outcomes without leading to excessive administrative burden or other costs.
    - The availability of adequate skills and resourcing across government and industry is necessary to ensure the common framework is implemented effectively and can remain responsive to latest evidence.

Figure 1: Theory of Change



Policy Options Analysed

Implementation options considered

35. Implementation options are defined considering deliverability and enforceability. Biomass is an active area of policy development both in the UK and globally, with the EU recently updating its own sustainability criteria in the 2023 Renewable Energy Directive (RED III). Therefore, it is important that clarity is provided in a timely manner to ensure that sectors and industries can make investment decisions with confidence, while also allowing for future flexibility as the evidence base improves. At the same time, the framework implementation route should also ensure that its objectives are met in accordance with the overarching principles as set out above.

36. The consultation considers two options for implementing the common framework along with the counterfactual:

    - **Option 0:** Business as usual (do not implement a common framework)
    - **Option 1 (preferred):** Deliver the framework as a policy document
    - **Option 2:** Deliver the framework as legislation

37. **Option 0** (business as usual) constitutes the **counterfactual** (described in more detail below), where no common framework is developed, and existing and future biomass policies continue to implement similar criteria to those that currently exist.

38. **Option 1** (policy document) is preferred for the following reasons:

    - It is not subject to the extended timeframes required to implement primary legislation. Future updates would also not be subject to these extended timeframes and the document can therefore remain flexible and aligned with latest evidence.
    - Although Option 2 (legislation) would send a clear signal on enforcement, future policies that incorporate this framework will themselves either rely on legislation or contract to enforce the sustainability criteria and so legislating for the framework itself does not engender any additional benefit for bioenergy that is subject to government intervention.
    - Separate legislation would leave open the opportunity to extend the framework to bioenergy that is not subject to government incentive schemes, and could therefore support longer-term goals to introduce sustainability criteria to the unsubsidised market. However, extending the framework in this way would require the establishment of a new overarching regulator and in the meantime would slow down the implementation of the framework in the supported market, which covers the majority of bioenergy in the UK.

39. The proposed sustainability criteria themselves, and their implementation, do not differ substantially between Option 1 and Option 2 except in timing, and so analysis is not repeated for Option 2 at this stage. It may be assumed that any additional

delay caused by pursuing legislation would lead to reduced NPV figures (where impacts are quantified) due to discounting of costs and benefits.

Analytical Approach

Sectors in scope

40. The framework will initially apply to any biomass feedstocks used for government-supported bioenergy, including bioenergy with carbon capture and storage. This includes energy uses across the power, heat and transport sectors, and where biomass is used to produce other energy vectors such as hydrogen or biomethane. It will not apply to biomass for non-energy uses (such as biochemical production), nor to biomass that is not supported by government incentive schemes (such as logs for domestic wood-burning stoves).

Sustainability criteria

41. Sustainable biomass use in the UK is currently regulated through sector-specific bioenergy incentive schemes and policies, such as the Green Gas Support Scheme (GGSS) or the Renewable Transport Fuel Obligation (RTFO). Each scheme implements its own sustainability criteria and monitoring system. Although each scheme uses broadly similar criteria, there are increasing levels of divergence. The common framework will create shared minimum criteria that will apply to all supported bioenergy use.

42. Biomass sustainability criteria are defined as the **Land Criteria and the Greenhouse Gas (GHG) Criteria**. The land criteria relate to requirements around wider environmental protections associated with the sourcing of biomass feedstocks from land, including those relating to maintaining forest carbon stocks. The GHG criteria set out the requirements around the supply chain emissions associated with the production and use of the biomass feedstock.

43. The land and GHG Criteria are supported by **Monitoring, Reporting and Verification (MRV) Criteria**. These set out the requirements for businesses to demonstrate that they are meeting the land and GHG criteria.

Counterfactual and approach to analysis

44. For the purpose of this analysis, the assumed **counterfactual** to a common framework is not a complete absence of sustainability requirements for the businesses and activities in scope. Instead, we assume that existing and future biomass incentive schemes will continue to implement similar criteria to those that already exist in their relevant sectors. We assume that the common framework would, for certain sectors, result in a strengthening of sustainability requirements relative to what they would have been in the assumed counterfactual.

45. Therefore, this analysis looks to assess:

- the costs and benefits of harmonising future policy to use a common set of minimum sustainability criteria that apply to all supported bioenergy uses.
- the costs and benefits of strengthening certain sectors' criteria to meet the new minima, where these impacts are significant. It should be noted that the design of future incentive schemes and their proposed sustainability criteria are inherently uncertain.

46. As this is primarily an administrative change, the **appraisal period** is 10 years, beginning in 2028, allowing time for the publication and implementation of a policy document. Although the policy lifetime is likely to exceed 10 years, there are significant uncertainties as to which biomass support policies may be implemented in the future, and which updates may be made to the common framework. Any new policies or updates to this framework would require additional impact analysis in due course and so we do not attempt to capture this here.

Uncertainty and proportionality approach

47. As the framework will be implemented through future policies, many of which have not yet been fully developed and/or rely on nascent technologies, quantification of all impacts is subject to a large amount of uncertainty. In addition, the wide range of feedstocks and technologies in scope and the complexity of biomass supply chains means there is often insufficient data to quantify impacts across the bioeconomy.

48. We have taken a proportionate approach to this analysis and where possible have quantified impacts using high-level illustrative scenarios and assumptions. Some impacts were not possible to quantify and are discussed qualitatively in the "Non-Monetised Impacts" section.

Summary of Costs and Benefits

Channels of impact

49. There are three main channels of impact through which the common framework is expected to achieve the changes discussed above: harmonisation, changes to sustainability (land and GHG) criteria, and changes to monitoring, reporting and verification (MRV) criteria. Each of these, and a summary of their impacts, are discussed below.

Harmonising biomass sustainability criteria

50. There are many biomass incentive schemes in the UK. While sustainability criteria are broadly similar across schemes, there are differences between them. Some bioenergy operators are eligible for support from multiple schemes. Where a business participates in more than one scheme, or where a biomass supplier supplies to different businesses participating in a range of schemes, this could lead to some businesses needing to comply with multiple sets of criteria. **Harmonising the criteria** is expected to reduce the amount of administrative burden for these businesses. It also improves the transparency of the market and helps mitigate

market distortions (such as feedstock being diverted to end-use sectors based on more favourable sustainability criteria).

Changes to land and GHG criteria

51. The common framework proposes **changes to land and GHG criteria**. Some of these changes may not have immediate significant impacts, as it is common for operators to overachieve against existing criteria[15][16], and some changes are designed to avoid risks materialising in the future, rather than stopping existing practices. Where changes do have an impact, they may help to reduce carbon emissions and support other environmental benefits, such as improved biodiversity, both in the UK and globally.

