



SUSTAINABLE BIOENERGY  
SYSTEMS FOR OUR  
LOW-CARBON FUTURE



# Towards a biomass sustainability framework: Feedstocks and products

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Aston University




## Purpose and overview of the webinar

Make research around biomass sustainability widely available to support stakeholders in their responses to the UK Government's Common Biomass Sustainability Framework Consultation.

The Supergen Bioenergy Impact Hub is running two webinars :

### **Towards a biomass sustainability framework: Feedstocks and products**

 By Supergen Bioenergy Hub

 Online event

 Jan 20 from 12pm to 1pm GMT

### **Towards a biomass sustainability framework: Trees, crops and carbon**

 By Supergen Bioenergy Hub

 Online event

 Jan 27 from 12pm to 1pm GMT

Exploring some of the questions around biomass as a **sustainable feedstock for energy and products** and highlight the role of **biomass in carbon regulation and the practicalities of growing and trading biomass.**

## Topics and speakers for today's session



### ***Sustainability overview and co-products***

Mirjam Röder and Dan Taylor, Aston University



### ***Land and grown biomass***

Rebecca Rowe, UK Centre for Ecology and Hydrology



### ***Different types of biomass and sustainability implications***

Andrew Welfle, University of Manchester



### ***Non-energy products from biomass***

Parimala Shivaprasad, University of Nottingham



### **Q&A session**

*Chaired by Mirjam Röder*



Department for  
Energy Security  
& Net Zero

# Biomass sustainability: overview



UK Government

Common Biomass  
Sustainability Framework  
Consultation



Only sustainable biomass can be considered to be low carbon.



The UK only supports biomass that meets sustainability criteria across the economy in power, heat and transport.



Sustainability criteria cover the greenhouse gas (GHG) emissions of the supply chain and environmental protections (land criteria).



Current requirements vary across the UK subsidy schemes.

