Policy and Governance Challenges of Achieving Negative Emissions with BECCS

Market and regulatory issues related to Bio-CC(U)S

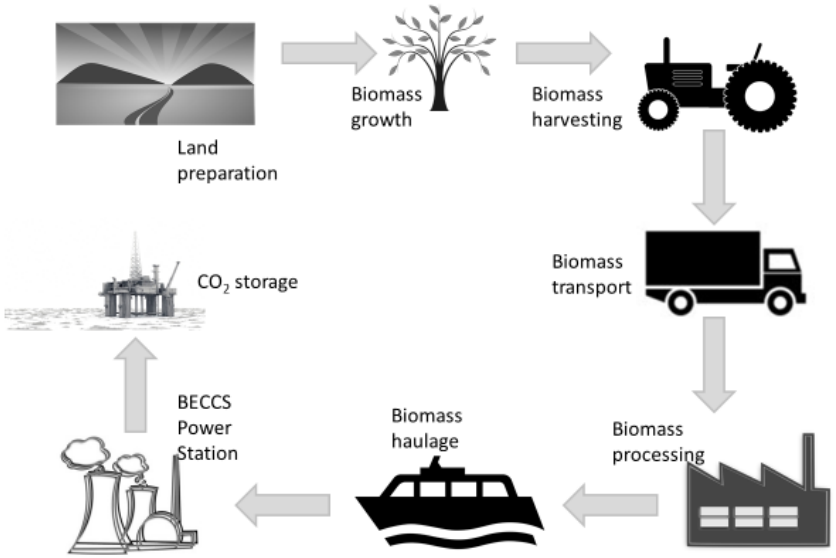
IEA Bioenergy Special project on Bio-CCS & Bio-CCU & DG of the EC

16 January 2018

Professor Patricia Thornley
Tyndall Centre for Climate Change Research
School of Mechanical, Aerospace & Civil Engineering
University of Manchester

Dr Alison Mohr
Institute for Science & Society
School of Sociology & Social Policy
University of Nottingham

Characterisation of BECCS as providing net removal of GHGs from the atmosphere predicated on consideration of the environmental impacts along the entire supply chain



But does such a comprehensive **scope of system** make sense from an analytical and governance perspective?

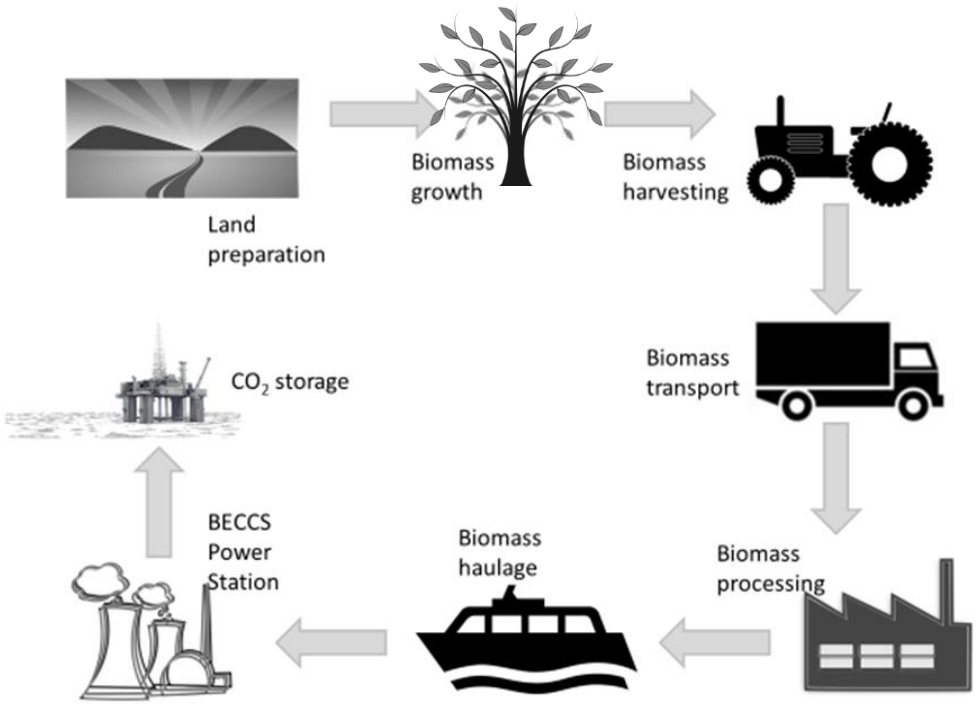
Is the boundary being drawn around the BECCS system an ideologically and defensible one from an analytic perspective?

