TASK 38: Climate Change Effects of Biomass and Bioenergy Systems

2015 ANNUAL REPORT

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1 Overview of the Task

The main drivers for bioenergy are mitigation of climate change, energy security, and rural development. Reduction in greenhouse gas (GHG) emissions has become an issue of great international importance. Mounting evidence of climate change and its impacts, together with developments in emissions trading through international, regional, national, bilateral and multilateral agreements, have stimulated abatement activities. While bioenergy has grown dramatically, particularly due to favourable policy environment in Europe and USA, there is intensifying debate about the climate change benefits of bioenergy systems, and the appropriate role for bioenergy in climate policy.

The primary goal of IEA Bioenergy Task 38 on Climate Change Effects of Biomass and Bioenergy Systems is to promote the sustainable use of biomass and bioenergy through improved understanding of the climate change effects of biomass production and utilisation for energy. We devise and promote standard methodology for quantifying the climate change effects of bioenergy systems and of forest carbon sequestration and. Our objective is to support decision makers in government and industry, in the development of climate change mitigation strategies.

Participating countries: Australia, Brazil, Finland, France, Germany, Sweden, Norway, and USA

Task Leader: Annette Cowie, New South Wales Department of Primary Industries/University of New England, Australia

Task Manager: Miguel Brandão, Royal Institute of Technology, Stockholm, Sweden

Operating Agent: Stephen Schuck, Bioenergy Australia, Australia

The Task Leader directs and manages the work programme, with the assistance of the Task Manager. A National Team Leader from each country is responsible for coordinating national participation in the Task by each participating country.

For further details on Task 38, please refer to the Task 38 website http://task38.org/ and the IEA Bioenergy website www.ieabioenergy.com under ‘Our Work: Tasks’.
2 Progress in R&D

2.1 Task Meetings and Workshops
During 2015 Task 38 held two face-to-face meetings of national team leaders, organised one Task 38 conference, co-organised one joint workshop and presented a session at the end of triennium conference.

2.1.1 Task 38 Business Meeting: Växjö (Sweden) 25 May
- Five of the eight participating countries (Australia, Finland, Germany, Sweden, USA) were represented at the meeting.
- Key discussion points:
  - Progress reports on items on workplan, particularly paper in development on choosing the appropriate reference system with which to compare a bioenergy system, to determine the climate change mitigation benefits - decisions on next steps;
  - Brief input from NTLs on recent developments in each country.

2.1.2 Task 38 Conference, Växjö, Sweden 26-27 May 2015,
  Topic: Climate Change Effects of Biomass and Bioenergy Systems
  - Hosted by Linnaeus University
  - Presentations on climate effects of managed forest systems, wood products and bioenergy, including presentations from four Task 38 members.
  - Excursion to the Växjö Energy AB, visit CHP-plant, Limnologen Wood-frame apartment buildings and Södra Climate Arena.

2.1.3 Task 38 session End of Triennium conference Berlin
Task 38 presented the session: “Quantifying climate change effects of bioenergy” at the conference “Realising the world's sustainable bioenergy potential”. Four members of Task 38 presented papers.

2.1.4 Task 38 Business Meeting: Berlin 29 October
- Six of the eight participating countries (Australia, Brazil, Finland, Germany, Sweden, USA) were represented at the meeting.
- Key discussion points:
  - reviewing progress and deciding next steps for items on workplan, particularly paper in development, on metrics for quantifying climate effects of emissions and removals associated with bioenergy systems.
  - Discussion on recent papers that present negative results for bioenergy;
  - Brief input from NTLs on recent developments in each country;

2.1.5 Joint Task Workshop: Berlin 30 October
- Experts from Task 38 participated in the workshop on Quantifying climate effects of forest-based bioenergy, jointly organised by Tasks 38 and 43
- Key points:
  - Presentations of studies on quantifying climate effects of forest-based bioenergy from member countries
  - Presentations on quantifying and managing iLUC
  - Policy development in GHG accounting
  - Economic and energy system modelling
  - Planning for future collaboration
2.1.6 Next Meeting
The next Task 38 Business Meeting will be held in USA in April 2016.