## Land criteria

Sustainable and legal harvesting



Protections for biodiversity, ecosystem services

Maintaining carbon stock of sourcing area and protecting high carbon stocks



Land and labour rights

## Greenhouse gas criteria

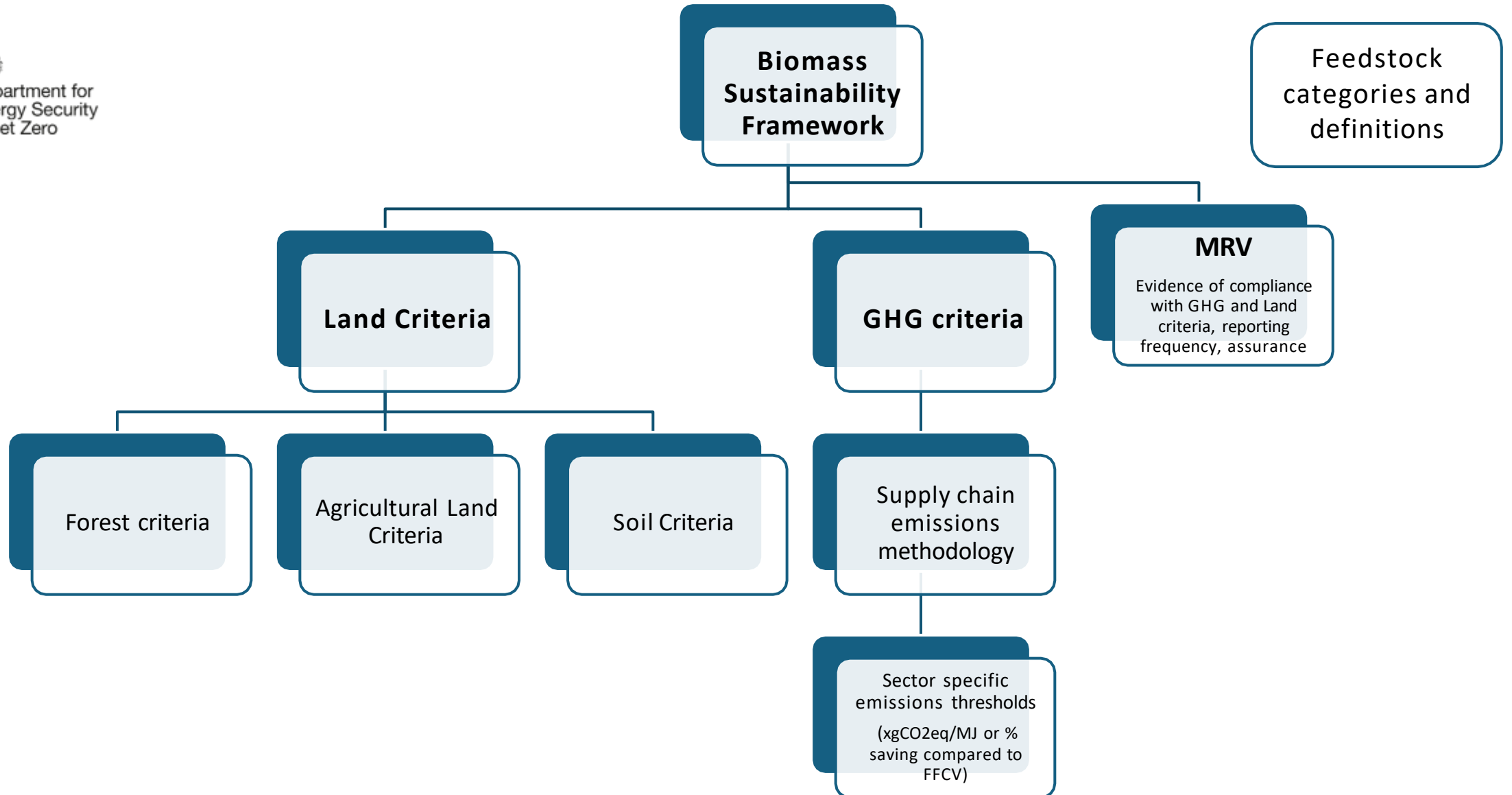
Greenhouse gas emissions from whole life cycle



Must meet a set carbon threshold and emissions savings compared to fossil fuel

Emission threshold gets stricter over time





## Purpose and aim of the Common Biomass Sustainability Framework

UK Government  
Common Biomass  
Sustainability Framework  
Consultation

- To be **delivered as a policy document** to help inform legislation or contractual arrangements for individual schemes (rather than additional legislation).
- Applied to any biomass feedstocks that are sourced domestically or internationally and **used for bioenergy that is subject to a government support mechanism in the UK.**
- **May also be used as guidance by the unsubsidised market** on a voluntary basis to develop their own sustainability criteria.
- To be **reviewed regularly, and updates published** every 5 years.

## Overarching principles for developing sustainability criteria

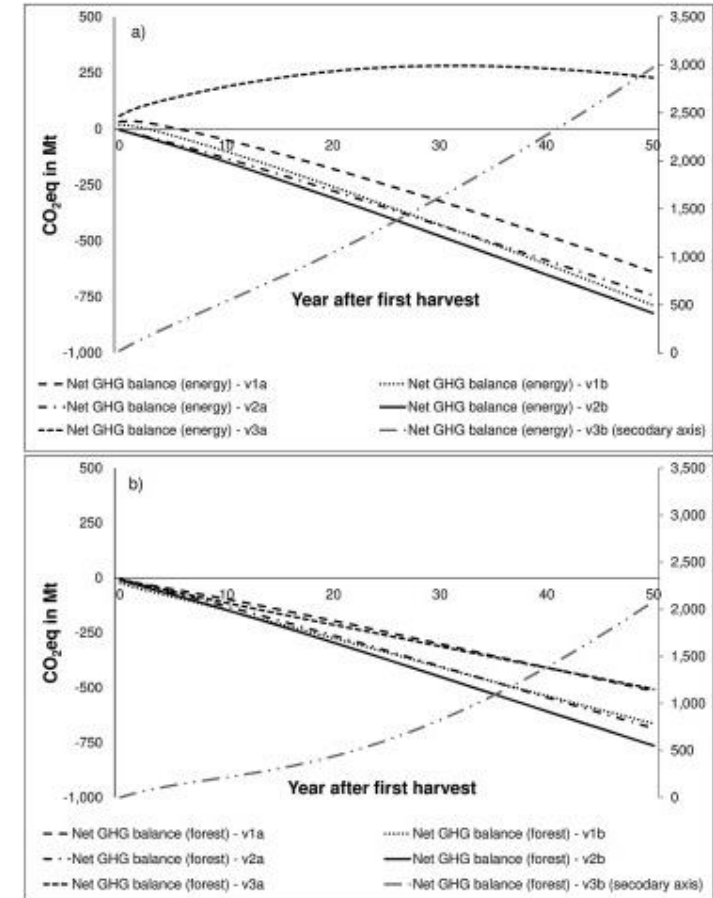
- **Maximise carbon benefits** from bioenergy use.
- **Minimise wider environmental harm** associated with bioenergy supply chains e.g. biodiversity and ecosystem services.
- **Alignment with wider government objectives** and policies for related sectors.
- **Alignment with criteria used in other countries**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