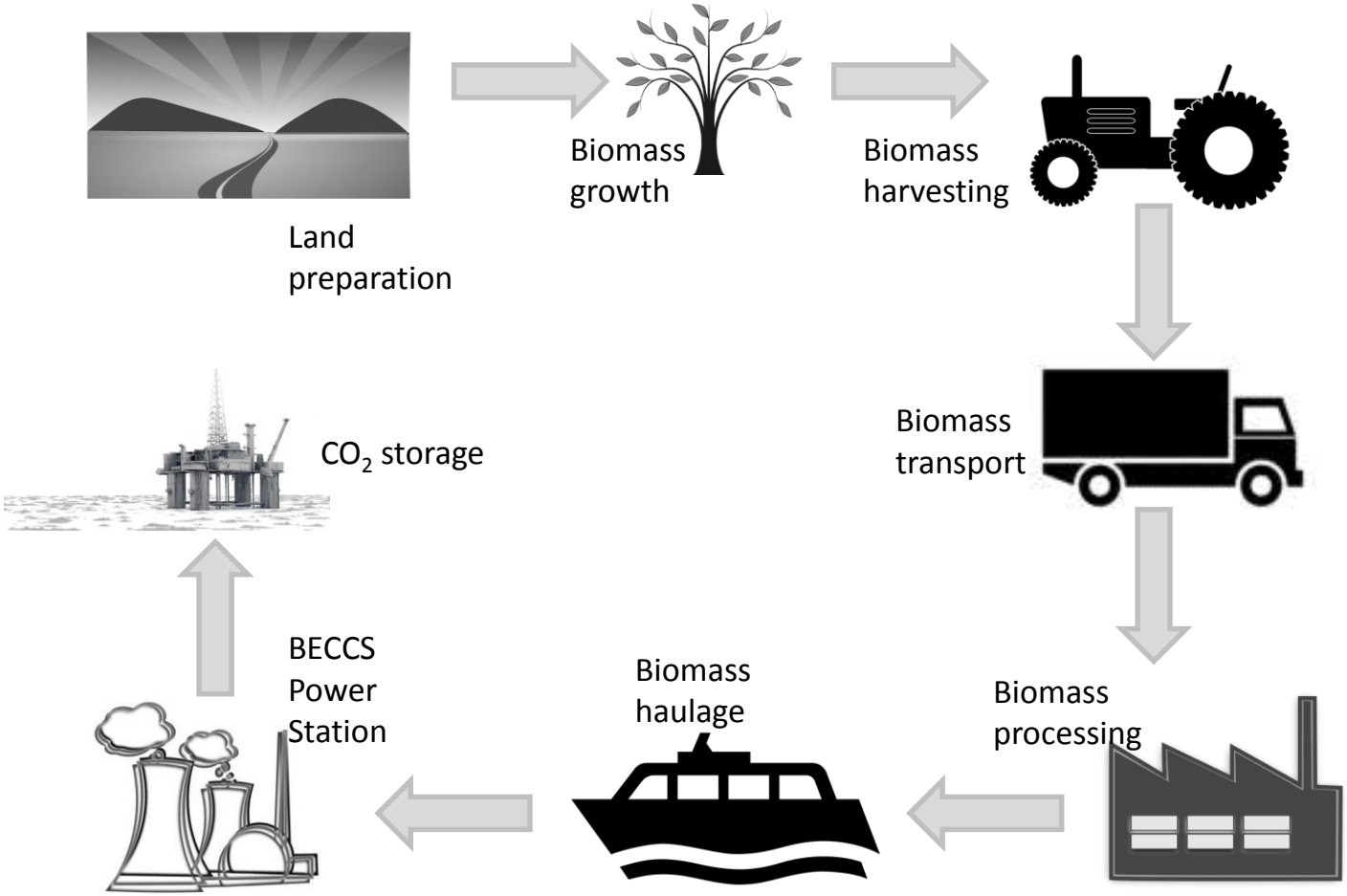
Is the scope of system ethically justifiable, i.e., is there a justification for combining carbon sequestration and emissions incurred in different countries and sectors?

What lessons can be drawn from the spatial ordering of bioenergy technologies and the uneven distribution of their impacts across North/South and global/local contexts?

