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Task 38

Climate Change Effects of Biomass and Bioenergy Systems

Triennium 2016-2018

IEA Bioenergy

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IEA Bioenergy

Task 38
Climate Change Effects of Biomass and Bioenergy Systems

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Introduction

The primary goal of IEA Bioenergy Task 38 “Climate Change Effects of Biomass and Bioenergy Systems” is to develop, demonstrate and promote methods to assess the net climate effects of bioenergy, to support greenhouse gas accounting for bioenergy, and to inform decision-makers in the selection of GHG mitigation strategies. Task 38 brings together the research work of national programmes in participating countries, on climate change effects of a wide range of biomass systems, bioenergy technologies and terrestrial carbon sequestration. The Task considers questions of GHG estimation in agriculture, forestry and the energy sector, with application to GHG inventory reporting and life cycle assessment, and contributes to the work of the Intergovernmental Panel on Climate Change (IPCC). Emphasis is placed on the development of state-of-the-art methodologies for assessing climate change effects that demonstrate the application of established methods and support decision-makers in implementing effective GHG mitigation strategies.

For the 2016-2018 Triennium, Task 38 continued to work on quantifying the climate change effects of biomass and bioenergy systems, with specific emphasis on:

1. Completing work on the appropriate reference systems against which to compare a bioenergy system;

2. Completing work on the appropriate metrics for quantifying the climate effects of bioenergy;

3. Responding to the growing scepticism about the climate effects of bioenergy;

4. Providing input to development of international standards and IPCC reports that influence GHG reporting and policy for bioenergy; and

5. Developing guidance on application of Life Cycle Assessment of bioenergy systems.

The Task aimed to promote understanding of the role of bioenergy in climate change mitigation. The Task objectives were:

1. Continue to update and improve the “Task 38 standard methodology” for the calculation of climate change effects of bioenergy, based on life cycle perspective, by incorporating new issues, technologies and topics as they arise;

2. Interact with researchers and policy-makers to improve understanding of the standard methodology

3. Work with other IEA Bioenergy Tasks to assess climate change effects of emerging bioenergy technologies;

4. Apply the standard methodology to assist in developing best practices for reducing GHG emissions using biomass and bioenergy; and

5. Aid decision makers in selecting mitigation strategies that optimise climate outcomes by disseminating the results of the above-mentioned activities.

This report summarises the activities, deliverables, progress on objectives, and successes and difficulties during the Triennium 2016-2018.

Background

The urgent need for strong action on climate change was spelled out by the IPCC in their 5th Assessment report, released in 2013-14. The IPCC's Special Report on meeting a 1.5 degree target, released in October 2018, stressed the large benefit of limiting warming to 1.5 rather than 2 degrees, and presented the case that, although challenging, it is not impossible to achieve this target if rapid decarbonisation is pursued.

Bioenergy has been promoted as a component of renewable energy policies in many countries, as an alternative to fossil fuels, with climate change mitigation benefits. However, the mitigation benefit of bioenergy has been increasingly challenged. The debate began around 2008, initiated by publication of several high-profile papers including by Tim Searchinger (Searchinger et al, 2008[1]; Searchinger et al, 2010[2]), and boosted by various similar studies (e.g. Walker et al, 2010[3]; Hudiburg et al, 2011[4]; Schulze et al, 2012[5]). Some of these studies received wide publicity and have raised doubts in the community and amongst decision-makers about the effectiveness of bioenergy as a climate change measure. The debate has continued, fuelled by further publications by Searchinger et al. (2018a[6], 2018b[7]) and others (e.g. Sterman et al., 2018[8]) focusing on long payback times of forest-based bioenergy, and indirect effects on land use and food production.

At the same time, interest in negative emissions technologies, also known as carbon dioxide removal, has intensified. Most of the scenarios presented by the SR1.5 that enable stabilisation at 1.5 or 2 deg rely on large quantities of bioenergy with or without CCS (BECCS). Other have questioned the technical potential indicated in these scenarios, and highlighted risks of food insecurity, biodiversity loss and land degradation, should such strategies be pursued.

Thus, the debate on bioenergy has become increasingly heated, and highly polarised. Some declare that bioenergy is always carbon neutral while others claim it will not provide climate benefits unless based on rapidly-decomposed residues, and therefore live trees or energy crops should not be used.

Amongst the scientific community there has been an ongoing debate about the appropriate use of life cycle assessment (LCA) to inform and implement policy, and how direct and indirect land use impacts should be included. Two approaches to LCA are described in the literature – attributional LCA, that seeks to quantify the impacts of a product as a component of all human activity; and consequential LCA that quantifies the marginal impact of a change in production. Task 38 has

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1 Searchinger, T., et al. 2008. Use of US croplands for biofuels increases greenhouse gases through emissions from land-use change. Science, 319(5867), pp.1238-1240.

2 Searchinger, T.D., 2010. Biofuels and the need for additional carbon. Environmental Research Letters, 5(2), p.024007.

3 Walker, D.A., 2010. Biofuels–for better or worse?. Annals of Applied Biology, 156(3), pp.319-327.

4 Hudiburg, TW et al., 2011. Regional carbon dioxide implications of forest bioenergy production. Nature Climate Change, 1(8), p.419.

5 Schulze, E.D., et al., 2012. Large-scale bioenergy from additional harvest of forest biomass is neither sustainable nor greenhouse gas neutral. Gcb Bioenergy, 4(6), pp.611-616.

6 Searchinger, T.D., et al., 2018. Europe's renewable energy directive poised to harm global forests. Nature communications, 9(1), p.3741.

7 Searchinger, T.D., et al., 2018. Assessing the efficiency of changes in land use for mitigating climate change. Nature, 564(7735), p.249.

8 Sterman, J.D., er al., 2018. Does replacing coal with wood lower CO2 emissions? Dynamic lifecycle analysis of wood bioenergy. Environmental Research Letters, 13(1), p.015007.

been working on the development of methodology to support LCA, and guidance to assist decision-makers to understand the appropriate use of LCA for different applications.

It is in this highly charged context that Task 38 seeks to provide a balanced, scientifically-grounded perspective on the appropriate role for bioenergy in contributing to the urgent need for climate change mitigation, and to develop and communicate methods to quantify the climate change effects of different bioenergy systems

Task objectives and work carried out

OBJECTIVE 1

Refine the “Task 38 standard methodology” for the calculation of climate change effects of bioenergy, based on a life cycle perspective, by incorporating new issues, technologies and topics as they arise

The following scientific papers on aspects of climate change impact assessment methodology, that contribute to enhancing the standard methodology, were published during the triennium:

a) Reference systems for evaluating climate effects of bioenergy

Koponen, K., Soimakallio, S., Kline, K.L., Cowie, A. and Brandão, M., 2017. Quantifying the climate effects of bioenergy–Choice of reference system. *Renewable and Sustainable Energy Reviews*.