# Supergen Bioenergy Impact Hub

## Sustainability research insights

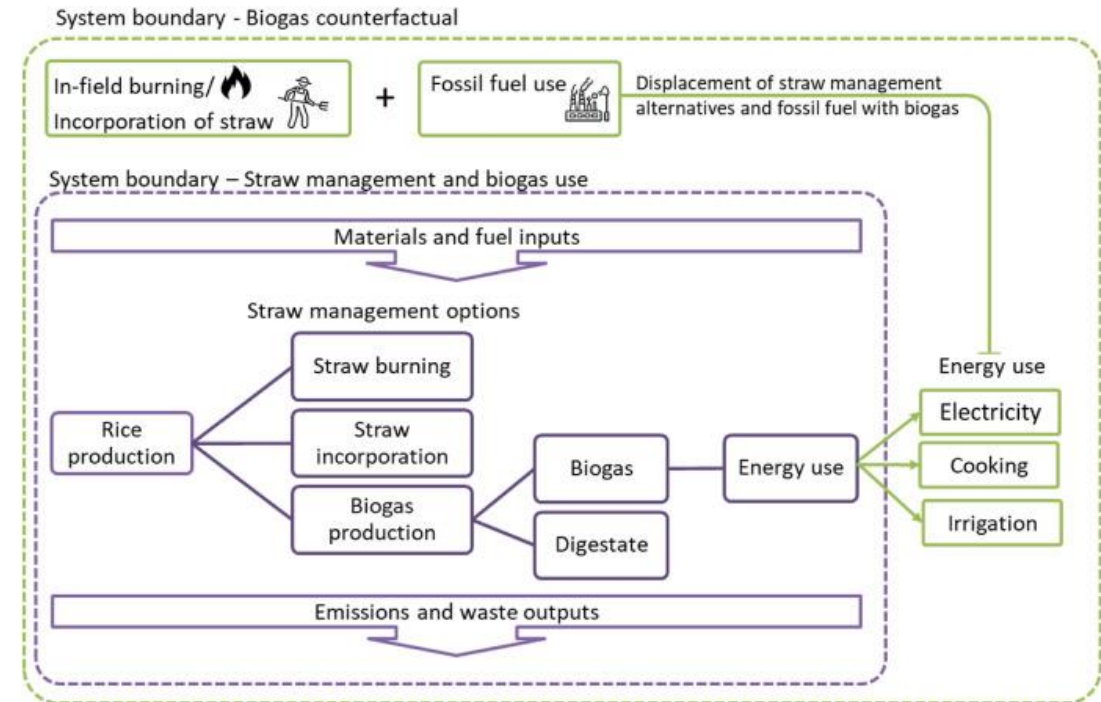
## Carbon stocks

- Carbon dynamics and timing matter. Depending on plants/trees grown, management practices, business model, region, context, etc..
- Considering cumulative emissions over long timeframes and accounting for forest carbon stocks at the landscape level.
- Management practices and business models needed for long-term C stock, e.g, integrating bioenergy can prevent C losses and maintain long-term C stocks. (**Consultation Q46**)