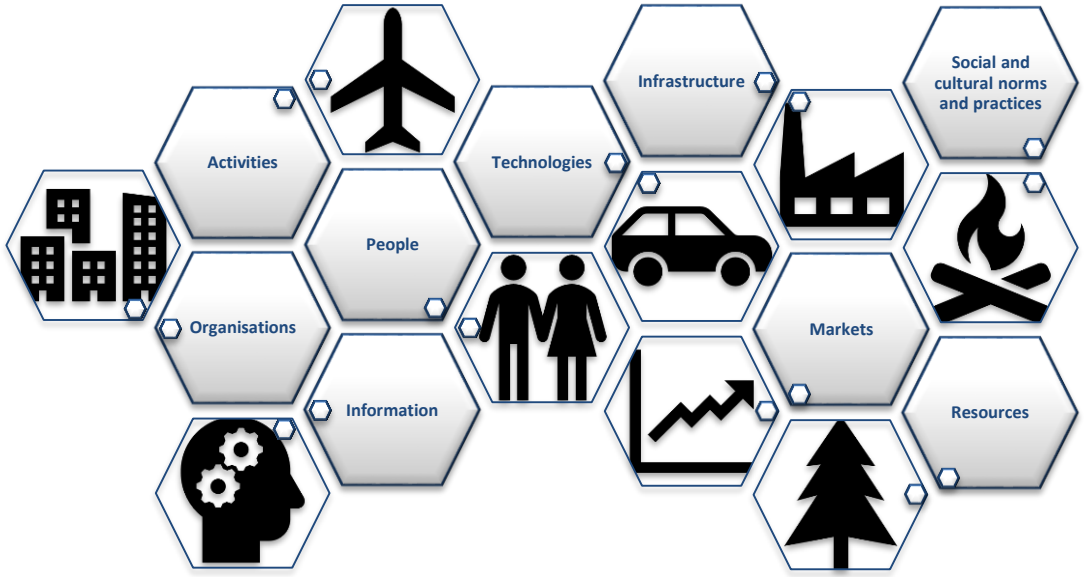
How could an extended analytical focus to encompass the social processes of BECCS deployment and their consequences help shape its governance?

Important to fully account for all parts of the bioenergy system which may be contributing to GHG emissions




Land preparation
Biomass growth
Biomass harvesting
Biomass transport
Biomass processing
Biomass haulage
BECCS Power Station
CO_2 storage

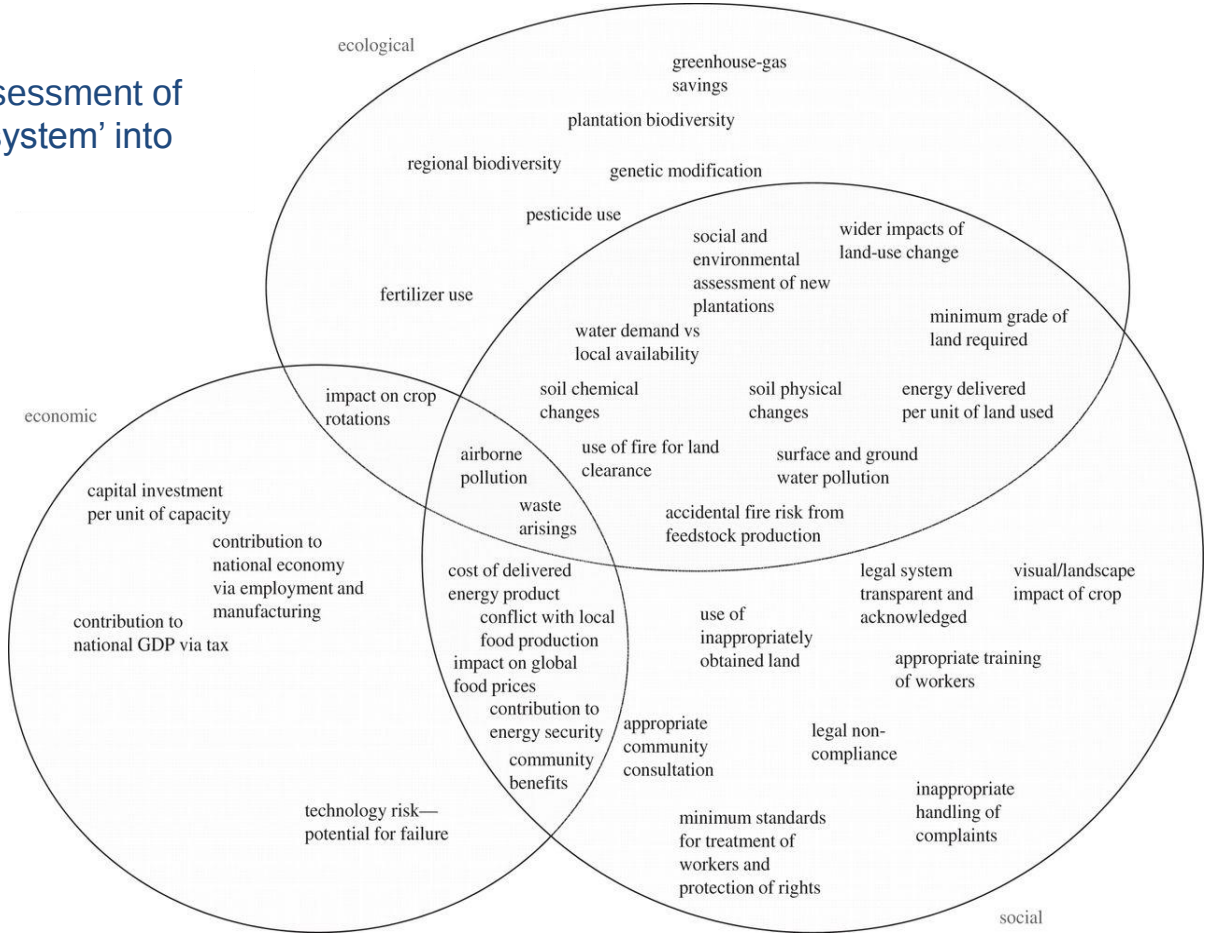
BECCS supply chains are heterogeneous systems