52. It is also possible that changes will reduce the supply of biomass that is available to the UK. This could have impacts such as reduced use of biomass for bioenergy (which may be replaced by renewable or fossil fuel sources), and/or an increase in the cost of biomass feedstock. However, more sustainable use of biomass will ensure that in the long term, biomass supply can be maintained.

Changes to monitoring, reporting and verification (MRV) criteria

53. The common framework proposes **changes to MRV criteria**. While these changes will help facilitate the delivery of the benefits of the changes to the land and GHG criteria, and improve transparency in the biomass market, they could also lead to increased administrative burden on businesses and government.

Summary of impacts

54. Proposed changes to the land, GHG and MRV criteria are set out in full in the consultation. This analysis aims to assess the key impacts from the proposed changes to each criterion, as well as overall benefits of harmonising criteria across sectors. This is summarised in Table 4. Note that not all criteria are discussed in this analytical annex, such as those where the proposals do not recommend a significant change, or where proposals have been presented as a Call for Evidence.

55. It is expected that the common framework will deliver environmental benefits and improve the functioning of the bioenergy market within the UK, but there exist significant uncertainties outside of the influence of the framework that will affect the magnitude of any impacts. These are discussed at a high level in the Theory of Change (above) and in more detail in the discussion of individual costs and benefits (below).

56. Overall, monetised costs and benefits across the 10-year appraisal period are small, and do not represent the full range of expected impacts of the common framework, the majority of which have not been possible to monetise. Table 3 summarises the monetised costs and benefits to business and government. Low, Central and High

[15] Renewables Obligation (RO) Annual Report: Scheme Year 22 (April 2023 to March 2024) | Ofgem In Scheme Year 22 (2023-24), the weighted average life cycle GHG emissions of a solid biomass station were 19.49 gGHG/MJ compared to the scheme threshold of 55.6 gGHG/MJ

[16] Renewable fuel statistics 2023: Final report - GOV.UK Table RF_0105a. In 2023, average savings (including ILUC) were 77% compared to the strictest scheme threshold of 65%.

scenarios consider uncertainty in administrative costs and are described in more detail in the following chapter. The future business population is extremely uncertain and so we present results for two possible scenarios, “small” and “large”.

Table 3: Summary of monetised costs and benefits across a 10-year appraisal period, 2024 prices (discounted)[17]

Costs and benefits to business in the event of a small business population (400 businesses)

	Low	Central	High
Costs to business			
Third-party verification	- £2,438,000	- £2,438,000	- £2,438,000
Benefits to business			
Familiarisation	£19,000	£41,000	£126,000
Standardisation of reporting metrics	£341,000	£750,000	£1,158,000
Total	**- £2,078,000**	**- £1,648,000**	**- £1,154,000**

Costs and benefits to business in the event of a large business population (1,100 businesses)

	Low	Central	High
Costs to business			
Third-party verification	- £7,079,000	- £7,079,000	- £7,079,000
Benefits to business			
Familiarisation	£54,000	£117,000	£357,000
Standardisation of reporting metrics	£1,086,000	£2,240,000	£3,394,000
Total	**- £5,939,000**	**- £4,722,000**	**- £3,328,000**

Costs and benefits to government

	Low	High
Costs to government		
Benchmarking of certification schemes	- £280,000	- £280,000
Benefits to government		
Harmonisation of feedstock definitions	£5,000	£10,000
Total	**- £275,000**	**- £270,000**

[17] A negative number denotes a cost while a positive number denotes a benefit

Table 4: Summary of monetised and non-monetised costs and benefits

Impact	Harmonisation	Land	GHG	MRV
Monetised				
Reduction in familiarisation cost to business	Overall impacts[18]	-	-	-
Ongoing reduction in administrative costs to business and government	Overall impacts	-	-	Impacts due to updating the following criteria: • Harmonise feedstock definitions • Standardise reporting metrics
Ongoing administrative costs to business and government	-	-	-	Impacts due to updating the following criteria: • Third-party verification risk assessment • Benchmarking of voluntary certification schemes
Non-monetised				
Administrative impacts	-	Overall impacts	Overall impacts	Impacts due to updating the following criteria: • Mandatory reporting of country of origin • Publication of sustainability data • Additional monitoring & verification of voluntary certification schemes
Restricted supply of biomass	-	Impacts due to updating the following criteria:	Overall impacts	Overall impacts

[18] "Overall impacts" here means that impacts are discussed in general terms rather than in the context of specific criteria

		• Prohibited agricultural land categories • Prohibited forest land categories • Prohibition of roots and sawlogs • Application of forest criteria to sawmill residues • 100% sustainable sourcing • Soil criteria		
Increased cost of biomass	-	Impacts due to restricted supply	Impacts due to restricted supply	Impacts due to restricted supply
Decreased use of biomass	-	Impacts due to restricted supply	Impacts due to restricted supply	Impacts due to restricted supply
Carbon emissions	-	Impacts due to updating the following criteria: • Forest carbon • Prohibition of roots and sawlogs • Application of land criteria to sawmill residues • Soil criteria	Overall impacts	-
Environmental benefits	-	Impacts due to updating the following criteria: • Prohibited agricultural & forest land categories • Indirect land use change (ILUC) • Prohibition of roots and sawlogs • Social criteria • 100% sustainable sourcing	Overall impacts	-
Wider impacts	Overall impacts	Overall impacts	Overall impacts	Overall impacts

Monetised Impacts

Reduction in familiarisation cost to business of sustainability criteria

Methodology

57. We have used time and wage assumptions to estimate the cost for a business to familiarise with an updated framework (which may be the common framework or a sector-specific framework), using the equation:

$$c_f = t \times c \times e$$

where t is the time taken for one employee to familiarise with a framework (estimated using reading time), c is the hourly wage and non-wage cost of that employee's time, and e is the number of employees required to familiarise.

58. To estimate the total familiarisation cost to business, we use the equation:

$$C = B \times c_f \times N$$

where C is the total cost, B is the number of businesses in scope, c_f is the cost to a single business of familiarising with a single framework, and N is the average number of frameworks that a business must familiarise with.

59. In the **counterfactual**, we assume that every business in scope will need to familiarise with at least one sector-specific framework within the appraisal period, while a proportion of businesses will need to familiarise with multiple frameworks. In the **common framework scenario**, we assume that each business in scope will only need to familiarise with one framework – namely, the common framework.