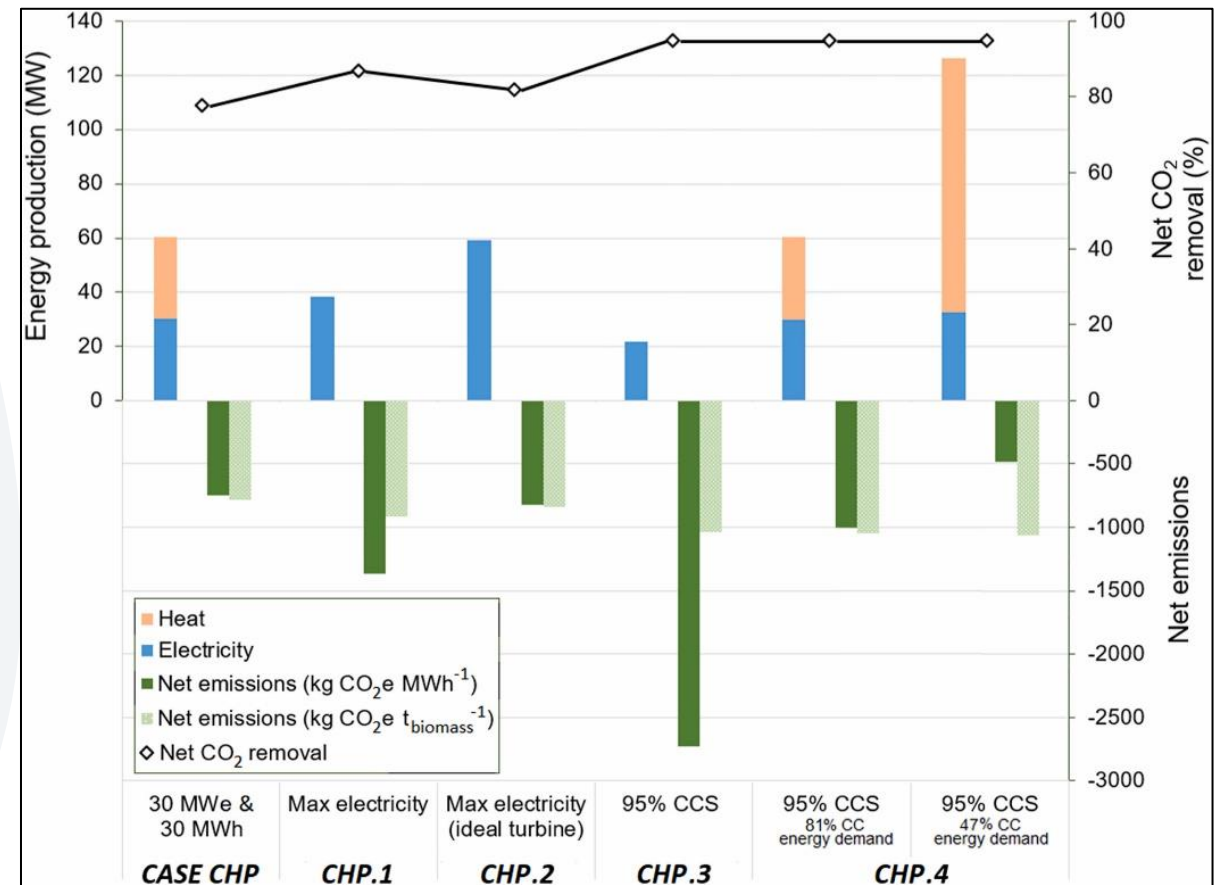
## System boundaries and cross-sectoral approaches

- Extended system boundaries (consequential LCA and multi-sector modeling) help to capture critical feedbacks and trade-offs and capture, interactions between different sectors and systems (**Consultation Q1, 80**)
- Narrow boundaries (e.g., assuming biogenic carbon is climate neutral) limits to quantification of true GHG impacts and carbon removal potential