2.2 Work Programme

In 2015 the Task:
- Organised two Task 38 face to face business meetings (see above)
- Organised a one day conference on the theme of climate effects of forest-based bioenergy (see above)
- Co-organised one expert working meeting on quantifying effects of forest-based bioenergy (see above)
- Presented a session at the end of triennium conference
- Progressed the preparation of scientific papers:
  - Metrics for quantifying the climate effects of bioenergy systems:
  - Reference Systems for evaluating climate effects of bioenergy
- Participated in one Inter-Task project (“Mobilising Sustainable Bioenergy Supply Chains”)
- Participated at ExCo75 in Dublin and ExCo 76 in Berlin

2.2.1 Scientific Papers

The following scientific papers are under preparation:

Reference systems for evaluating climate effects of bioenergy

Stemming from the two expert meetings in 2012, this 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 decisions tree is presented to aid researchers and decision-makers in identifying the relevant reference system for their purpose.

Metrics for quantifying climate effects of bioenergy

Also arising from the two expert meetings in 2012 is a paper that discusses the implications of different metrics in evaluating the climate impacts of bioenergy. Climate change effects, including those of biomass and bioenergy systems, are traditionally measured with the cumulative radiative forcing of greenhouse gas emissions (using GWP$_{100}$ to combine impacts of different gases) as the indicator, but other indicators such as global temperature potential could be used.

Updating the Standard Methodology

The standard methodology for calculation of GHG emissions for different bioenergy systems developed by Task 38 is in the process of being updated in order to capture the latest and best available knowledge and state-of-the-art methods for modelling the climate change effects of biomass and bioenergy systems. The task is currently working on a paper which shows how the climate change effects of biomass and bioenergy systems ought to be modelled by defining sharply the research question, choosing the appropriate system...
boundaries, reference system and functional unit, as well as integrating new scientific topics, such as the timing of GHG flows, direct and indirect land use change impacts and non-greenhouse gas effects (e.g. albedo effect) and how to deal with e.g. harvested wood products. The completion of the paper is postponed until the metrics and reference system papers are completed, as it will refer to these.

Comparison of Major Life Cycle Assessment Models

Several papers are under preparation addressing: (1) models and practices used in policy implementation for GHG emissions in Europe, United States, and Canada; (2) other environmental impacts for commercial biofuels; and (3) prospective models used in conjunction with technology development evaluation. Topic (1) methodology was developed in 2014 and accepted for presentation at the 2015 IEA Bioenergy Conference1, and will be used to, in conjunction with Task 39, prepare a short IEA report explaining differences reported in the various IEA and IEA Bioenergy task reports.

2.2.2 Inter-task Projects

Joint workshop on Quantifying climate change effects of forest-based bioenergy, Berlin, October 30, 2015 (see also above)

Tasks 38 joined Task 43 in devising and presenting this workshop which brought together researchers with a range of views on the role of forest-based bioenergy in contributing to climate change mitigation. The workshop was successful in facilitating dialogue between experts from different disciplines, discussing the appropriate approaches for assessing the climate effects of bioenergy, and priorities for future collaborative research between Tasks 38 and 43.

Mobilising sustainable bioenergy supply chains

Task 38 collaborated in this large project led by Task 43, and contributed to several of the supply chain case studies. Annette Cowie was a member of the Coordination Committee for this Inter-task Project. Alison Goss Eng from the U.S. program provided input to the case study on agricultural residues to Niclas Scott, leader, through Patrick Lamers and Jacob Jacobson of the Idaho National Laboratory (INL); Helena Chum informed the study on the GBEP indicators. Regis Leal and Helena Chum provided input to the component of the project that focuses on cultivated grasslands and pastures, and converting part of the degraded pastureland to ethanol from sugar cane in Brazil. Kristen Johnson from the U.S. provided Task 38 input to lignocellulosic supply chains through Virginia Dale and Keith Kline from the Oak Ridge National Laboratory. Patrick Lamers from INL provided input to the Boreal and Temperate Forest Supply Chain. Task 38 reviewed the reports on each of the supply chains.

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2.3 Website/Communication

2.3.1 Task Website

The Task 38 website (www.task38.org) 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:
- Documentation from Joint workshop on Forests, bioenergy and climate change mitigation, Copenhagen, May 19-20 2014: workshop statement, background documents, presentations, summary of discussion
- Presentations from all Business Meetings and Workshops
- Case studies (identified by both country and process)
- Publications of Task 38
- Journal publications of Task38 members
- Guidance on methods for quantifying greenhouse gas balance of bioenergy systems
- FAQ page
- List and contact details of member countries and delegates.

2.4 Collaboration with Other Tasks

2.4.1 Joint workshops

Quantifying climate change effects of forest-based bioenergy, Berlin, October 30, 2015 (see above)

2.4.2 Intertask projects (see above).

Within the inter-Task project “Mobilising sustainable bioenergy supply chains” (a collaboration of Tasks 43, 42, 40 and 38) Task 38 has contributed and reviewed the case studies.