Business population

60. Businesses affected by the common framework fall into four categories:

- **Directly impacted businesses** who participate in government incentive schemes (for example, an anaerobic digester receiving support under the GGSS, or an obligated fuel supplier under the RTFO).
- **Voluntary certification schemes** develop standards that certify that biomass feedstocks meet the sustainability criteria on behalf of directly impacted businesses.
- **Approved supplier schemes** maintain a list of approved feedstock suppliers, which are audited according with the relevant sustainability criteria. Operators may source their fuel from an approved supplier instead of providing their own bespoke evidence to the delivery body.
- **Supply chain participants** who produce or process biomass feedstocks to be used in bioenergy.

61. We assume that **directly impacted businesses**, **voluntary certification schemes** and **approved supplier schemes** will need to familiarise with the common framework and their business population is estimated below. There is insufficient

evidence on biomass supply chains to estimate the number of impacted supply chain participants.

62. The number of **directly impacted businesses** has been estimated using existing statistics from a variety of sources (DUKES power stations[19], RO[20]- and CfD[21]-supported installations, RTFO fuel suppliers[22], anaerobic digesters, and the ETS) and cross-referencing to avoid double-counting. Out-of-scope installations (such as landfill or sewage gas, or very small installations) were excluded, as were installations supported by heat incentive schemes, as we expect the majority of these to comply via an approved supplier scheme such as the BSL rather than directly engaging with the sustainability framework. There are 14 **voluntary certification schemes** and 2 **approved supplier schemes**.

63. There is a large amount of uncertainty in the business population estimates due to the following reasons:

    - Bioenergy policy is evolving, and it is uncertain which installations will be supported throughout the appraisal period. While the updated framework won't apply to existing contracts, some may see their support expire without renewal, while others may enter into new contracts, particularly where they intend to install CCS technology. New technologies (such as biomass-to-hydrogen production, or advanced conversion technologies) are likely to come onstream, while others may be brought under emissions trading rules, but it is too early to say how many of these installations may be required to comply with the framework in the future.
    - Businesses may be double-counted due to operating more than one installation, or where a single installation is supported by more than one incentive scheme. These overlaps have been accounted for where information exists.

64. The total estimated business population range is:

	Low estimate	High estimate
Business population (B)	400	1,100

Familiarisation cost

65. There is limited evidence on the **time taken for a business to familiarise with a new set of guidance**, and so reading time has been used as a proxy. Wage data from the Annual Survey of Hours and Earnings (ASHE)[23] has been used to estimate the total cost of familiarisation for one business.

[19] Digest of UK Energy Statistics (DUKES): renewable sources of energy - GOV.UK Table 6.7
[20] Renewables Obligation (RO) Annual Report: Scheme Year 22 (April 2023 to March 2024) | Ofgem Fig. 2.1
[21] Actual CfD Generation and avoided GHG emissions - Dataset - LCCC Data Portal
[22] Renewable fuel statistics 2023: Final report - GOV.UK Table RF0109
[23] Annual Survey of Hours and Earnings time series of selected estimates - Office for National Statistics Table 10_SOC20

66. Assuming 4 employees per business are required to familiarise with a sustainability framework, and this takes each employee between 2.4-5.4 hours[24] (depending on the length of the guidance), this results in a cost to business of between £253-£561 (2024 prices) for each framework.

	Low estimate	Central estimate	High estimate
Cost to a single business of familiarising with a single framework (c_f)	£253	£275	£561

Number of future frameworks that a business needs to comply with

67. Due to the uncertainty in future policy, it is not possible to accurately estimate the number of incentive schemes that an individual business may participate in (and so need to familiarise with each scheme's sustainability criteria). Therefore, we use three **illustrative scenarios** to estimate the familiarisation savings if 25%, 50% or 75% of businesses needed to familiarise with 2 schemes in the future.

Average number of frameworks a single business familiarises with (N)	Low scenario	Central scenario	High scenario
Counterfactual	1.25	1.5	1.75
With common framework	1	1	1

Results

68. Accounting for the uncertainty in business population B and familiarisation cost c_f, the potential benefit to business of having to familiarise with only one framework rather than multiple frameworks is:

Benefit to business (2024 prices, discounted)	Low scenario	Central scenario	High scenario
Small business population	£19,000	£41,000	£126,000
Large business population	£54,000	£117,000	£357,000

Reduction in administrative costs to business and government due to harmonised MRV requirements

69. Existing monitoring, reporting and verification (MRV) requirements vary across different biomass applications. By harmonising where relevant, the common framework aims to improve transparency and clarity, and reduce administrative burden for businesses that must comply with multiple sets of criteria.

Monitoring: harmonise feedstock definitions

[24] Based on the length of sustainability guidance of existing biomass policies

70. There are many ways to describe and categorise biomass feedstocks, and reporting templates often allow free text inputs when submitting feedstock data to delivery bodies. This lack of standardisation increases the complexity of collating and analysing feedstock data, and the risk of misreporting. The common framework proposes defining and introducing a standardised list of feedstocks for reporting purposes.

71. It is difficult to fully quantify the benefits of having a standardised list of feedstocks, as this is dependent on the volume of future data collected and the amount of aggregated reporting carried out. As an illustrative example, three employees saving 1-2 days each of FTE per year[25] of data cleaning activities could result in an overall administrative saving to government of £5,000-£10,000 over 10 years.

	Low scenario	High scenario
Benefit to government (2024 prices, discounted)	£5,000	£10,000

Reporting: standardise reporting metrics

72. Research[26] suggests that it may take up to 16 hours per month, or 192 hours per year for a business to collect and submit sustainability reporting data. It is uncertain whether this assumption would continue to hold over the appraisal period as this depends on how incentive schemes choose to implement reporting requirements in the future and doesn't account for any additional automation of reporting.

73. Where a business must report to two incentive schemes, it is uncertain whether this would result in a doubling of time taken (i.e. from 16 to 32 hours per month), as it is likely that at least some of the requirements would be similar across schemes. Similarly, standardising a set of minimum reporting requirements across schemes would result in a reduction in time taken to fulfil reporting requirements, but this is unlikely to be a 100% reduction for the second and any subsequent schemes (i.e. from 16 to 0 hours per month) as:

    - Completing the reporting template is only a portion of the tasks required to fulfil reporting requirements
    - Submission of the template would still need to be done separately for each scheme
    - Schemes will retain flexibility to ask for additional metrics beyond those recommended by a common framework.

74. Therefore, we use a conservative illustrative assumption that standardising reporting metrics across schemes may save 10% (or 19.2 hours per year) of time reporting to government incentive schemes, for those businesses that report to two schemes.

[25] Annual Survey of Hours and Earnings time series of selected estimates - Office for National Statistics Table 10_SOC20

[26] EXPLANATORY MEMORANDUM TO THE RENEWABLE TRANSPORT FUEL OBLIGATIONS ORDER 2007 No.3072 Annex F, Table F4

75. Using the equation

$$s_r = t \times c \times e$$

where t is the time taken to fulfil reporting requirements, c is the hourly wage and non-wage cost of that employee's time, and e is the number of employees required (in this case, assumed to be 1), this results in a potential saving to business of approximately £544 per year for each subsequent scheme reported to.