This paper discusses the importance of the reference system in evaluating the climate effects of bioenergy and presents guidance on choosing the most appropriate reference system according to the purpose of the study, with particular focus on the land use reference. A decision tree is presented to aid researchers and decision-makers in identifying the relevant reference system for their objective.

b) Consequential life cycle assessment

Brandão, M., Martin, M., Cowie, A., Hamelin, L., Zamagni, A., 2017.Consequential Life Cycle Assessment: What, How, and Why? In: Abraham, M.A. (Ed.), Encyclopedia of Sustainable Technologies. Elsevier, pp. 277–284.
This book chapter published in Elsevier Encyclopedia for Sustainable Technologies provides guidance on conducting consequential life cycle assessment.

c) Metrics for quantifying climate effects of bioenergy

Brandão, M., Kirschbaum, M.U., Cowie, A.L. and Hjuler, S.V., Quantifying the climate change effects of bioenergy systems: comparison of 15 impact-assessment methods. *Global Change Biology Bioenergy*

There are different approaches to quantitatively estimate the climate change effects of bioenergy systems. This paper focused on a range of published impact assessment methods that vary due to conceptual differences in the treatment of biogenic carbon fluxes, the type of climate change impacts they address and differences in time horizon and time preference. Specifically, this paper reviews fifteen different methods and applies these to three hypothetical bioenergy case studies. Our analysis shows that the choice of method can have an important influence on the quantification of climate change effects of bioenergy. In general, results are more sensitive to specific impact assessment methods when they involve both emissions and removals at different points in time, such as for forest bioenergy, but have a much smaller influence on agricultural bioenergy systems grown on land previously used for pasture or annual cropping. The development of effective policies for climate change mitigation through renewable energy use requires consistent and accurate approaches to identification of bioenergy systems that can result in climate change mitigation. The use of different methods for the same purpose: estimating the climate change effects of bioenergy systems, can lead to confusing and contradictory conclusions. A full interpretation of the results generated with different methods must be based on an understanding that the different methods focus on different aspects of climate change and represent different time preferences.

d) Quantifying the Climate Effects of Forest-Based Bioenergy

Cowie, A.L., Brandão, M. and Soimakallio, S., 2019. Quantifying the climate effects of forest-based bioenergy. In *Managing Global Warming* (pp. 399-418). Academic Press

This book chapter explains the basis for divergent results amongst published studies on climate effects of forest-based bioenergy systems, and summarises the Task 38 recommended approach to assessing climate effects of forest-based bioenergy.

The following papers are nearing completion:

Indirect land use change: A component of the inter-Task project "Measuring, governing and gaining support for sustainable bioenergy supply chains", this paper analyses statistical data for the USA and trading partners to estimate whether corn use for ethanol has resulted in indirect land use change (iLUC). It is to be published in a special issue of the journal Sustainability, on land-use competition.

Updating the standard methodology: This paper reiterates and expands the "standard methodology" paper (Schlamadinger et al 1997), synthesising recent work of Task 38, to present recommendations on quantifying climate change effects of bioenergy, with guidance on how to make appropriate choices for key aspects such as system boundary, reference land use, metrics for climate assessment and handling co-products.

Two reports on specific biophysical aspects that influence the climate effects of bioenergy systems, commissioned jointly with Task 43, have been published and a third it in review:

- Albedo effects of biomass production: This report reviews recent findings on the extent to which changes in albedo can enhance or diminish the climate change benefits of bioenergy. The albedo effect is dependent on the latitude, and the bioenergy system (woody or annual crop, and its management).

- Climate impact assessments of forest bioenergy affected by decomposition modelling This report compares the Q and Yasso models, that are used to model decomposition of forest litter. The study found that the choice of the decomposition model results in different quantitative estimates. However, the decomposition model choice does not lead to diverging conclusions about the warming impact of extracting forest residues for bioenergy.

- The Representation and Role of Biomass and Bioenergy in Integrated Assessment Models (IAMs): This review provides an overview of the representation of biomass and bioenergy in IAMs, their modelled interaction with other mitigation measures including renewables and other land-based mitigation, and how their results should be interpreted.

OBJECTIVE 2

Interact with researchers and policy-makers to improve understanding of the standard methodology, and the climate change effects of bioenergy

Task 38 organised workshops, some in conjunction with other Tasks, to facilitate interaction with researchers outside IEA Bioenergy:

a) Understanding the Climate Effects of Bioenergy Systems

16 May 2017 Gothenburg This workshop co-hosted with Chalmers university focussed on how bioenergy contributes to climate change mitigation, in the context of the global carbon budget, transformation pathways and application of LCA in informing policy for bioenergy.

Key messages included:

Most scenarios to stay below 2°C include negative emissions from BECCS, but global models do not accurately simulate large-scale bioenergy.

CO_2 emissions and sequestration from bioenergy should not be considered in the global carbon budget, except when there is a long-term reduction in the biospheric carbon stock in biomass and/or soil. Fossil CO_2 emissions have an irreversible climate impact. In contrast, the climate warming effects of bioenergy are reversible except if C stock loss is permanent.

Policy should be guided by research using various analytical methods, including LCA with different metrics), integrated assessment models, scenario analysis, energy system and economic modelling, as each gives different insights.

b) Understanding Climate Change Effects of Forest biomass and Bioenergy Systems,

Angers (France) November 7 2017

The Angers workshop brought together researchers from a range of disciplines to share insights from different approaches to assessing the climate effects of bioenergy. Participants presented a range of perspectives on bioenergy, and methods being developed to quantify, for example, land use change and impacts on soil carbon. The workshop identified key messages, and future work required to resolve uncertain aspects.

c) Consequences for climate and bioenergy of land sector carbon accounting under the Paris agreement:

Uppsala (Sweden) 29-30 August 2018

The aim of the workshop, hosted by the Swedish University of Agricultural Sciences (SLU), was to inform decisions on an accounting framework for the land use sector under the Paris Agreement, and to contribute to the further discussion and planning of climate and energy policies. Specifically, the workshop examined and discussed:

- How different land sector carbon accounting frameworks create incentives or disincentives to harvest biomass for bioenergy and/or biomass-based products.
- How different land sector carbon accounting frameworks influence forestry and other land management options towards build-up of land carbon stocks,
- How the implementation of reference levels in carbon accounting schemes influences land

management options.

The scope of the workshop was global, and case studies and analyses from different regions, biomes and political and institutional contexts were presented. The workshop brought together researchers from a range of disciplines to share insights from different approaches to assessing the consequences of land sector carbon accounting. The workshop examined the pros and cons of the current approach to land sector accounting, particularly the forest reference level (FRL, a dynamic forward baseline). While there is scepticism about the potential for gaming and creating a disincentive for harvest, it is generally agreed to be preferable to the previous gross-net approach. Recent refinements in modelling the baseline, and restriction to existing policies, have reduced criticism. The workshop identified future work required to resolve uncertain aspects. A review of effectiveness of the FRL will be undertaken by JRC, due to be released late 2019.