## GHG thresholds

- GHG performance varies widely by feedstock, technology, region, and management practices (e.g., seasonal emissions, fugitive methane, digestate handling).
- A single cross-sector threshold would ignore these differences and create obstinate incentives. Flexible, context-driven thresholds better reflect actual sustainability and GHG trade-offs. (**Consultation Q87**)





# Literature on GHG and environmental sustainability



Biomass and Bioenergy  
Volume 177, October 2023, 106919

Sustainability of bioenergy – Mapping the risks & benefits to inform future bioenergy systems

Andrew James Wellie<sup>a, b</sup>, Alberto Almena<sup>a, c</sup>



Biomass and Bioenergy  
Volume 159, April 2022, 106406

Carbon dioxide removal potential from decentralised bioenergy with carbon capture and storage (BECCS) and the relevance of operational choices



Alberto Almena<sup>a</sup>, Patricia Thornley<sup>b</sup>, Katie Chang<sup>a</sup>, Mirjam Röder<sup>c</sup>



Biomass and Bioenergy  
Volume 182, March 2024, 107072

The greenhouse gas performance and climate change mitigation potential from rice straw biogas as a pathway to the UN sustainable development goals



Mirjam Röder<sup>a</sup>, Patricia Thornley<sup>a</sup>, Craig Jamieson<sup>b</sup>



Biomass and Bioenergy  
Volume 136, May 2020, 105542

Research paper  
A review of the role of bioenergy modelling in renewable energy research & policy development

Andrew Wellie<sup>a, b</sup>, Patricia Thornley<sup>c, d</sup>, Mirjam Röder<sup>c, d</sup>



Biomass and Bioenergy  
Volume 121, February 2019, Pages 99–114

Research paper  
Understanding the timing and variation of greenhouse gas emissions of forest bioenergy systems

Mirjam Röder<sup>a, b, c, d</sup>, Evelyne Thiffault<sup>b</sup>, Celia Martínez-Alonso<sup>e</sup>, Fanny Senez-Gagnon<sup>d</sup>, Laurence Paradis<sup>b</sup>, Patricia Thornley<sup>a</sup>



Energy Conversion and Management  
Volume 303, 1 March 2024, 118186

Research Paper  
Reducing the environmental impact of international aviation through sustainable aviation fuel with integrated carbon capture and storage



Alberto Almena<sup>a, b, c, d</sup>, Regina Siu<sup>b</sup>, Katie Chong<sup>a</sup>, Patricia Thornley<sup>b</sup>, Mirjam Röder<sup>b</sup>



Renewable Energy  
Volume 191, May 2022, Pages 493–509

Mapping the sustainability of bioenergy to maximise benefits, mitigate risks and drive progress toward the Sustainable Development Goals

Andrew Wellie<sup>a, b, c, d</sup>, Mirjam Röder<sup>b, c</sup>



Biomass and Bioenergy  
Volume 151, August 2021, 106164

The greenhouse gas removal potential of bioenergy with carbon capture and storage (BECCS) to support the UK's net-zero emission target ☆

Samira Garcia-Freites<sup>a, b, c, d</sup>, Clair Gough<sup>a</sup>, Mirjam Röder<sup>c</sup>