Saving per year to a single business of fulfilling reporting requirements of a second or subsequent scheme (s_r)	£544

76. We calculate the total savings per year using the equation

$$S = B \times s_r \times N_s$$

where S is the total administrative saving per year, B is the number of businesses in scope (as defined in the Low and High estimates above), s_r is the saving per year of a business reporting to a second or subsequent scheme, and N_s is the percentage of businesses reporting to a second or subsequent scheme (as defined in the Low (25%), Central (50%) and High (75%) scenarios above).

77. Accounting for the uncertainty in business population B, the potential benefit to business of reporting to two incentive schemes under a harmonised common framework over the appraisal period is:

Benefit to business (2024 prices, discounted)	Low scenario	Central scenario	High scenario
Small business population	£341,000	£750,000	£1,158,000
Large business population	£1,086,000	£2,240,000	£3,394,000

Administrative costs to business and government due to strengthened MRV criteria

Verification: third-party verification risk assessment

78. Independent audit reports of sustainability data are required by most incentive schemes. Operators must commission audits from an independent third party. Some schemes require submission of an audit report based on a specific frequency, while for others it is consignment-based. The common framework proposes that each auditing cycle includes a risk assessment by the delivery body, who would then be able to determine the frequency and level of detail of the audit.

79. There are two levels of audit: "limited assurance", which involves a basic level of verification, and "reasonable assurance", a more thorough level of auditing. For a limited assurance audit, an auditor reviews the data for errors, while for a reasonable assurance audit, higher levels of evidence gathering are required.

80. Audit costs to businesses vary widely depending on the type and source of biomass, the complexity of the supply chain and the amount of biomass considered. It is

difficult to precisely quantify the additional cost associated with a risk-based audit approach due to the uncertainty in the future business population. As an illustration, we assume that average annual audit costs are around £2,100 for a small business and £21,000 for a large business (2024 prices)[27]. Engagement with industry suggests that the costs of a reasonable assurance audit are approximately twice those of a limited assurance audit.

81. It is very uncertain as to how many additional "reasonable assurance" audits may be required due to the proposed risk-based approach, and this will be determined by how individual schemes assess risk. As an illustrative example, if we assume that the majority of existing audits are limited assurance, and that a risk-based assurance approach would lead to approximately 1 audit per business becoming a reasonable assurance audit across the appraisal period, this could result in additional costs of £21,000 per affected large business and £2,100 per affected small business. Assuming the Low and High estimates for business population as described above, and assuming approximately one third of impacted businesses are large[28], this results in total additional administrative costs to business of £2.4-7.1 million.

Cost to business (2024 prices, discounted)	
Small business population	£2,438,000
Large business population	£7,079,000

Verification: benchmarking of voluntary certification schemes

82. Voluntary certification schemes are benchmarked by government delivery bodies to ensure they are valid for certification against the relevant sustainability requirements. There are currently no set intervals at which benchmarking must take place. The common framework proposes that delivery bodies carry out benchmarking of the relevant certification schemes at least once every five years.

83. Current benchmarking frequency varies, but is thought to take place between every 8-10 years. Assuming that benchmarking one scheme costs approximately £30,000, and that there are 16 schemes to benchmark, this would imply an additional cost to government of around £280,000 over 10 years.

Cost to government (2024 prices, discounted)
£280,000

[27] Amendments to the Renewable Transport Fuel Obligation for compliance with the Renewable Energy Directive - (5) Overarching Impact Assessment p15

[28] This figure is very uncertain and depends on the future policy landscape. SIC Code 192 (Manufacture of refined petroleum products) from Business population estimates - GOV.UK and data from the Renewables Obligation (assuming any installation over 1MW is "large") have been used to obtain an approximate figure based on existing estimates.

Non-Monetised Impacts

Administrative impacts

Changes to land and GHG criteria

84. It is possible that some of the changes to land and GHG criteria described above will lead to additional administrative burden. For example, operators and supply chain participants may need to ensure biomass meets additional requirements (such as producing soil management plans, or changing the way supply chain emissions are calculated). There could also be indirect impacts – for example, if a certification scheme was no longer able to certify biomass against updated UK criteria, this could result in businesses needing to provide bespoke evidence, at a potentially greater cost. However, the likelihood and magnitude of any administrative impacts are currently unclear and we will aim to refine evidence in this area throughout the consultation stage.

Reporting: mandatory reporting of country of origin

85. Where the country of origin of biomass is unknown, businesses may submit the country of purchase instead. We assume that if businesses do have access to this information, then supplying it would not result in a significant additional burden. However, previous engagement has raised concerns that in some cases, it may not be possible to report country of origin – for example, when a consignment of biomass is sourced from or processed in multiple countries or where the supply chain is particularly complex, such as where feedstocks from many countries are blended in one refinery to make one consignment of transport biofuel. Mandating reporting in this instance could lead to imports to the UK being restricted to those consignments that do have easily obtainable countries of origin.

Reporting: publication of sustainability data

86. The common framework proposes that all government incentive schemes publish detailed sustainability data where possible, and where this is not possible due to practical or commercial constraints, publish aggregated sustainability data. It is not yet decided which data points should be included and therefore how much this would differ from existing data publication, but this could result in some additional cost for delivery bodies.

Verification: additional monitoring & verification of voluntary certification schemes (VCSs)

87. Where businesses choose not to provide bespoke (“Category B”) evidence, they use evidence generated by voluntary certification schemes (“Category A”). The common framework proposes introducing additional mechanisms for delivery bodies to check that VCSs are upholding the sustainability standards. These mechanisms include mandatory disclosure of information on audits undertaken, a declaration of real or perceived conflicts of interest, and a ten-year limit on an auditor working with a given operator.

88. It is expected that this would introduce additional costs for both operators and VCSs (who would then be expected to pass these costs onto operators who pay for their services), but the magnitude of these costs is uncertain.

Restricted supply of biomass

89. Strengthening land and GHG criteria would result in some biomass that is currently eligible for government support becoming ineligible under the new criteria, resulting in an effective reduction in sustainable biomass supply.

90. It is also possible that if land, GHG or MRV criteria diverge sufficiently from standards used in other countries, including the UK's closest trading partners such as the EU, certification schemes may no longer be recognised by both UK and international markets. This is particularly a concern in the transport sector, where fuels are often traded while in transit and it is not always possible to know which market a fuel is bound for at the point of production.