With the specific aim of informing policy advisors and decision-makers on the role of bioenergy in climate change mitigation, Task 38 undertook the following:

- Led a response to a report by Chatham House: "Woody Biomass for Power and Heat: Impacts on the Global Climate", published by IEA Bioenergy. IEA Bioenergy published a short letter (https://www.dropbox.com/s/8nbrkmy9owhpk8m/Chatham_House_response_3pager_final.pdf?dl=0), and a supporting document (https://www.dropbox.com/s/fcty5tjpdaqr8g5/Chatham_House_response_supporting%20doc.pdf?dl=0) in which the main flaws are highlighted, and Chatham House was urged to reconsider its policy recommendations

- Contributed to organising and delivering the first international conference on negative emissions

- Contributed to the letter from scientists ahead of the European Parliament vote on the EU Renewable Energy Directive, written to convey a balanced scientific view on forest bioenergy: https://www.efi.int/news/forests-bioenergy-and-climate-change-mitigation-are-worries-justified-2018-01-16.

- Contributed to the FAQ on climate effects of bioenergy published by IEA Bioenergy.

OBJECTIVE 3

Work with other IEA Bioenergy Tasks to assess climate change effects of emerging bioenergy technologies

a) Harmonising tools for biofuel assessment

The study examined the basis for differences between tools used for assessing climate effects of biofuels in different jurisdictions. Brazilian Bioethanol Science and Technology Laboratory (CTBE, Campinas, Sao Paulo) and National Renewable Energy Laboratory (NREL, US) researchers completed a comparison of the LCA tools GREET, GHGenius, BioGrace, used in Europe, Canada and United States, respectively, and the Brazilian tool Virtual Sugar Biorefinery VSB/CTBE). This study, which commenced in collaboration with Task 39, was expanded under the Inter-Task project "Measuring, governing and gaining support for sustainable bioenergy supply chains".

The comparisons were made for corn, wheat, and sugarcane ethanol. When harmonised with common assumptions and default values, the tools provide similar results with respect to greenhouse gas (GHG) emissions of biofuel supply chains. The study is relevant for policymakers and researchers because it shows that differences are a function of the framework setup for each of the tools, and includes legislative requirements in some cases. The results for the sugarcane comparison were presented by CTBE in Campos de Jordao, Brazil at the Brazilian BioEnergy Science and Technology Conference (October 2017), and the entire study has now been accepted for publication in Renewable and Sustainable Energy Reviews.

b) Intertask Algae report

Led by Task 39 with contributions from Tasks 34, 37, 38, and 42, the State of Technology Review – Algae Bioenergy. Task 38 contributed Chapter 8, Sustainability and Life-cycle Assessment of Algal Bioenergy. The review of LCA studies of algal biofuel has also been submitted for publication in the Journal of Industrial Ecology.

c) The special project on Bio-CCUS

- The Bio-CCUS special project organised a series of four workshops:
- Jan 2018: Market and regulatory issues related to Bio-CCUS
- Oct 2017: Market-driven future potential of Bio-CC(U)S
- Nov 2016: Sustainability and GHG impact of Bio-CC(U)S
- May 2016: Workshop on applicable Bio-CC(U)S concepts for member states 2030 – 2050

In the context of the project, VTT has published a discussion paper on Carbon Capture and Utilisation, available at: http://task41project5.ieabioenergy.com/news/new-discussion-paper-carbon-capture-utilisation/

Also a journal paper "GHG emission balances and prospects of hydrogen enhanced synthetic biofuels from solid biomass in the European context" by Koponen & Hannula 2017 (https://doi.org/10.1016/j.apenergy.2017.05.014) relates to the special project.

OBJECTIVE 4

Apply the standard methodology to assist in developing best practices for reducing GHG emissions using biomass and bioenergy

Utilising land clearing biomass for bioenergy and biochar:

A component of the inter-Task project, "Measuring, governing and gaining support for sustainable bioenergy supply chains", this study evaluated the climate effects of utilising native scrub residues for bioenergy and biochar, rather than burning in the field, as an alternative approach to managing invasive scrub, a common issue in the world's drylands. The pyrolysis of biomass residue from land clearing, to produce biochar and electricity, in comparison with in-field burning, was assessed using consequential LCA. When indirect effects are considered, pyrolysis gives better climate outcomes despite the low density of biomass and long transport distances, compared with the current policy approach, which provides carbon credits for cessation of land clearing. The manuscript is under review.

OBJECTIVE 5

Aid decision makers in selecting mitigation strategies that optimise climate outcomes by disseminating the results of the above-mentioned activities.

Task 38 led or contributed to the following activities designed to disseminate the work of Task 38 to decision-makers

- Comment to misleading paper on climate impacts of bioenergy policy published in the high-profile journal Nature Climate Change:

Cowie et al. (2016) Reply to “Rethinking forest carbon assessments to account for policy institutions”, by Andrew Macintosh, Heather Keith and David Lindenmayer. Published Online: 29 June 2015 / DOI: 10.1038/Nclimate2695 (2015), Nature Climate Change.

These researchers used biased assumptions and inappropriate system boundaries to contrive a result that was detrimental to production forestry, including bioenergy. This emphasises the need for the updated standard methodology to be published as soon as possible. While the journal was keen to publish our response, the process was very slow, appearing 12 months after the original publication.

- Contribute to report on Carbon neutrality of Bioenergy, with Task 43, for European Forest Institute: "Forest biomass, carbon neutrality and climate change mitigation" (Berndes, Asikainen, Cowie, Egnell, and others)

Full report: http://www.efi.int/files/attachments/publications/efi_fstp_3_2016.pdf

Brief: http://www.efi.int/files/attachments/publications/efi_thinkforest-brief_carbon_neutrality.pdf

Key findings: ´Carbon neutrality” is a complex issue that can distract from understanding the full climate consequences of using forest biomass for energy. The report outlines the many factors that determine the climate impacts of bioenergy.

- Chatham House response: As described above.

- Response to Sterman et al. 2018: Critique of Sterman’s study, highlighting unrealistic assumptions applied. (Prisley et al., 2018)

Success stories

To determine how much a bioenergy system contributes to climate change mitigation it is necessary to compare scenarios with and without the bioenergy system. Task 38 has worked since its inception to convey the importance of inclusion of a reference system in studies that assess the climate change effects of bioenergy. This requires determining what energy source would be used in the absence of bioenergy. If the feedstock is an energy crop, then the “without-bioenergy” scenario must also include consideration of what would happen to the land in the absence of bioenergy, that is, what would be the reference land use.

In earlier triennia, Task 38 has held several workshops on the topic of the reference land use (Chicago, April 2012; Vienna, November 2012). Task member Sampo Soimakallio (Finland) led a study examining the inclusion of a land use reference in published LCA studies (Soimakallio *et al.*, 2015 and 2016[9]).