Potential sustainability impacts of bioenergy systems

Need for sustainability assessment of bioenergy to take 'whole system' into account

In practice, most sustainability assessments focus on *environmental* life cycle assessment (LCA)



Thornley and Gilbert, Interface Focus, 2013

Spatial dimension

S. Raman, A. Mohr / Journal of Cleaner Production 65 (2014) 224–233

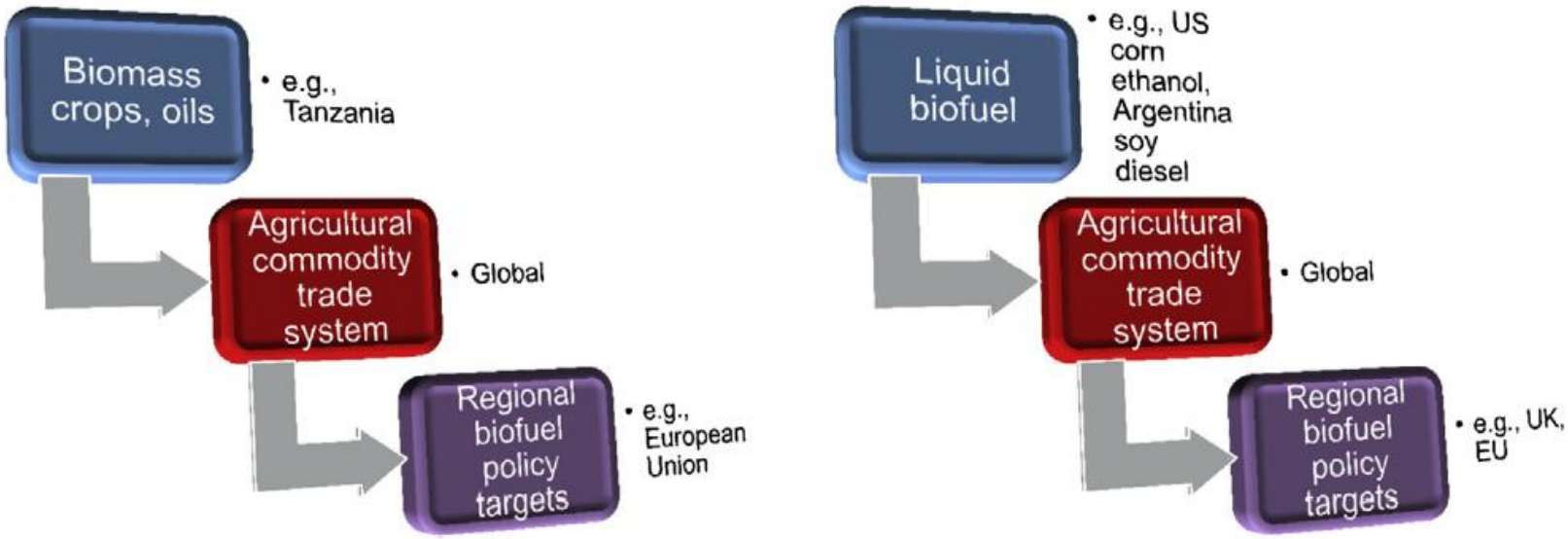


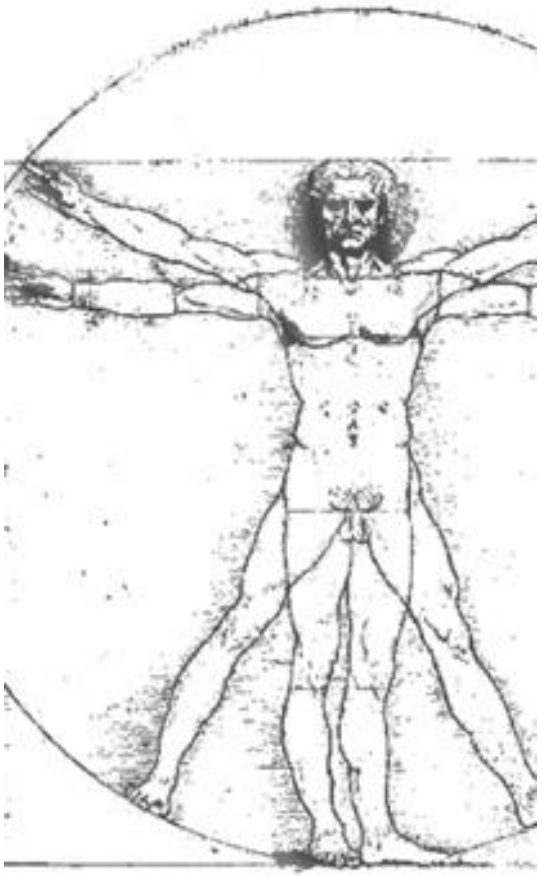
Fig. 1. Spatial representation of controversial Biofuel systems.

Human dimension

Role of institutional and socio-economic innovations, human-technology interactions, and understanding the effects of social and cultural practices and routines on systems change often overlooked

Value-based visions of bioenergy have highlighted concerns about difficulties of monitoring large-scale supply chains, the potential for distributing impacts unfairly, and competition for biomass in global bioeconomy

Public concerns related to CCS are not simply down to knowledge gaps but have to do with differences in values and how the public frames potential risks compared with experts (Markussen et al. 2012, Mander et al. 2010)



Wider and longer-term impacts of unsustainable production systems are under-represented in bioenergy policy because of a tendency to overlook questions of whose value choices count when deciding which impacts to measure and how to measure them (***human dimension***), or the distant degradation of social groups, places and ecologies (***spatial dimension***), or the implications of land use and CO_2 storage for future generations (***temporal dimension***)

Policy interventions

Global (all about the GHGs)

IPCC, UNFCCC Framework, ETS

European

Renewable energy sources, renewable fuels, fuel quality

National (all about meeting targets)

Renewable energy action plans

e.g., UK: RO, RTFO, Banding of the RO, double counting, RHI

Policy planning security and adaptive flexibility – a critical challenge for BECCS

Uncertainties, for example related to the heterogeneity of technology-feedstock combinations and associated sustainability impacts, make it difficult to design policy instruments

Balancing policy flexibility and the ability to respond to new developments and changes in public attitudes vs. policy stability underpinned by firm expectations and planning security

Inclusion of stakeholders as a core guiding principle for BECCS policy design would help strike that balance, as well as balancing other trade-offs