91. It is difficult to quantify the specific impact on future biomass supply for the following reasons:

- The common framework does not set specific GHG thresholds and so any future thresholds (and therefore supply impacts) are dependent on future policy design.
- There is very limited evidence on specific biomass sourcing areas and how much currently supported material would fall into categories that the common framework proposes to prohibit. In addition, the definition of categories such as "old growth forest" are not always consistent between sourcing areas, nor is data collected in a consistent way.
- Future global biomass supply, and how much the UK may be able to access, is inherently uncertain with a large range of possible outcomes.

92. However, it is likely that the immediate impact on biomass supply would be small, because:

- Evidence shows that it is common for operators to overachieve against existing GHG thresholds[29] [30] and land criteria[31] and so it is likely that the biomass supply chain would be able to adapt to new criteria.
- The framework will only apply to future or updated biomass policies, with installations receiving support under existing incentive schemes (such as the RO, CfD and RHI) continuing to comply with existing rather than new sustainability and MRV criteria.

[29] Renewables Obligation (RO) Annual Report: Scheme Year 22 (April 2023 to March 2024) | Ofgem In Scheme Year 22 (2023-24), the weighted average life cycle GHG emissions of a solid biomass station were 19.49 gGHG/MJ compared to the scheme threshold of 55.6 gGHG/MJ

[30] Renewable fuel statistics 2023: Final report - GOV.UK Table RF_0105a. In 2023, average savings (including ILUC) were 77% compared to the strictest scheme threshold of 65%.

[31] For example, the Sustainable Biomass Programme (SBP) has more stringent requirements than existing scheme criteria.

Land criteria impacts

93. Land criteria fall into three categories (agricultural, soil and forest criteria). Which criteria apply depends on the type of feedstock (see consultation for details). In general, forest-derived biomass must comply with the forest criteria, agricultural-derived biomass must comply with the agricultural criteria (with residues additionally needing to comply with the soil criteria), and most non-forest and non-agricultural wastes and residues are exempt from all land criteria.

94. To model the longer-term impacts of the proposed changes to land criteria, we have used the UK and Global Bioenergy Resource Model 2024[32] to compare changes to the land criteria against a baseline. Baseline modelling assumptions are aligned to the "Ambitious" scenario published in the 2023 Biomass Strategy[33]. As future biomass supply and demand rely on a large number of variables, and are inherently uncertain, the analysis below should be considered **illustrative only**.

95. As well as the proposed changes modelled below, we are also consulting on options to **reduce the risk of indirect land use change (ILUC)** and **strengthen the carbon stock criteria for forest biomass**. The impact of ILUC recommendations will depend on how they are implemented by future policy, while forest carbon is complex to assess without a detailed analysis of major sourcing areas, and so it has not been possible to quantify the potential supply impacts here.

Agricultural land criteria: prohibited agricultural land categories

96. The land criteria define and expand **prohibited agricultural land categories** from which biomass may not be sourced. This means that material may not be obtained from land that had any of the following statuses in or after January 2008: primary, old growth, or highly biodiverse forest, heathland, natural and non-natural highly biodiverse grassland, areas designed for nature protection, continuously or lightly forested areas, peatland and wetland (with some exceptions; see consultation for details).

97. The Bioenergy Resource Model already assumes in all scenarios that any new land that is converted for the production of bioenergy is abandoned arable land and so would not fall into any of the above prohibited categories (except for peatlands drained after 2008; however, these are unlikely to have been abandoned). Therefore, any impact on sustainable biomass supply compared to existing forecasts is likely to be small.

Forest criteria: prohibited forest land categories

98. The land criteria introduce **prohibited forest land categories** from which biomass may not be sourced. This means that material may not be obtained from land that had any of the following statuses in or after January 2008: primary, old growth or highly biodiverse forest, heathland, natural and non-natural highly biodiverse grassland, peatland and wetland (with some exceptions; see consultation for details).

99. Primary and old growth forest assumptions can be explicitly adjusted in the Bioenergy Resource Model and the results of this analysis are discussed below. The

[32] UK and Global Bioenergy Resource Model 2024 - GOV.UK
[33] Biomass Strategy 2023 - GOV.UK

impact of prohibiting the remaining forest land categories on future supply is likely to be small:

- Highly biodiverse forest is not explicitly included in the model, though some may be captured within the primary and old growth definitions. In addition, there is not an outright ban proposed on this material as long as sourcing does not interfere with nature protection.
- The model already requires material from forestry regions in which feedstocks are harvested at a rate faster than their growth to be reduced to the sustainable growth rate. Harvest from deforested areas is also excluded, so as to preserve forest area and carbon stocks.
- The model doesn't allow for net afforestation, meaning that conversion of heathland, grassland, wetland and peatland areas is already excluded from all scenarios.

100. It is difficult to estimate the amount of material that is currently sourced from primary or old growth forest, but this is mostly likely to apply to material sourced from British Columbia (which represented 8% of wood pellet imports to the UK in 2023, and 6% in 2024[34]) for electricity generation, where there is a programme to bring a proportion of unmanaged forest into commercial forestry.

101. The Bioenergy Resource Model already assumes that in the longer term, no material is sourced from primary forest, even in an ambitious supply scenario, and therefore any impact on sustainable biomass supply compared to existing forecasts is likely to be small.

102. The definition of "old growth" forest depends on the region, local climate and specific species, and so is less consistent than that of "primary forest". As an approximation, the impact of prohibiting material from these areas is modelled using the "old regenerated forest" definition in the Bioenergy Resource Model. In the existing baseline scenario, it is assumed that up to 35% of forest residue harvested from these types of areas could be theoretically used for bioenergy (it should be noted that the model does not assume that this material **will** be used for bioenergy, only that it is potentially available).

103. Table 5 shows the impact of prohibiting sourcing from old growth forest on imported forest biomass. There is also a small impact on imported road fuel, as while there is currently very little forest material used in the transport sector, the model assumes that in the future there may be more conversion of forest residues to liquid biofuels.

Table 5: Potential reduction in available biomass due to prohibiting sourcing from old growth forest

	2025	2030	2035	2040	2045	2050
Amount of potentially available material for bioenergy (PJ)						

[34] Forestry Statistics 2025 - Forest Research Table 3.8

Total biomass availability (baseline)	837	1,001	947	926	938	990
Reduction in available material for bioenergy compared to baseline (PJ)						
Imported road fuel from waste/residues	1.0	3.4	4.4	5.2	5.0	4.8
Imported sawmill residues	0.8	1.1	1.3	1.5	1.4	1.4
Imported small roundwood	1.2	0.8	1.0	1.1	1.1	1.0
Total	**3.0**	**5.3**	**6.6**	**7.9**	**7.5**	**7.2**
Reduction in available material for bioenergy compared to baseline (%)						
Imported road fuel from waste/residues	0.6%	0.9%	1.3%	1.7%	1.7%	1.7%
Imported sawmill residues	1.9%	3.7%	5.3%	7.1%	7.0%	6.9%
Imported small roundwood	1.9%	3.7%	5.3%	7.0%	6.9%	6.7%
Total	**0.4%**	**0.5%**	**0.7%**	**0.8%**	**0.8%**	**0.7%**

104. The modelling shows that by the 2040s the prohibition of old growth forest sourcing could see a reduction of around 7% of forest-derived feedstock availability. However, this is small compared to the impact of other uncertainties, such as global demand and the UK's future share of internationally produced biomass, and so by itself is unlikely to make any substantial difference as to whether UK demand for forest biomass can be met.