Following the workshops held in 2015 Task 38 commenced development of a scientific paper to provide guidance on the choice of land use reference system. Kati Koponen (Finland) led the drafting of the manuscript. The paper discusses the importance of the reference system in evaluating the climate effects of bioenergy. It develops the concept that policy makers have different needs (for example, implications of a policy or selection of a particular bioenergy technology within a policy) hence the reference system should be selected to meet these requirements. A decision tree is presented to aid researchers and decision-makers in identifying the relevant reference system for their purpose (Figure 1). The paper has now been published in the journal Renewable and Sustainable Energy Reviews.

The paper has been cited already in many subsequent studies by other authors

Application: The paper provided the substantiation for Annette Cowie to make a case for including a requirement to specify a land use reference, in the development of the International Standard on carbon footprint of a product (ISO 14067: 2018). The standard requires users to document and to justify their choice of reference. An appendix was drafted using options presented in the paper, to provide guidance to LCA practitioners to inform their choice of reference land use.

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[9] Soimakallio, S., Cowie, A., Brandão, M., Finnveden, G., Ekvall, T., Erlandsson, M., Koponen, K. and Karlsson, P.E., 2015. Attributional life cycle assessment: is a land-use baseline necessary?. *The International Journal of Life Cycle Assessment*, *20*(10), pp.1364-1375.
Soimakallio, S., Brandão, M., Ekvall, T., Cowie, A., Finnveden, G., Erlandsson, M., Koponen, K. and Karlsson, P.E., 2016. On the validity of natural regeneration in determination of land-use baseline. *The International Journal of Life Cycle Assessment*, *21*(4), pp.448-450.

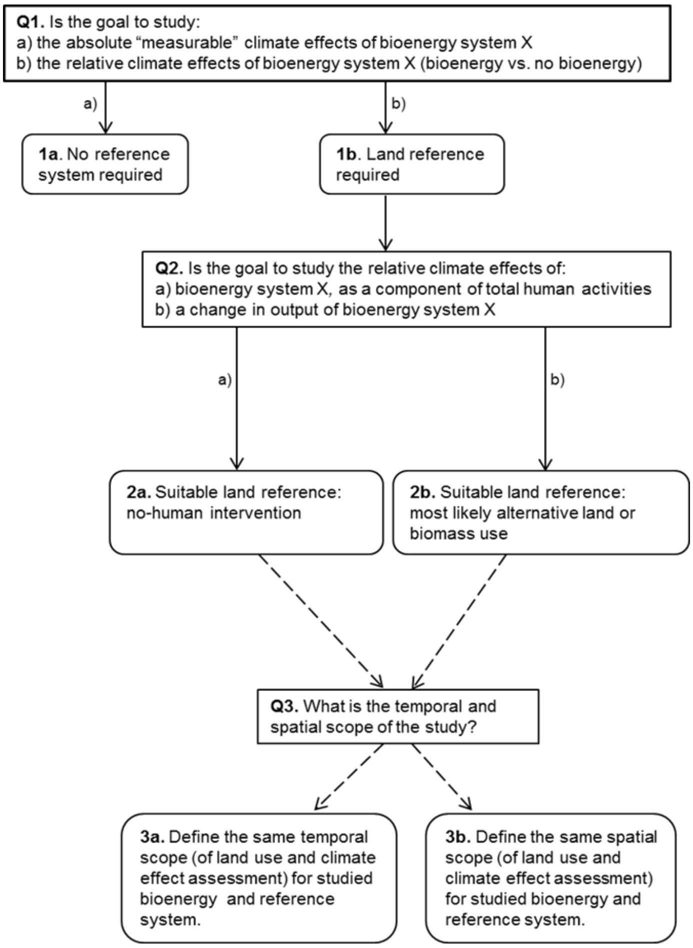

Figure 1 Decision tree to aid choice of the appropriate land use reference (Koponen et al., 2018)

Conclusions and recommendations

CONCLUSIONS

The evidence of climate change continues to mount, and the IPCC has warned that strong action to rapidly decarbonise energy systems and prevent land use emissions is needed to minimise the risk of catastrophic climate change impacts. In this context of growing awareness of the urgency to act on climate change, there has been increasing scrutiny of bioenergy, particularly in relation to climate change, but also other environmental and social impacts. Forest-based bioenergy in particular has been challenged with respect to its payback time and indirect emissions, and there has been strong criticism of the "carbon neutral" status afforded, or perceived, for bioenergy in some contexts.

During the 2016 – 2018 triennium Task 38 has responded to this debate in several ways: (1) by continuing its work on methodological issues in quantifying climate change effects of bioenergy, publishing journal papers and reports on aspects of methodology relevant to life cycle assessment and GHG reporting for bioenergy; (2) by facilitating discussion amongst the research community on the role of bioenergy in climate change mitigation, through expert workshops hosted in member countries; (3) Task 38 has sought to inform public debate and decisions by policy-makers through webinars, contribution to FAQ, input to policy processes, letters to MPs, and the widely-publicised response to the Chatham House report; (4) Task 38 members involved in international processes to develop high profile standards and reports, and have used these opportunities to communicate the methods developed by Task 38, and the understanding of bioenergy's role in climate change mitigation; and (5) Task 38 has worked closely with other Tasks to apply the standard methodology, including to emerging bio-based systems (BECCU), undertake joint studies, present joint workshops and develop outreach materials.

Thus, through publications and other outputs, workshops, webinars, and involvement in international bodies, Task 38 has maintained its position as a recognised authority on climate change effects of bioenergy. In total, Task 38 National Team Leaders and associates delivered ten scientific papers and reports. Task 38 held six business meetings and organised four expert workshops. In addition, Task 38 members published over 50 papers related to the work of the Task.

Task 38 has discerned that the wide range of results between different studies of bioenergy systems arises for a variety of reasons: Bioenergy systems differ with respect to feedstock procurement; efficiency of conversion; benefit from avoided emissions, due largely to the context (site conditions, existing land use and energy systems) and the bioenergy product produced. Importantly, studies also differ in the methodological approach. Key choices in this respect relate to system boundary, reference land use and energy system, and methods used for climate impact assessment.

Some differences are associated with differences in the intended application of the study results. For example, a consequential approach intended to inform policy development should use as reference the most likely alternative land use, whereas an attributional study would use the natural regeneration anticipated in the absence of human interference.

Some decisions are subjective, such as the time frame used for analysis. Some studies overlook important aspects such as changes in C stock at the site of biomass production, or use unrealistic assumptions that over or underestimate the likely effects of bioenergy.

Task 38 has therefore continued working to promote understanding that bioenergy systems vary widely, from those with negligible payback times to others that provide benefits only in the long term. Task 38 focuses on promoting appropriate methods to quantify the climate change effects of different bioenergy systems, so that decision-makers will be better able to understand the contribution that bioenergy can make to the urgent task of climate change mitigation, identify the most beneficial bioenergy systems, and devise policy measures to promote these systems

RECOMMENDATIONS

Task 38 has established good practice in quantifying climate change effects of bioenergy. The methodology developed by Task 38 should be applied in IEA Bioenergy Tasks that consider specific technologies, and further developed in the new Task 45, that will continue the work of Task 38 under one of its three work programmes.