Task 38 is working with Task 39 to review GHG assessment tools for liquid biofuels, and contribute to a review of algae biofuels.

2.4.3 Joint publications:


Stupak, Inge; Jamie Joudrey; C. Tattersall Smith; Luc Pelkmans; Helena Chum; Annette Cowie; Oskar Englund; Chun S Goh; Martin Junginger. "A global survey of stakeholder views and experiences for systems needed to effectively and efficiently govern sustainability of bioenergy", Wiley Interdisciplinary Reviews: Energy and Environment (11) DOI: 10.1002/wene.166.


2.5 Networking

1. Networking with bioenergy-relevant multilateral organizations' projects and publications:


- Chapter 1. SCOPE Bioenergy and Sustainability Technical Summary, pp. 8-26. (Chum)
- Chapter 2. Bioenergy Numbers, pp. 28-57 (Chum, Regis Leal)
- Chapter 6. Sustainable development and Innovation, pp. 184-217 (Chum, Regis Leal)
- Chapter 11. Feedstock Supply Chains, pp.348-373 (Regis Leal)
- Chapter 17. Greenhouse Gas Emissions of Bioenergy, pp. 482-617 (Annette Cowie)*
- Chapter 18. Soils and Water, pp. 618-659 (Annette Cowie)*
*With contribution from Task 43 (Göran Berndes)
2. In December 2015 the Finnish team leaders of IEA Bioenergy Task 38 organised a stakeholder workshop in co-operation with the Finnish research programme BEST (Sustainable Bioenergy Solutions for Tomorrow) in Espoo, Finland. The aim was to discuss the current issues in climate impact assessment of bioenergy systems. Altogether 20 participants from Ministry of Employment and the Economy, from 5 private companies and from 3 Finnish research institutes participated, and had a lively discussion on the topic.

3. Annette Cowie presented on Task 38 activities, specifically related to the current debate on climate effects of bioenergy, to the quarterly meeting of Bioenergy Australia in September 2015, and to the Bioenergy Australia conference in December 2015.

4. Annette Cowie presented on the work of Task 38 to the Industrial Ecology group at the Royal Institute of Technology, Stockholm, Sweden

2.6 Deliverables
Apart from the wide range of deliverables mentioned above, the Task also produced progress reports and audited accounts for the ExCo, and minutes of the Task meetings. In addition, individual task members published scientific papers that were informed by interactions with Task members, and some of these outputs were formally reviewed by Task 38 members.

2.7 Task Members’ relevant publications


**TASK 38**

Minutes from the Task Business Meeting: Växjö (Sweden). 25 May.

Minutes from the Task Conference, Växjö (Sweden). 26-27 May.

Minutes from the Task Business Meeting: Berlin (Germany). 30 October.


Progress Report for ExCo76, Berlin (Germany). October 2015.
### TASK 38 — Climate Change Effects of Biomass and Bioenergy Systems

**Operating Agent:** Stephen Schuck, Bioenergy Australia Manager.

**Task Leader:** Annette Cowie, NSW Department of Primary Industries, Australia.

**Task Manager:** Miguel Brandão, Royal Institute of Technology, Stockholm, Sweden

The Task is organised with ‘National Teams’ in the participating countries. The contact person (National Team Leader) in each country is listed below:

<table>
<thead>
<tr>
<th>Country</th>
<th>National Team Leader</th>
<th>Institution</th>
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<tbody>
<tr>
<td>Australia</td>
<td>Annette Cowie</td>
<td>NSW Department of Primary Industries</td>
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<tr>
<td>Brazil</td>
<td>Manoel Regis Leal</td>
<td>Brazilian Bioethanol Science and Technology Laboratory</td>
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<tr>
<td>Finland</td>
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<td>Finnish Environment Institute (SYKE)</td>
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<td></td>
<td>Kim Pingoud</td>
<td>VTT Technical Research Centre of Finland</td>
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<td>France</td>
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<td></td>
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<td>Sebastian Rüter</td>
<td>Thünen Institute of Wood Research</td>
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<tr>
<td>Norway</td>
<td>Anders Strømman</td>
<td>Norwegian University of Science and Technology</td>
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<tr>
<td>Sweden</td>
<td>Leif Gustavsson</td>
<td>Linnaeus University</td>
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<td></td>
<td>Matti Parikka (deceased)</td>
<td>Swedish Energy Agency</td>
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<tr>
<td>USA</td>
<td>Alison Goss Eng</td>
<td>US Department of Energy</td>
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