Forest criteria: prohibition of roots and sawlogs

105. The common framework proposes the **prohibition of the use of roots and sawlogs for bioenergy**. The extraction and processing of roots is energy intensive and costly, while sawlogs are more valuable as timber than as pellets[35], so it is unlikely that much of this material would enter the bioenergy supply chain. The Bioenergy Resource Model already assumes that none of this material will be used for bioenergy, even in an ambitious supply scenario, and therefore any impact on sustainable biomass supply compared to existing forecasts is likely to be very small.

Forest criteria: application of forest criteria to sawmill residues

106. The common framework proposes applying the forest criteria to all forestry residues, including **sawmill processing residues**. A review[36] of wood pellet mills in the USA found that 20-30% of feedstock was made up of sawmill residues. Currently the

[35] South-wide Average Prices - TimberMart-South Illustrative example from the Southern USA. The stumpage price of sawtimber is between $25-35/ton, while the price of pulpwood is around $10/ton.
[36] Assessing the wood sourcing practices of the U.S. industrial wood pellet industry supplying European energy demand | Energy, Sustainability and Society | Full Text

majority of forest biomass is used in the power and heat sectors, where existing UK criteria[37] already apply to sawmill processing residues, and so it is unlikely there will be any immediate impact to supply chains.

107. The EU's RED III exempts sawmill residues from forest criteria. There is a risk that diverging from this position means international certification schemes will not include assessment of sawmill residues in the future, resulting in internationally traded fuels becoming ineligible for the UK supported biomass market by default if they contain any sawmill residues (although allowing the use of mass-balancing calculations may mitigate this risk). This could be a particular risk in the transport sector. However, some existing certification schemes such as the Sustainable Biomass Programme (SBP) currently certify against both EU and UK criteria, even where the existing criteria diverge, and so as long as this continues the risk of supply chain disruption is low.

108. The Bioenergy Resource Model assumes a significant proportion of potentially available imported forest-derived biomass (which may be used in the power, heat or transport sectors) is made up of sawmill residues. Table 6 shows the impact of losing access to 1) 50% and 2) 100% of imported sawmill residues due to divergence with international criteria. It should be noted that these scenarios are **illustrative only** and do not make any assumption as to the likelihood of occurrence.

109. As noted above, although the supply impact of traded fuels containing sawmill residues becoming ineligible for support in the UK could be very high, current certification schemes exist that are recognised as meeting both UK and international criteria, even in the case of divergence. Therefore, we believe that the risk of serious impacts to UK sustainable biomass supply is low, but it will be necessary to ensure that certification schemes remain valid for UK sustainability criteria.

Table 6: Illustrative reduction in available imported forest biomass due to reduction in sawmill residues

	2025	2030	2035	2040	2045	2050
Reduction in available imported forest biomass for bioenergy compared to baseline (PJ)						
50% reduction in imported sawmill residues	20.3	14.5	12.3	10.6	10.3	10.1
100% reduction in imported sawmill residues	40.6	29.1	24.6	21.2	20.6	20.1
Reduction in available imported forest biomass for bioenergy compared to baseline (%)						
50% reduction in imported sawmill residues	19.6%	28.7%	28.5%	28.3%	28.3%	28.3%
100% reduction in imported sawmill residues	39.3%	57.5%	57.1%	56.7%	56.7%	56.7%

[37] Including the RO, CfD, FIT and RHI

Forest criteria: 100% sustainable sourcing

110. Electricity and heat biomass incentive schemes[38] currently require that 70% of woody biomass is obtained from a **"sustainable source"**. This means that in theory up to 30% of forest-derived material supported by these schemes does not need to demonstrate compliance with land criteria sustainability requirements (although all must be legally sourced). The common framework proposes all relevant feedstocks need to meet the forest criteria (i.e. the 70% requirement is increased to 100%).

111. The amount of biomass that is currently obtained from a "sustainable source" is difficult to quantify, although a survey of existing operators under the RO suggests that this could already be significantly more than the 70% minimum. The RTFO and SAF Mandate already require 100% of forest biomass to be obtained from a sustainable source. In addition, the Bioenergy Resource Model already assumes that 100% of forest biomass meets the forest land criteria as described above, and so any longer-term impacts on supply are expected to be small.

Soil criteria

112. The common framework proposes that where agricultural residues are used as feedstocks, the land from which feedstock is sourced is subject to **soil monitoring and management plans** to minimise the impact on the site's soil quality and soil carbon. This requirement already exists in transport and hydrogen incentive schemes (and the EU's RED III), although biomethane schemes do not currently include this requirement and so are the most likely to be affected. However, in England, soil management plans are relatively commonplace[39], so immediate impacts on supply are expected to be limited.

113. The common framework could also extend this requirement to purpose-grown energy crops and the use of food or feed crops for bioenergy. This is not a requirement in existing or international criteria and so presents a risk of supply chain disruption, especially in the transport fuels sector (see above).

Increased cost of sustainable biomass due to restricted supply

114. In the event of a reduction in sustainable biomass supply, such that supply is not sufficient to meet demand, it is likely there would be a market response in the form of increased prices. This may not affect all sectors or feedstocks equally, with the greatest defined changes applying to forest-derived biomass (noting that liquid biofuels may also be produced using forest-derived feedstocks in the future). However, impacts will depend on how future government incentive schemes choose to implement sustainability criteria and any supply impact mitigations they may put in place.

[38] Including the RO, CfD, FIT and RHI

[39] CS, ES and SFI option uptake data April 2025 - GOV.UK Soil management is the most popular option under the Sustainable Farming Incentive in England with 25,500 agreements covering 3.6 million hectares (out of 32,600 businesses with an SFI agreement). This is compared to 9 million hectares of total farmed area in England in 2024.

115. As discussed above, it is difficult to robustly quantify supply impacts due to uncertainty in future policy design, and global biomass supply. In addition, there is little evidence on how the biomass feedstock and fuel markets may respond to supply restrictions. Therefore, it has not been possible to quantitatively assess the impact of increased biomass prices across all feedstocks and sectors.