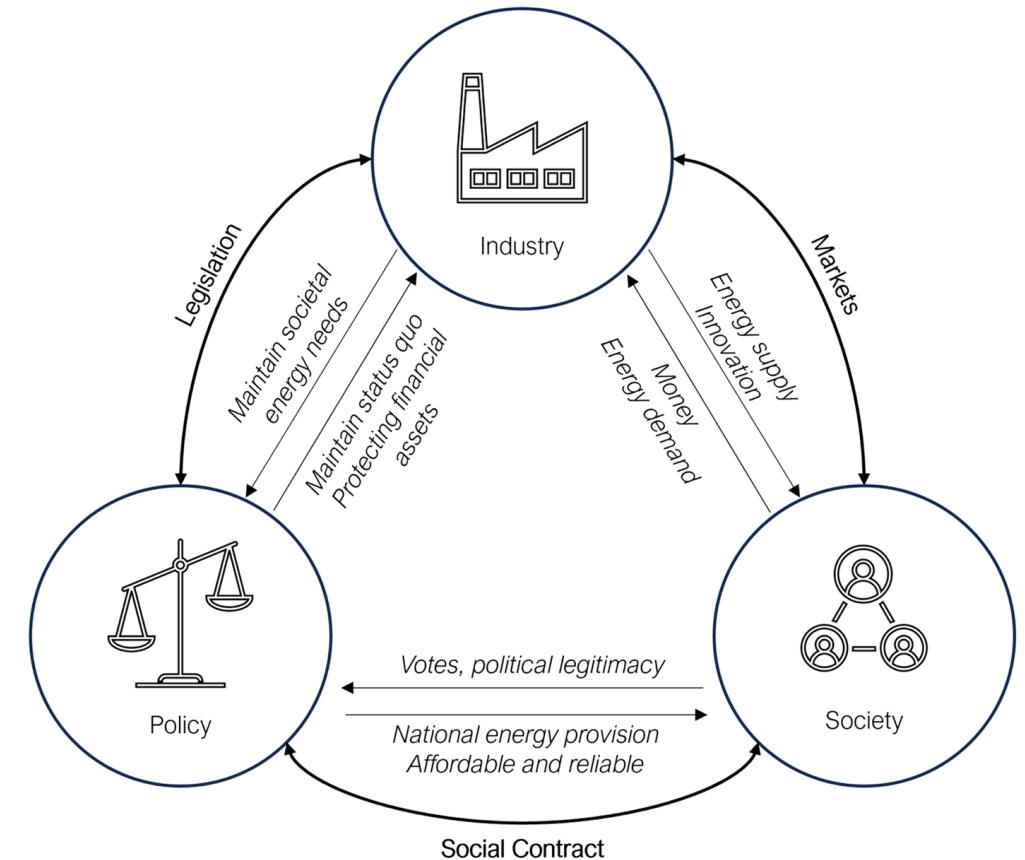
Harmonising greenhouse gas and sustainability criteria for low-carbon transport fuels, bioenergy and other bio-based sectors

Supergen Bioenergy Hub and Low Carbon Vehicle Partnership  
Collaboration Project Report

Authors  
Costanza Cucuzzella<sup>1</sup>, Andrew Wellie<sup>2</sup>, Mirjam Röder<sup>1</sup>

## Social aspects of sustainability as determinants for UK bioenergy success

- Mobilising public support for projects is as important as the technical challenge, incentivise building social legitimacy around harvesting activities. (**Consultation Q41, 42**)
- A truly 'cross-sectoral' framework would contribute towards overcoming siloed policy and bio-based sectors. (**Consultation Q1**)



Taylor, D., Chong, K., & Röder, M. (2024). Designing biomass policy: The political economy of renewable energy for net zero. *WIREs Energy and Environment*, 13(2), e512.