Practitioners undertaking studies on the climate change effects of bioenergy should ensure that the method (e.g. approach, system boundary, time frame of assessment) and assumptions are aligned with the intended application of the study. A consequential approach is applicable where the study aims to determine the impact of a change in production, such as to inform policy development; an attributional approach is applicable for micro-scale decisions and to test compliance, where the policy framework has been informed by consequential approaches. In all cases, the assumptions should be clearly stated and justified. There is often merit in using more than one approach and in considering alternative reference scenarios for the counterfactual, acknowledging that the future is uncertain. Work is required to quantify and communicate uncertainties in different methods, and to better understand the implications for climate stabilisation of the timing of emissions and removals.

While the challenges to bioenergy have increased, the need for negative emissions has also been increasingly recognised. It is therefore important to enhance understanding of: the potential for sustainable bioenergy, through BECCS, to contribute negative emissions; the challenges and opportunities from expansion of bioenergy; and the uncertainties in the global modelling. IEA Bioenergy should work with the modelling community to enhance the capacity of global models to accurately represent biomass production systems, and overcome recognised limitations of these models. Work is required to develop bottom-up estimates of the global potential for biomass production through sustainable systems, to complement global modelling results, recognising that bottom-up studies have greater capacity to quantify biomass potential from strategic integration of biomass production into agricultural and forestry systems. Besides product-focussed LCA, alternative approaches should be applied, including regional and national scenario modelling, and energy systems modelling, to investigate how bioenergy can best support decarbonisation of energy systems

Attachments

TASK MEETINGS AND PARTICIPATION IN MAJOR EVENTS

Table 1: Meetings and conferences organized

Item	Date	Description
Business/expert meeting	15 April 2016	Task meeting, Savannah (USA). Key items discussed: - Finalising paper on choosing the reference system with which to compare a bioenergy system; - Presentations from Task members on time dependence of climate change mitigation; - Climate change mitigation challenges for wood utilisation in Finland; Bioenergy pathways for cars; ClimWood2030 project; - Inter-Task projects on Bio-CCUS and Sustainable bioenergy supply chains - Report comparing the Q and Yasso decomposition models, and report on

Item	Date	Description
		albedo effects of bioenergy.
Business meeting	9 & 11 January 2017	Task meeting, Växjö (Sweden) Key discussion points: - Finalising paper on choosing the metric with which to compare a bioenergy system; - Presentations from invited experts on cellulosic ethanol, on Full climate impacts of managed boreal forests, and on Potential of forest management for future climate mitigation; - Inter-Task projects on Bio-CCUS and Sustainable bioenergy supply chains
Business meeting	15 May 2017	Task meeting, Gothenburg (Sweden) Key items discussed: - Presentations by members on recent work, other items of interest, country developments; - Update on international developments: IPCC to prepare a Special report on Climate change and the Land: - Revision of carbon footprint standard ISO 14067
Business meeting	6 &8 November 2017	Task meeting Angers (France) Key items discussed: - Future of Task 38; - Update on current Task papers in preparation, including metrics paper, attributional vs consequential LCA paper, LCA tools harmonisation paper and standard methodology paper; - Country developments; - Approaches to modelling biochar systems: - Planning for workshop with Task 43 on land sector accounting.
Business meeting	26&28 May 2018	Task meeting , Gothenburg (Sweden) Key items discussed: - progress of work on 1) metrics for

Item	Date	Description
		quantifying climate change effects, 2) Attributional vs Consequential LCA, 3) meta-analysis of GHG emissions from algae biodiesel, and 4) standard methodology - contribution to the Inter-Task project "Measuring, governing and gaining support for sustainable bioenergy supply chains". - Update on international developments: ISO, IPCC, UNCCD - Planning for workshop with Task 43 on LULUCF accounting - Planning for the new triennium
Business meeting	30-31 August 2018	Task meeting, Uppsala (Sweden) Key items discussed: - Reflections on workshop with Task 43 and SLU on LULUCF accounting - New Sustainability Task and related Inter-Task project proposals - Discussion of a proposal to commission a review of integrated assessment models, including their assumptions regarding bioenergy and BECCU/S

Expert workshops		
Joint study tour with **Task 43** Southeastern USA	10-14 April, 2016	The Bioenergy in the Southeastern United States Study Tour (hosted by Oak Ridge National Laboratory) commenced in Knoxville and travelled to Savannah 10-14/4/2016. The Study Tour highlighted innovations developed by the US Department of Energy (DOE) national laboratories that support deployment of a sustainable bioeconomy. The Tour began with a one-day symposium on April 11 and included site visits and presentations that demonstrated innovations developed by the Bioenergy Technologies Office (BETO) of the US Department of Energy (DOE) in support of deployment of a sustainable bioeconomy, visited forests and mills, and discussed

Expert workshops		
		sustainability considerations associated with forest-based bioenergy.
Expert Workshop Forests modelling Växjö (Sweden)	10th January 2017	The workshop focused on divergent results for the climate change effects of bioenergy from forest systems from two studies in Finland and Sweden. The workshop included discussion to clarify details of the methods and draw out key factors that influence the results. General discussion then considered the strengths and weaknesses of the approaches of the two studies, and identified aspects for which further information is required, to gain a more complete understanding of the results of each study. The group then summarised the points of difference identified, and finally noted some ideas for future work
Expert Workshop Joint Task 38 and Chalmers University on climate impacts of bioenergy systems: Gothenburg (Sweden) 16th May	16 May 2017	Task 38 and Chalmers University of Technology co-hosted a workshop on the climate impacts of bioenergy systems, stimulated in part by concerns raised in a recent report by Chatham House: "Woody Biomass for Power and Heat: Impacts on the Global Climate". Climate scientists, energy system modellers and life cycle assessment experts presented their work, and exchanged views on research methods and knowledge gaps. The objectives for the workshop were to advance scientific understanding of the climate effects of bioenergy. Major issues discussed included: - how bioenergy contributes to the global carbon budget - short-term vs long-term emission-reduction targets - how climate effects of bioenergy should be assessed
Joint Task 38 and Ademe workshop on Understanding Climate Change Effects of Forest biomass and Bioenergy Systems:	7th November 2017	ADEME and Task 38 co-hosted a workshop on "Understanding Climate Change Effects of Forest biomass and Bioenergy Systems". The program included presentations on the mitigation value of forests managed for biomass and other products; use of land clearing biomass for biochar; tools for GHG assessment of biofuels, for LCA of agricultural crops, and for including soil carbon in LCA; and

Expert workshops		
Angers (France)		methods to quantify land use change due to bioenergy. Several presentations were based on projects funded by ADEME, and others presented aspects of the Inter-Task project “Measuring, governing and gaining support for sustainable bioenergy supply chains”.
Joint workshop Task 38, SLU and Task 43 Consequences for climate and bioenergy of land sector carbon accounting under the Paris agreement	29-30 August 2018	The workshop examined and discussed: - How different land sector carbon accounting frameworks create incentives or disincentives to harvest biomass for bioenergy and/or biomass-based products. - How different land sector carbon accounting frameworks influence forestry and other land management options towards build-up of land carbon stocks, - How the implementation of reference levels in carbon accounting schemes influences land management options.