Decreased use of biomass due to restricted supply

116. In the event of a reduction in sustainable biomass supply leading to increased costs, this could also see a decrease in the amount of biomass used for energy. This would result in alternative fuels or technologies being used to meet the "gap" in energy demand. This would have an impact on overall cost and carbon emissions, but is highly dependent on the alternative technologies available in each sector.

117. In the transport sector, constraints in biofuel availability would generally be expected to lead to "buy-out" of the RTFO and the SAF mandate, meaning that the energy demand gap would be met by an increased use of fossil fuels. A reduction in biomethane injected to the grid would result in this biomethane being replaced by natural gas. In the power and heat sectors, there is a wider range of alternative technologies that could meet the demand gap, including both fossil fuel and renewable technologies.

Carbon emissions

118. Both GHG and land criteria are expected to limit future carbon emissions in the UK and globally. Supply chain emissions directly associated with bioenergy are accounted for and limited by the GHG criteria. The land criteria proposals put in place requirements to ensure the low carbon nature of biomass sourcing, including a requirement to at least maintain long term forest carbon stock and minimise the risk of carbon emissions from land use change. Forest carbon stock considerations are discussed further in the technical annex.

119. Due to the international nature of many biomass supply chains, future carbon savings are expected to accrue abroad as well as in the UK. Overall, 36% of biomass for bioenergy (by energy content) was imported in 2024[40]. In the same year, over 96% of wood pellets were imported[41], while for transport biofuels, 93% of verified renewable fuels were derived from feedstocks sourced outside the UK[42].

120. There are a number of ways in which the common framework may affect carbon emissions across the bioeconomy, both in the UK and abroad. The main mechanisms of impact are set out below (and above in the "Decreased use of biomass" section), but it has not been possible to quantify these, and there is significant uncertainty as to which may have the greatest impact. While overall we expect to see a net reduction in carbon emissions as biomass use becomes more sustainable, there could also be a certain amount of offsetting due to biomass being replaced with fossil fuels (see above), or other unintended consequences such as

[40] Digest of UK Energy Statistics (DUKES) 2024 - GOV.UK Table 6.1
[41] Forestry Statistics 2025 - Forest Research Table 3.8
[42] Renewable Transport Fuel Obligation (RTFO) statistics 2024: Fifth provisional release - GOV.UK

useful material being burned or left to rot (see below) due to overly stringent sustainability criteria.

Land criteria

121. The common framework proposes strengthening the **carbon stock criteria for forest biomass** by explicitly requiring that long term forest carbon stocks are stable or increasing. Forest carbon is complex to assess, and without a detailed analysis of major sourcing areas it is challenging to precisely quantify the impact of strengthening this criterion on forest carbon stocks, but this is expected to reduce the risk of declining carbon stocks in biomass sourcing areas, leading to an overall carbon benefit.

122. The common framework proposes the **prohibition of the use of roots and sawlogs for bioenergy**. Prohibiting sawlogs helps ensure that wood is used for the most valuable and long-lasting purpose under the cascading use principle[43]. This maximises the carbon storage in products of woody material removed from the forest and ensures the benefits of the biomass resource are maximised.

123. The common framework proposes applying the forest criteria to all forestry residues, including **sawmill processing residues**. This ensures that there is accountability and transparency across the whole bioenergy supply chain and is consistent with existing UK electricity and heat schemes (including the RO, CfD, FIT and RHI). However, this could also lead to a disbenefit where if it is too costly or difficult to prove that sawmill residues comply with the forest criteria, they could be burned or left to rot, releasing emissions without the benefit of energy recovery. The consultation is exploring potential mitigations, including applying a more limited subset of the forest criteria to sawmill residues, and invites respondents to supply evidence on the relative risks and benefits of this proposal.

124. The common framework proposes that where agricultural residues are used as feedstocks, the land from which feedstock is sourced is subject to **soil monitoring and management plans**. This is expected to minimise negative impacts on the site's soil quality and soil carbon, although quantifying the precise impacts of soil management plans on carbon sequestration across the wide variety of biomass sourcing areas is extremely complex.

GHG criteria

125. The common framework does not impose a single GHG emissions threshold on all sectors due to the diversity of feedstock supply chains and bioenergy uses, instead taking a principles-based approach to set out common parameters for calculating life cycle carbon emissions and guidance on setting thresholds. Thresholds are expected to tighten over time and therefore we would expect to see emissions savings throughout the appraisal period, but as any future thresholds are to be set by individual policies it isn't possible to quantify or monetise savings.

[43] The cascading use principle requires that resources are re-used sequentially in the order of the specific resource quality at each stage of the cascade chain (wood should be used and recycled for as long as possible and used for the most valuable, and longest lasting, purposes at each stage). This helps maximise the environmental, societal and economic value and benefits of the biomass resource.

126. Evidence shows that it is common for operators to overachieve[44] [45] against existing GHG thresholds and therefore it is uncertain whether significant savings would be immediately realised in practice. However, tightening thresholds reduces the risk of emissions increasing in the future as supply chains evolve.

Environmental benefits

Land criteria

127. The land criteria aim to ensure that biomass use is compatible with wider environmental goals by limiting where and how it can be harvested. These impacts are difficult to quantify and vary depending on feedstock and use sector, but include limiting direct and indirect land use change, and protecting water quality, biodiversity and ecosystem services.

128. The land criteria define and expand **prohibited agricultural and forest land categories** from which biomass may not be sourced. This includes areas of high biodiverse value and areas of high carbon stock. While there is little evidence to suggest that biomass is currently being sourced from these areas in high volumes, it is expected that these criteria will reduce the future risk of harm to biodiverse ecosystems, and the risk of direct land use change which could lead to carbon stored in the land being released to the atmosphere. There could also be health and welfare benefits due to maintaining existing areas of high conservation or recreational value.

129. We are consulting on options to reduce the risk of **indirect land use change (ILUC)**, where non-agricultural land is brought into agricultural production due to displacement of existing food and feed crops by biomass production. The common framework sets out principles for biomass policies to follow, including considering crop caps and ILUC risk assessments, similar to those already implemented in the RTFO and SAF Mandate. As the impacts of these recommendations will depend on how they are implemented by future biomass policies, it is not possible to quantify potential benefits at this stage.

130. The common framework proposes the **prohibition of the use of roots and sawlogs for bioenergy**. The extraction and processing of roots is energy intensive and costly, while sawlogs are more valuable as timber[46] than as pellets, so it is unlikely that much of this material would enter the bioenergy supply chain. However, where it does occur, root extraction can lead to significant soil disturbance and erosion, the loss of soil carbon, and habitat damage, and so prohibiting this material reduces the risk of harmful environmental impacts.