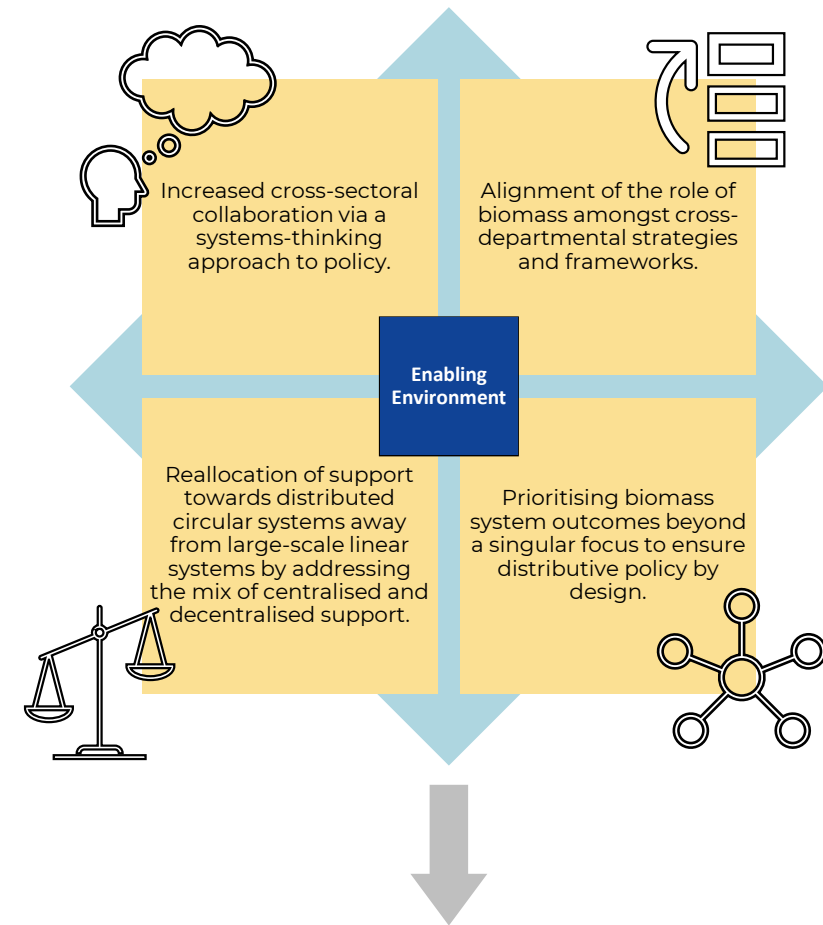
Taylor, D., Sparks, J., Chong, K., & Röder, M. (2024). Determining the Benefits of Biomass: Who Wins, and Who Loses? *Agronomy*, 14(10), 2350.

## Alternative policy frameworks to address social aspects of UK bioenergy

- Historical policy mixes have been hindered by complex trade-offs and siloes, welcome commitment to future legislative routes (**Consultation Q2**).
- Reviewing sustainability criteria with agreed review period. (**Consultation Q5**)
- Focus on carbon welcome but need a framework that incentivises multi-dimensional benefits. (**Consultation Q2, 76, 77**)

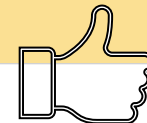


Taylor, D., & Röder, M. (2026). "Bringing biomass out from behind the scenes: An alternative approach to biomass policy design for a sustainable transition to net zero". PREPRINT (V1) available at Research Square.



### Principles for alternative biomass policy

Reward biomass systems that deliver multi-dimensional benefits whilst protecting citizens.



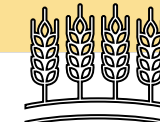
Develop stringent sustainability criteria in line with the latest scientific evidence, reviewed periodically.



Allocate resources to engaging with beneficiaries and stakeholders, as well as addressing public concern.