DELIVERABLES

Table 2: Deliverables - Publications

Item	Description	Status
Scientific paper: Consequential life cycle assessment (Brandão et al.)	This book chapter published in Elsevier Encyclopedia for Sustainable Technologies provides guidance on conducting consequential life cycle assessment, which is recommended LCA approach for informing policy development.	Published: Brandão, M., Martin, M., Cowie, A., Hamelin, L., Zamagni, A., 2017.Consequential Life Cycle Assessment: What, How, and Why? In: Abraham, M.A. (Ed.), Encyclopedia of Sustainable Technologies. Elsevier, pp. 277–284.
Scientific Paper:	A paper that arose from the two expert meetings in 2012, it	Published: Koponen, K., Soimakallio, S., Kline, K.L.,

Item	Description	Status
Reference Systems for evaluating climate effects of bioenergy *(Koponen et al)*	recognises that one of the most important factors for evaluating the climate effects of bioenergy is understanding and properly assessing what would have occurred in the absence of bioenergy (the reference system). - Provides guidance on selection of the appropriate reference system for evaluation of the effects of bioenergy - Focuses on the land use reference	Cowie, A. and Brandão, M., 2017. Quantifying the climate effects of bioenergy–Choice of reference system. *Renewable and Sustainable Energy Reviews*
Scientific Paper: Metrics for assessing the climate change effects of emissions from bioenergy systems (Brandão et al)	Quantifying the climate effects due to timing of emissions from bioenergy: Metrics, Associated Uncertainties, and Discounting A paper that arose from the two expert meetings in 2012, it discusses how to handle the time component of climate impacts of bioenergy systems. - Comparison of more than 10 metrics for climate change that yield different results - Recommendations given	Published: Brandão, M., Kirschbaum, M.U., Cowie, A.L. and Hjuler, S.V., 2019. Quantifying the climate change effects of bioenergy systems: comparison of 15 impact-assessment methods. Global Change Biology Bioenergy 11: 727-743.
Scientific Paper: “Quantifying the Climate Effects of Forest-Based Bioenergy” (Cowie, Brandão, Soimakallio) chapter for the book “Managing global warming”, Elsevier	Presents a summary of Task 38 methodology for quantifying climate change effects of bioenergy, with focus on forest-based bioenergy, and discusses the basis for different results between different studies.	Published Cowie, A.L., Brandão, M. and Soimakallio, S., 2019. Quantifying the climate effects of forest-based bioenergy. In Managing Global Warming (pp. 399-418). Academic Press
Scientific	The study examined the basis for	Accepted (In press): Pereira,

Item	Description	Status
Paper: Harmonising existing LCA tools for biofuels (Pereira et al.) Joint with Task 39	differences between tools used for assessing climate effects of biofuels in different jurisdictions. The study compared the tools GREET, GHGenius, BioGrace, used in Europe, Canada and United States, respectively, and the Brazilian tool Virtual Sugar Biorefinery VSB/CTBE).	L.G., Cavalett, O., Bonomi, A.1,3, Zhang, Y., Warner, E., Chum, H.L .Comparison of biofuel life-cycle GHG emissions assessment tools: the case studies of ethanol produced from sugarcane, corn, and wheat. Renewable and Sustainable Energy Reviews
Scientific Paper: Review of GHG emissions from microalgae biodiesel	This paper reviewed published LCA studies of GHG emissions from algal biofuels.	Under review in Journal of Industrial Ecology
Report: Albedo effects of biomass production	This report reviews recent findings on the extent to which changes in albedo can enhance or diminish the climate change benefits of bioenergy. The albedo effect is dependent on the latitude, and the bioenergy system (woody or annual crop, and its management).	Published: Bernier, P.Y.; Bright, R.M. 2017 Albedo effects of biomass production: a review. IEA Bioenergy
Report: Comparison of decomposition models	This report compares the Q and Yasso models, that are used to model decomposition of forest litter. The study found that the choice of the decomposition model results in different quantitative estimates. However, the decomposition model choice does not lead to diverging conclusions about the warming impact of extracting forest residues for bioenergy.	Published: Stendahl, J., Repo, A., Hammar, T. and Liski, J., 2017. Climate Impact Assessments of Forest Bioenergy Affected by Decomposition Modelling—Comparison of the Q and Yasso Models. IEA Bioenergy
Deliverables in preparation		
Scientific Paper: Study	This paper analyses statistical data for the USA and trading	Nearing submission

Item	Description	Status
investigating evidence for iLUC associated with US corn ethanol	partners to estimate whether corn use for ethanol has resulted in indirect land use change (iLUC). On track for target. To be published in a special issue of the journal "Sustainability", on land-use competition.	Brandão et al.
Scientific Paper: Updating the Standard Methodology for Comparing the Greenhouse Gas Balances of Bioenergy Systems and Fossil Energy Systems O1, O2	The standard methodology for calculation of GHG emissions for different bioenergy systems developed by Task 38 has been up-dated in order to address issues that have emerged since its first publication (e.g. timing of flows, indirect land use change, non-GHG climate forcers). The updated methodology applies the latest knowledge and state-of-the art methods for quantifying the climate change effects of biomass and bioenergy systems. The paper incorporates the findings of papers published on specific methodological aspects.	Nearing submission Cowie et al.
Report: Consideration of bioenergy in integrated assessment models	This review provides an overview of the representation of biomass and bioenergy in IAMs, their modelled interaction with other mitigation measures including renewables and other land-based mitigation, and how their results should be interpreted.	Under review: Daioglou, V. The Representation and Role of Biomass and Bioenergy in Integrated Assessment Models
Reports: Inter-Task project "Measuring, governing and gaining support for sustainable bioenergy supply chains"	This Inter-Task project built on previous successful collaborative projects addressing aspects of sustainability of bioenergy. This project, led by Task 40, involved input from Tasks 37, 38, 39, 40, 42 and 43. The project aimed at addressing the following questions: 1. How to measure and quantify progress towards more sustainable practices? 2. How to improve the input,	Published: Berndes G & Cowie A. 2019 Measuring, governing and gaining support for sustainable bioenergy supply chains: Methods and tools to assess the sustainability of biomass and bioenergy supply chains Junginger, M., Göran Berndes, Annette Cowie, Uwe Fritsche, Tat Smith, Inge Stupak 2019

Item	Description	Status
	output and throughput legitimacy of existing and proposed governance systems? 3. How to engage more successfully with the broad range of stakeholders so that policies and sustainability governance are perceived as legitimate and helpful for build-up of social capital, trust, and support among all stakeholders?	Measuring, governing and gaining support for sustainable bioenergy supply chains: Main findings and recommendations

TASK WEBSITE

The Task 38 website (http://task38.ieabioenergy.com/) is the repository of publications and other material produced by Task 38 and predecessor Task "Greenhouse Gas Balances of Biomass and Bioenergy Systems".