131. **Social criteria** require that forest managers comply with local and national laws regarding the rights of workers and land use rights. The majority of existing criteria and certification schemes already include comprehensive social criteria and so the

[44] Renewables Obligation (RO) Annual Report: Scheme Year 22 (April 2023 to March 2024) | Ofgem In Scheme Year 22 (2023-24), the weighted average life cycle GHG emissions of a solid biomass station were 19.49 gGHG/MJ compared to the scheme threshold of 55.6 gGHG/MJ

[45] Renewable fuel statistics 2023: Final report - GOV.UK Table RF_0105a. In 2023, average savings (including ILUC) were 77% compared to the strictest scheme threshold of 65%.

[46] South-wide Average Prices - TimberMart-South Illustrative example from the Southern USA. The stumpage price of sawtimber is between $25-35/ton, while the price of pulpwood is around $10/ton.

immediate impact of this is expected to be small, but these criteria ensure that the rights of workers and communities are explicitly protected in the future.

132. The largest existing users of forest-derived biomass for bioenergy are the power and heat sectors. Electricity and heat biomass incentive schemes[47] currently require that 70% of woody biomass is obtained from a **"sustainable source"**. This means that in theory up to 30% of forest-derived material supported by these schemes does not need to demonstrate compliance with land criteria sustainability requirements (although all must be legally sourced). The common framework proposes all relevant feedstocks need to meet the forest criteria (i.e. the 70% requirement is increased to 100%). Where additional forest-derived biomass is required to comply with the forest land criteria this would result in increased benefits as described above. The amount of biomass that is currently obtained from a "sustainable source" is difficult to quantify, although a survey of existing operators under the RO suggests that this could already be significantly more than the 70% minimum.

GHG Criteria

133. Although the GHG criteria primarily aim to **limit GHG emissions from biomass supply chains**, these emissions may be correlated with other environmental impacts. For example, a tightened GHG threshold could encourage the use of more efficient vehicles or equipment in the biomass supply chain, indirectly leading to air quality or other environmental improvements.

134. The common framework does not directly mandate nor promote the use of biomass but instead sets out minimum sustainability requirements for biomass to meet. The amount of biomass used for energy will predominately depend on the design and objectives of future biomass policies rather than the common framework. Therefore, although it is possible that the common framework may indirectly affect future bioenergy deployment, we do not expect any significant changes to local air quality due to additional or reduced combustion of biomass. Biomass installations must already comply with statutory air quality requirements.

Wider impacts

135. The common framework proposals could lead to a range of wider indirect impacts that are difficult to value. The extent to which these impacts may be realised is uncertain and will depend on how the framework is implemented in future government incentive schemes.

136. A **harmonised approach** to sustainability criteria aims to create greater clarity and consistency for industry, to make it easier for businesses to comply with requirements. It helps to ensure that upstream biomass suppliers can follow one set of practices to confirm their biomass is government scheme compliant, meaning businesses can more easily source provably sustainable biomass. It could help to improve the functioning of the sustainable biomass market by easing supply chain friction and increasing market fairness between end-use sectors, reducing the barrier to entry to new market participants and fostering greater competition. It could also reduce uncertainty for investors and encourage longer-term innovation in biomass

[47] Including the RO, CfD, FIT and RHI

technologies, enabling continuous learning and adaptation, allowing sustainability performance to improve over time.

137. **Greater transparency** in the supported biomass market improves access to information for industry, academia and the public. This enables an improved understanding of biomass sustainability through further analysis or research, and ensures greater assurance, accountability and confidence in sustainable biomass use. In addition, greater transparency can support best practice more widely, potentially leading to additional benefits outside of the supported biomass market, or improved standards globally.

138. Finding the right degree of **alignment with international standards** can help facilitate smooth international trading and ensure that the UK can continue to access sustainable biomass without significantly increased costs. There is a risk that where the UK implements stronger sustainability criteria, less sustainable material is diverted to other markets. However, where the UK chooses to diverge, this also presents an opportunity to encourage best practice globally and indirectly improve biomass sustainability more widely.

139. By encouraging sustainable and responsible forest management, the common framework aims to ensure that the harvesting of forest biomass for bioenergy does not lead to permanent deforestation, ensuring a **continued supply of sustainable biomass in the long term**.

140. As the common framework only applies to businesses and not individuals, **we do not anticipate any significant impacts on households**. It is possible that individuals could be impacted indirectly if costs or benefits to business are passed on to consumers, while some changes could lead to more direct benefits (such as the social criteria, or criteria that have a positive impact on the environment and biodiversity). However, this is dependent on the location of individual supply chains and uses of biomass, and especially on future scheme design. Future schemes will be required to carry out their own impact assessments to understand the effect on households.

Small and Micro Business Assessment (SaMBA)

141. Biomass sustainability criteria can have an adverse impact on small and micro businesses due to the administrative burden associated with demonstrating sustainability of biomass fuel. While some costs would be expected to scale with business size (such as certifying fuel on a consignment basis), others are fixed (such as familiarising with sustainability requirements) and would have a greater impact on smaller businesses, including potentially raising barriers to entry.

142. Existing biomass incentive schemes generally mitigate these impacts by setting minimum thresholds for compliance on the amount of generation or fuel supplied by an operator. This may mean that an operator is exempt from a scheme entirely, or has adjusted sustainability or MRV requirements. Alternatively, some options exist to ensure operators can source fuel that is already pre-accredited as meeting requirements (and so do not need to provide bespoke evidence). Some examples are set out below.

- The RTFO only applies to entities that supply more than 450,000 litres of fuel per year[48].
- Under the RO, solid biomass or biogas stations with a declared net capacity (DNC) of less than 50kW are not required to report sustainability information, while stations with a DNC of greater than 50kW but a total installed capacity (TIC) of less than 1MW are required to report sustainability information but are not required to meet the sustainability criteria in order to claim Renewables Obligation certificates (ROCs)[49].
- The RHI allows operators to source fuel from suppliers on the Biomass Suppliers List (BSL), or the Sustainable Fuels Register (SFR), without needing to collect or provide additional or bespoke information to prove that the fuel is sustainable[50].

143. Where minimum thresholds are set, this is usually on the basis of energy generated, rather than the size of a business as defined by the number of employees (or other metrics, such as turnover). However, it is likely that in most sectors, there would be a correlation between a business's size and the amount of energy it generates.

144. The common framework does not set out specific guidance on adjusting sustainability requirements for smaller businesses, but future biomass incentive schemes will consider this as part of their policy development when sector-specific small and micro business impacts and mitigations will be considered.

[48] Renewable Transport Fuel Obligation (RTFO) scheme - GOV.UK
[49] Renewables Obligation (RO) Annual report scheme year 22
[50] NDRHI Guidance Vol2. Final Jan 2021