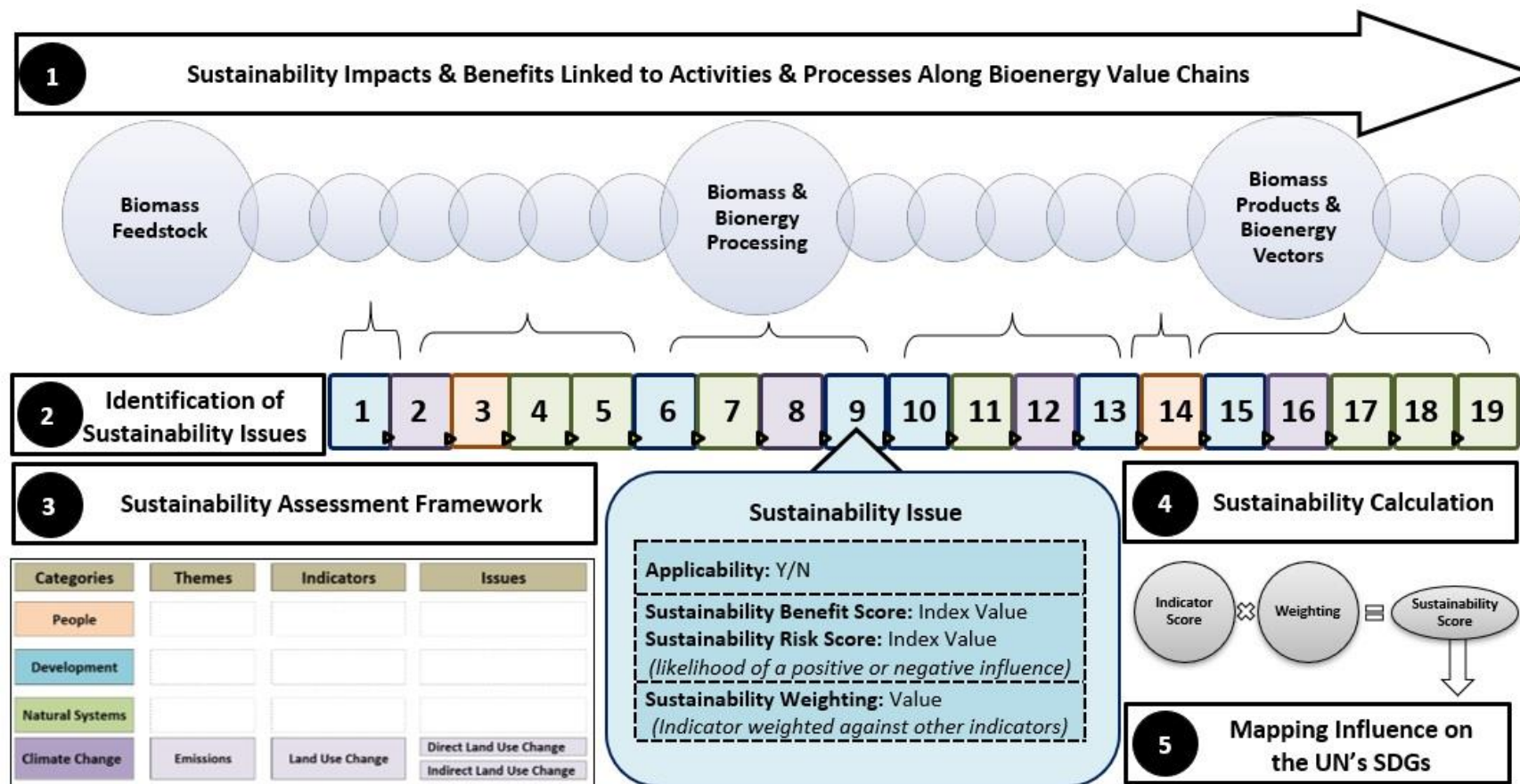
Encourage domestic biomass feedstocks by supporting farmers and foresters together, over the long-term.



Reduce the reliance on centralised BECCS to provide negative emissions.



# Supergen Bioeconomy Sustainability Indicator Model



Access the model:  
<https://bit.ly/SBH-BSIM>

Access the article:  
<https://bit.ly/SBH-BSIM-Article>

BSIM Guidance Manual:  
<https://bit.ly/SBH-BSIM-GUIDE>



Biomass and Bioenergy  
Volume 177, October 2023, 106919



Sustainability of bioenergy – Mapping the risks & benefits to inform future bioenergy systems

Andrew James Weirle, Alberto Almira



# What's next?



**1. All stakeholders:** Sign up for next Supergen webinar

Towards a biomass sustainability framework: Trees, crops and carbon

 27 January 2026  12-1pm

Register your place here: <https://lnkd.in/eqDehiV7>

**2. All stakeholders:** Visit page on Supergen website with links & resources

<https://www.supergen-bioenergy.net/common-biomass-sustainability-framework/>

**3. Researchers:** Researchers who wish to share with Supergen Bioenergy Hub research insights relevant to specific consultation questions may complete this **short MS Form:** <https://bit.ly/4pldNdn> *Closing date Friday 30 January*



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