Information on the site includes:

- publications of Task 38 including statements on timing of emissions, sustainability of bioenergy
- presentations from Task Workshops
- guidance on methods for quantifying greenhouse gas balance of bioenergy systems
- FAQ page
- case studies (identified by both country and process)
- contact details of national team leaders.

TASK MEMBERS' RELEVANT PUBLICATIONS

1. Bentsen, N.S., Nord-Larsen, T., Larsen, S., Berndes, G., Birdsey, R., Cowie, A., Felby, C., Junginger, M., Kant, P., Kurz, W. and Lamb, D., 2016. RE: Forests and forest management plays a key role in mitigating climate change. Science.

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5. Cintas, O., Berndes, G., Cowie, A.L., Egnell, G., Holmström, H., Marland, G. and Ågren, G.I., 2017. Carbon balances of bioenergy systems using biomass from forests managed with long rotations: bridging the gap between stand and landscape assessments. Global Change Biology Bioenergy, 9(7), pp.1238-1251.

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9. Dodoo, A., Tettey, U.Y.A. and Gustavsson, L., 2017. On input parameters, methods and assumptions for energy balance and retrofit analyses for residential buildings. *Energy and Buildings*, *137*, pp.76-89.

10. Dodoo, A., Tettey, U.Y.A. and Gustavsson, L., 2017. Influence of simulation assumptions and input parameters on energy balance calculations of residential buildings. *Energy*, *120*, pp.718-730.

11. Dodoo, A., Tettey, U.Y. and Gustavsson, L., 2018, March. Impacts of Common Simulation Assumptions in Sweden on Modelled Energy Balance of a Multi-family Building. In Cold Climate HVAC Conference (pp. 689-699). Springer, Cham.

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16. Hafner, A. and Rüter, S., 2018. Method for assessing the national implications of environmental impacts from timber buildings—an exemplary study for residential buildings in Germany. Wood and Fiber Science, pp.139-154

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COORDINATION WITH OTHER IEA BIOENERGY TASKS

“Measuring, governing and gaining support for sustainable bioenergy supply chains”

Within the inter-Task project “Measuring, governing and gaining support for sustainable bioenergy supply chains” (led by Task 40), Task 38 and Task 43 co-led Objective 1. The main focus is on GHG and other climate forcers, but other environmental, economic and social criteria and indicators for sustainable biomass feedstock production are also considered. Activities of Task 38 and 43 related to methods for assessing environmental effects of bioenergy underpining Objective 1. Objective 1 has investigated aspects of methods and tools to quantify the sustainability of bioenergy systems, and pros and cons of developing a harmonised framework. Within Objective 1 Task 38 led: Comparison of tools for assessing biofuels (Chum); Case study on the use of cleared scrub for bioenergy or biochar compared with in-field burning (Cowie), and contributed to the study on indirect land use change (Langeveld, Brandão and others), investigating the evidence for iLUC associated with ethanol production in the US.

Task 38 members presented at the project workshop 18-19 May, Gothenburg: Annette Cowie presented an overview of Objective 1, on tools and methods for assessment of sustainability of bioenergy. In parallel sessions, Annette presented an introductory talk on Understanding the Climate Effects of Bioenergy Systems and Helena Chum presented progress on the study comparing calculators for emissions from biofuels. Task 38 contributed to the summary report of the project, the summary report of Objective 1, and the annual report 2018 special feature.

Task 38 participated in the special project on Bio-CCUS, specifically the component related to GHG emission balances and prospects of hydrogen enhanced synthetic biofuels from solid biomass. Kati Koponen made GHG calculations for hydrogen boosted biofuel + CCU concept. With her colleague Ilkka Hannula, they published an article titled “GHG emission balances for hydrogen enhanced synthetic biofuels from solid biomass” which is a study of one type of bio-CCU concept. Kati presented at the IEA Bioenergy Task 41 Bio-CC(U)S workshop held in connection with the GHGT-13 conference in Lausanne in November 2016. The topic of the workshop was “Sustainability and GHG impact of bio-CC(U)S”.

The following reports were commissioned and published jointly with Task 43:

- Bernier P and Bright R. Albedo effects of biomass production: A review

This report reviews recent findings on the extent to which changes in albedo can enhance or diminish the climate change benefits of bioenergy. The albedo effect is dependent on the latitude, and the bioenergy system (woody or annual crop, and its management).

- Stendahl, Repo A, Hammar T & Liski J Climate impact assessments of forest bioenergy affected by decomposition modelling

This report compares the Q and Yasso models, that are used to model decomposition of forest litter. The study found that the choice of the decomposition model results in different quantitative estimates. However, the decomposition model choice does not lead to diverging conclusions about the warming impact of extracting forest residues for bioenergy.

- Annette Cowie worked with Göran Berndes Task 43 and Martin Junginger (Task 40) and Fabiano Ximenes (NSW DPI) to prepare Response to Chatham House report “Woody Biomass for Power and Heat: Impacts on the Global Climate”, published by IEA Bioenergy.

- With input from Task 38 and Task 43 members, Task 40 member Uwe Fritsche led preparation of a chapter for the UNCCD's Global Land Outlook:

Fritsche, U.R., Berndes, B., Cowie, A.L., Dale, V.H., Kline, K.L., Johnson, F.X., Langeveld, H., Sharma, N., Watson, H. and Woods, J., 2017. "Sustainable energy options and implications for land use".

- Resulting from the Task 43/Task 38 study tour conducted in 2016, an opinion piece on the US wood pellet trade:

Dale VH, KL Kline, ES Parish, AL Cowie, R Emory, RW Malmsheimer, R Slade, CT Smith, TB Wigley, NS Bentsen, G Berndes, P Bernier, M Brandão, H Chum, R Diaz-Chavez, G Egnell, L Gustavsson, J Schweinle, I Stupak, P Trianosky, A Walter, C Whittaker, M Brown, G Chescheir, I Dimitriou, C Donnison, A Goss Eng, KP Hoyt, JC Jenkins, K Johnson, CA Levesque, V Lockhart, MC Negri, JE Nettles, M Wellisch (2017) Status and prospects for renewable energy using wood pellets from the southeastern United States. Global Change Biology Bioenergy 9(8) 1296-1305. http://onlinelibrary.wiley.com/doi/10.1111/gcbb.12445/full

- A joint study between Task 43 and Task 38 members:

Cintas, O., Berndes, G., Cowie, A.L., Egnell, G., Holmström, H., Marland, G. and Ågren, G.I., 2017. Carbon balances of bioenergy systems using biomass from forests managed with long rotations: bridging the gap between stand and landscape assessments. Global Change Biology Bioenergy, 9(7), pp.1238-1251.

- Output from the Bio-CCUS joint project:

Koponen, K. and Hannula, I., 2017. GHG emission balances and prospects of hydrogen enhanced synthetic biofuels from solid biomass in the European context. Applied Energy, 200, pp.106-118.