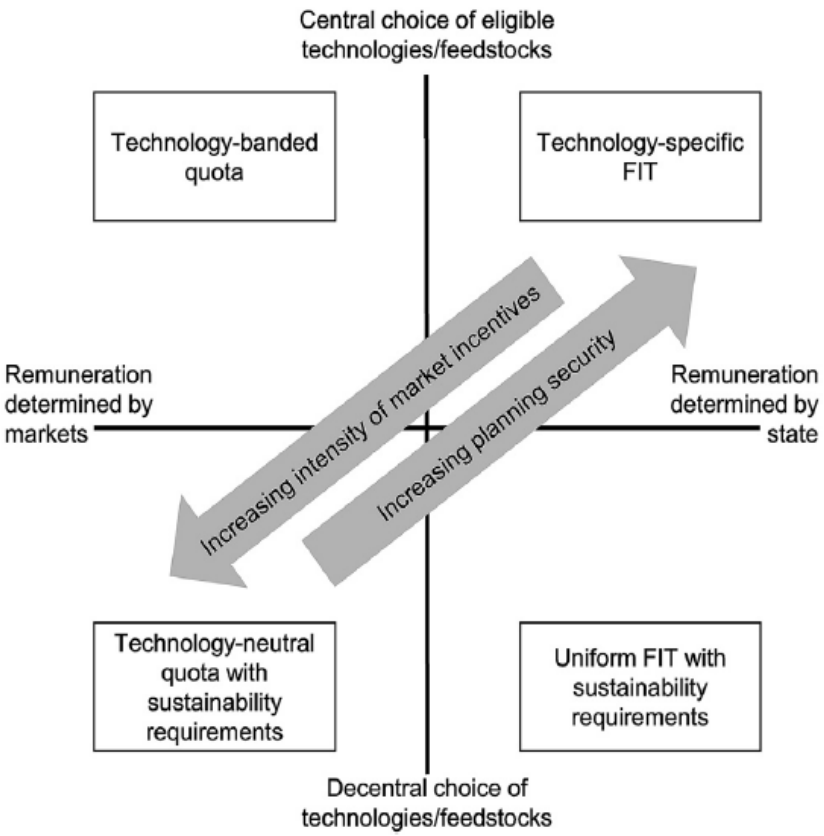
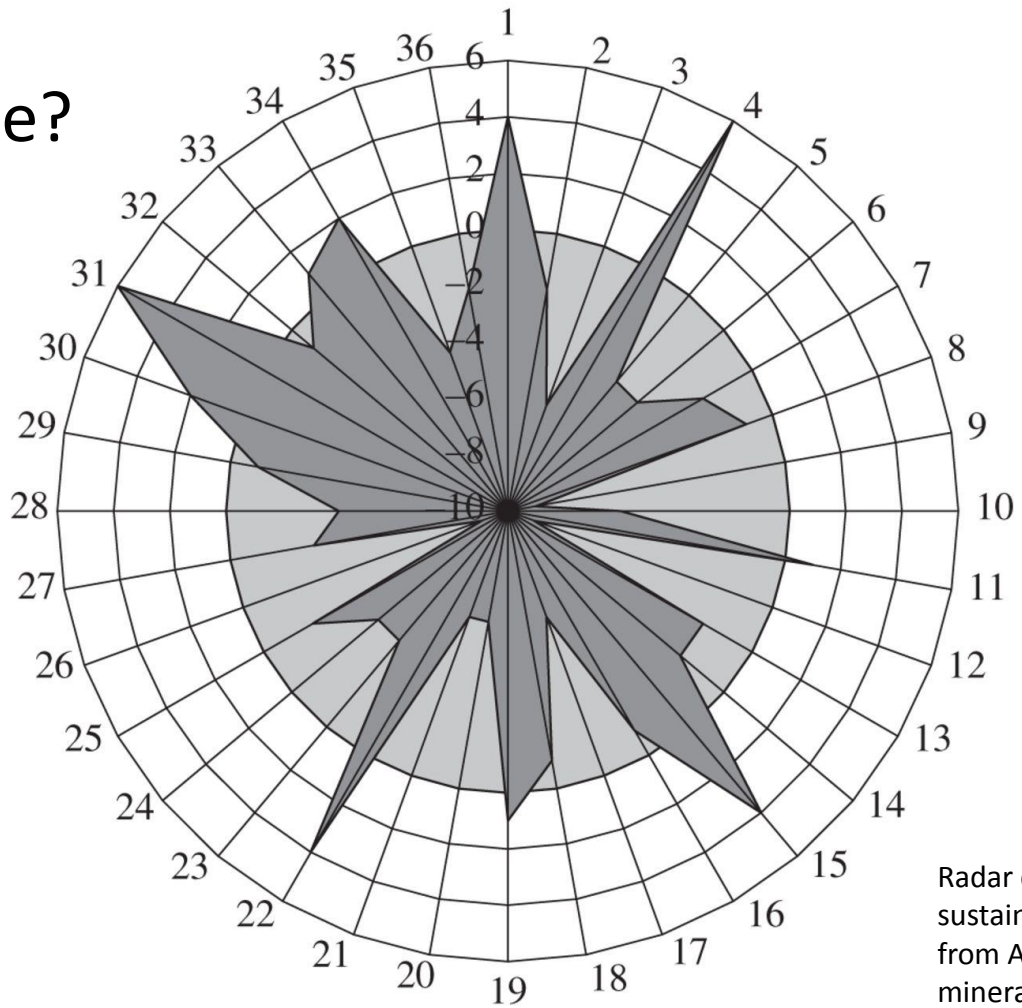