Task 38 also contributed to the following joint outputs:

- letter to EU parliamentarians intended to convey a balanced scientific view, in response to the campaign against bioenergy ahead of the European decision on support for bioenergy;
- FAQ on climate effects of bioenergy published by IEA Bioenergy.

Coordination with other bodies outside of IEA Bioenergy

Item	Description	Relevance
SCOPE: Bioenergy and Sustainability; Bridging the gaps	SCOPE (Scientific Committee on Problems of the Environment, http://www.scopenvironment.org/)	Demonstrates the substantial potential for bioenergy, when carefully integrated, to contribute to climate change mitigation and sustainable development. The SCOPE

Item	Description	Relevance
	Bioenergy and Sustainability: Bridging the Gaps, led by the Brazilian Research Foundation. In 2018 the 2016 publication was updated. (Souza, Chum)	process (led by FAPESP (State of Sao Paulo Research Foundation) and Latin American and African organisations) gathered significant input from IEA, IEA Bioenergy, IRENA, and SE4ALL. These activities led to the publication "Sustainable Bioenergy: Latin America and Africa." Policy Brief [Amstelveen: SCOPE, 2018, 8p. ISSN:2412-0286 available at http://bioenfapesp.org/scopebioenergy/index.php/policy-brief/2018].
IPCC (Intergovernmental Panel on Climate Change)	Lead author on the IPCC Special Report Climate Change and Land (SRCCL): participation in four lead author meetings and contributing to chapter 4, on land degradation, the cross-chapter boxes on bioenergy in integrated assessment models, traditional biomass, sustainable intensification. (Cowie) Coordinating lead author on Harvested wood products in the refinement of the 2006 IPCC Guidelines for inventory reporting. (Rüter)	IPCC reports underpin the development of international climate change policy and are commonly applied at national level in policy formulation and implementation for renewable energy and GHG mitigation. Bioenergy has a high profile in the SRCCL, as it is anticipated to play a key role in strategies to meet the Paris Agreement. The report discusses significant logistical and governance challenges from widespread adoption of bioenergy crops, including managing potential risks to the land resource base and food security. Annette's participation provided an important opportunity to encourage consideration of literature beyond the global models, that shows how bioenergy crops can be strategically integrated with agricultural and forestry land uses to provide economic and environmental benefits. The IPCC Guidelines underpin national inventory reporting and are commonly applied at project level.

Item	Description	Relevance
ISO	Member of ISO TC207 that prepared ISO 14067 2018 "Carbon footprint of a product", and is revising the ISO standards for life cycle assessment. (Cowie and Brandão)	ISO standards facilitate industry development and international trade. Improvements over the ISO TS 14067 2013 include greater clarity on the treatment of biogenic carbon, land use change and land management; addition of the requirement to include and justify the reference land use; modifications to the treatment of green electricity; a new informative Annex providing guidance on agriculture and forestry; and revision of definitions to harmonise across the 14060 family. The carbon footprint standard will influence GHG quantification methods for environmental labelling, greenhouse gas accounting and carbon offset schemes, including GHG accounting for bioenergy products..
Global Environment Facility and UNCCD	Member of the Scientific and Technical Advisory Panel of the Global Environment Facility (Cowie)	Provides opportunities to enhance understanding of the appropriate methods to evaluate bioenergy systems, potential benefits of bioenergy as part of a renewable energy strategy, with benefits for land management.
UNCCD (UN Convention to Combat Desertification)	Member of the Science Policy Interface of the UNCCD; key role in development of the conceptual framework for Land Degradation Neutrality. Co-author of chapter in the Global Land Outlook (Cowie)	Over 120 countries have committed to pursue targets for land degradation neutrality (LDN). This widespread interest in LDN is anticipated to provide opportunities for biomass production for bioenergy, particularly as a viable option for rehabilitation of contaminated lands.
FAO	FAO's Livestock Environmental Assessment Programme (LEAP)	Includes comprehensive review of how GHG emissions are quantified in LCA.

Item	Description	Relevance
	Partnership Technical Advisory Group (TAG) on Soil Carbon Stock Changes, (Brandão)	

OTHER OUTREACH ACTIVITIES OF TASK 38 INCLUDED:

- Scientific committee of the first International Conference on Negative Emissions, 22-24 May, at Chalmers University of Technology, Gothenburg, co-sponsored by IEA Bioenergy. Presentations on biochar, land degradation neutrality and the Bonn Challenge, and chaired the plenary session on land sector opportunities for negative emissions. (Cowie)

- Presentation on the topic “How emission accounting and reporting influence perceptions of bioenergy” in the session “Opportunities and Barriers for Sustainable Bioenergy” organised by Keith Kline (Oak Ridge National Laboratory) at the 30th Annual Conference of the U.S. Regional Association of the International Association for Landscape Ecology, in Asheville, North Carolina, April 3–7, 2016; Presentation on the role of bioenergy in climate change mitigation, including an overview of Task 38, to the Biology Department of Appalachian State University, Boone, 8 April 2016. (Cowie)

- Technical advisory committee, California Biomass Impact Project (Cowie)

- Bioenergy Australia: presentations to quarterly meetings, annual conferences, webinars, focused on recent achievements of Task 38 (Cowie, Gustavsson, Bonomi).

- Discussions with various Finnish ministries, companies and stakeholders on the newly proposed, extended sustainability criteria for bioenergy in the EU. (Koponen)

- Members of Task 38 (Annette Cowie, co-author, and Sampo Soimakallio, reviewer) contributed to a report written for the European Forest Institute, on the carbon neutrality of forest-based biomass. Göran Berndes (Task 43) led the project, and presented the report to seminars at the European Commission and the European Parliament.

- Opponent in the PhD defence of Torun Hammar, Swedish University of Agricultural Sciences (SLU), June 2017. (Cowie)

- Presentation to a conference March 12–13, 2018, in Stockholm organised by the Royal Swedish Academy of Agriculture and Forestry, the Royal Swedish Academy of Sciences, and the Royal Swedish Academy of Engineering Sciences, on the topic “Forests and the climate: Manage for maximum wood production or leave the forest as a carbon sink?” (Cowie)

- Plenary presentation on the role of bioenergy in climate change mitigation at the end of triennium IEA Bioenergy conference, presented in conjunction with the Advanced Bioeconomy Leadership Conference, San Francisco, 7-9 November. (Cowie)

COORDINATION WITH OTHER BODIES OUTSIDE OF IEA BIOENERGY

The work of Task 38 is most directly applicable to policy-makers and researchers. Its application to Industry is largely through improved understanding by decision-makers of the role that sustainable bioenergy can play in contributing to climate change mitigation, and therefore informing development of policy that supports bioenergy systems that deliver mitigation. Presentations were made by the Task Leader and several National Team Leaders at various conferences, workshops and webinars that were attended by industry members. Members of industry interacted with Task 38 members to better understand the debate on climate effects of bioenergy and the role of bioenergy in emissions trading.

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Further Information

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