Fig. 3 – Alternative options for differentiating between bioenergy technologies and feedstocks Note: FIT and quota schemes are used as illustrative examples.

Handling uncertainty in bioenergy policy design
(Purkus et al., 2015)

Where does the sustainable boundary lie?



Radar diagram showing overall sustainability assessment of biodiesel from Argentinean soy compared with mineral diesel (light grey = reference level; dark grey = scores for Argentinean soy system)

(Source: Thornley and Gilbert, 2013)

Limitations of bioenergy governance

Inability to comprehensively respond to full range of externalities . . . EU policy has delimited bioenergy specifically as a low carbon energy technology and not a process or alignment of interconnected processes

Narrow focus of EU sustainability certification criteria excludes many aspects of agricultural practices, conversion, distribution and end use

Many of the controversies and negative impacts arise at interfaces with adjacent systems . . . the products of the complex relations between the heterogeneous elements of bioenergy supply chains . . . such interfaces not envisaged by a specific focus on carbon emissions

Bringing the whole supply chain into the purview of governance opens up opportunities to be responsive to specific ways in which the techno-economic components interact with humans in different contexts and at different times

But can this be achieved in practice?

Such a comprehensive scope of system poses challenges for BECCS governance

While GHG emissions are a global issue, the effects of interventions are often context specific

Many emission reductions choices depend on specific aspects of particular supply chain situations

Policy and fiscal interventions (e.g., regulations, prices and other incentives) may need to be individualised – but still insufficient as drivers to establish new BECCS systems – overlooks the role of people in shaping energy and climate systems!

What should the scope of BECCS system governance look like?

Countries vary greatly in their GHG emissions levels as well as their levels of integration in global supply chains and global governance systems of treaties and protocols

Treaties among nations (e.g., COP21 Paris Agreement) that place demands on all signatories unlikely to be both achievable and strongly implementable – less practical potential for reducing emissions (Keohane & Victor, 2016)

Many partial efforts (decentralised governance) could build confidence and lead to larger cuts

Need to explore hybrid policy and governance mechanisms for developing BECCS systems at different scales and that are sensitive to spatial impacts!

Conclusions

BECCS uptake predicated on an assumed scope of system that combines biological carbon sequestration from the atmosphere with energy production and physical sequestration of the CO_2, even if these activities take place in different countries – inconsistent with UNFCCC's focus on national/territorial responsibility for GHG emissions

Supply chain framing allows consideration of how to minimise emissions along that supply chain – but that does not necessarily minimise global emissions, a key objective of UNFCCC and international climate policy

A multi-level governance approach is needed to bridge the value-action gap that exists between global strategies, national policies and institutions and everyday actions

Understanding of the role of institutional and socio-economic innovation, human-technology interactions and social practices in effecting lasting systems change will be important for BECCS governance

Adaptive flexibility needed in face of uncertainty!

Professor Patricia Thornley
Patricia.Thornley@manchester.ac.uk
www.supergen-bioenergy.net

Dr Alison Mohr
alison.mohr@nottingham.ac.uk

Thornley, P. and Mohr, A. (2018, in press). 'Policy frameworks and supply chain accounting' in C. Gough, S. Mander, P. Thornley, A. Lea-Langton and N. Vaughan (eds.), Biomass Energy and Carbon Capture and Storage (BECCS): Unlocking Negative Emissions (Wiley).

Acknowledgements:

BBSRC Sustainable Bioenergy Centre
EPSRC Engineering and Physical Sciences Research Council
The Leverhulme Trust
MANCHESTER 1824 The University of Manchester
Supergen Bioenergy
Tyndall Manchester Climate Change Research
University of Nottingham UK | CHINA | MALAYSIA