“Forests, bioenergy and climate change mitigation”

This statement is an outcome of the workshop on “Forests, bioenergy and climate change mitigation”, held May 19-20, 2014 in Copenhagen[1] , which had the following objectives:

- to facilitate dialogue between scientists on the topic of climate effects of forest -based bioenergy, in order to advance scientific understanding of the topic and to clarify divergent views on the role of forest-based bioenergy in climate change mitigation, and
- to identify knowledge gaps and priorities for future research and data collection, in order to improve scientific understanding and support policy development for forest-based bioenergy.

The workshop participants agreed on the following Joint Statement[2].

1 Framing the Issue

Concerns regarding global climate change led to the adoption of the target to limit global warming to 2°C. Current scientific understanding indicates that peak warming is insensitive to greenhouse gas (GHG) emission trajectories, that is, to timing of emissions. On the other hand, additional sub-targets that seek to limit the rate of change[3] are intended to facilitate climate change adaptation and to limit the rate of ocean acidification. Such targets constrain the possible emission trajectory

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[1] The workshop was organized by the Joint Research Centre of the European Commission (JRC), the European Environment Agency (EEA), the International Energy Agency (IEA) Bioenergy Tasks 38, 40 and 43 and the International Institute for Sustainability Analysis and Strategy (IINAS), and hosted at the EEA. The views expressed in this statement do not necessarily represent the views of the institutions that supported this workshop.

[2] A report summarising the discussions in parallel sessions and plenary sessions, and the short presentations given during the workshop will be available online at www.ieabioenergy-task38.org/workshops/copenhagen2014/.

[3] The target of a maximum rate of change in temperature of 0.1 °C per decade was introduced 1987 during the Villach and Bellagio Climate Conferences as an initial value which would allow for the adaptation of ecosystems. It was taken up in 1990 by the WMO/ICSU/UNEP Advisory Group on Greenhouse Gases and further substantiated by WBGU in 2003 as 0.2 °C per decade. The Secretariat of the Convention on Biological Diversity underlined in 2003 the need to link climate change targets to biodiversity targets. Recently, the Global Ocean Commission in its 2014 report calls for respective emission limitations to protect the oceans against dangerous acidification.

profile and shift focus toward gases with shorter atmospheric lifetimes; thus timing of GHG emissions is relevant for such policy targets.

Achieving the 2 °C target requires a global energy transition and massive fossil fuel substitution by 2050. For this, the IPCC sees a significant role for bioenergy, including from forests (50-100 EJ by 2050). A reduction of deforestation and more efficient use of forest biomass, maximising GHG mitigation per unit feedstock, are needed in parallel.

Forest management is responsive to markets and often has a long-term focus. Currently, the vast majority of forest managers receive no revenue from avoided deforestation or from carbon sequestration. Policies frame markets for bioenergy and the broader bioeconomy, and forest management will react to that, as well as forest product markets, with changes in respective carbon stocks and flows.

In many countries, forest carbon stocks have increased over recent decades, but deforestation has reduced carbon stocks in other regions (sub-Saharan Africa, Latin America, South-East Asia).

Forest governance differs between countries and regions, which is relevant when considering the implications of the increasing trade in bioenergy.

2 Modelling: scope, data and limitations

2.1 Accounting for Bioenergy under the UNFCCC and for Life Cycle Assessment (LCA)

The accounting for carbon fluxes from forest bioenergy in national inventories under the United Nations Framework Convention on Climate Change (UNFCCC) follows IPCC guidelines for national GHG reporting. This means that annual forest carbon releases or sinks are allocated to the land use, land use change and forestry (LULUCF) sector, and CO_2 emissions from biomass use in the energy sector are set to zero to avoid double counting. This is different from GHG accounting in life cycle assessment (LCA), which has a cross-sectoral and cross-border view and sums GHG emissions over the life cycle of a specific product or service to which the impact of those emissions is attributed.

Both approaches ask different questions and different actors apply them with different scopes. When IPCC "tier 1" data[4] are used in LCA studies to obtain estimates of biomass and soil carbon fluxes, caution and transparency are needed as these data were intended for national level reporting and may not be appropriate at finer scales.

[4] For example, the 2006 IPCC Guidelines for National Greenhouse Gas Inventories http://www.ipcc-nggip.iges.or.jp/public/2006gl/index.html

To reflect climate impacts in LCA, the Global Temperature Change Potential (GTP) may be a more appropriate metric than Global Warming Potential (GWP)[5] used in UNFCCC reporting. Other metrics have also been proposed; application of more than one metric may be informative for policy development.

2.2 Modelling and LCA approaches for assessing Forest Bioenergy

Information and knowledge from many scientific disciplines, applying a range of different methodologies, are needed to guide development of policy for forest bioenergy. For policy assessment, a landscape[6] perspective, rather than the forest stand level, would in general be the appropriate scope. In any case, the geographical scale should reflect the aim of the assessment or the scope of the (policy) instrument to be evaluated.

The workshop participants agreed that a consequential modelling approach is required to understand the climate effects of bioenergy and to inform policy development. A combination of biophysical, climate and socio-economic models (e.g. nested, integrated models) should be used. The earth climate system is altered not only by CO_2, but also by changes in the atmospheric concentration of other gases and aerosols (directly emitted or precursors), in solar radiation and in land surface albedo. Therefore, the effects of all climate forcers related to forest cover and forest management should ideally be included. Impacts on biodiversity and ecosystem services also need to be considered.

While Attributional LCA (ALCA) may be useful for some purposes (such as identifying hotspots in the supply chain or *implementing* a policy decision) , it is not appropriate for evaluating the consequences of the introduction of a new policy, which requires consideration of indirect effects on other sectors of the economy across time and space in addition to direct effects. Therefore, consequential approaches, such as consequential LCA (CLCA) are required in *developing* policy, to conduct due diligence of new policy alternatives. One significant drawback of CLCA is the inevitable uncertainty associated with modelling complex systems, so analysts, stakeholders and policy makers need to exercise appropriate caution and be transparent about the uncertainty associated with CLCA estimates, and pragmatic in choosing among policy alternatives that have high degrees of uncertainty.

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[5] GWP expresses the cumulative radiative forcing of a unit emission of GHG to that of CO_2 over a specified period, commonly 100 years. In contrast, GTP quantifies the effect of a unit emission of GHG on the global mean surface temperature at a specified point in the future, relative to that of CO_2.

[6] 'Landscape' is used to refer to relatively large spatially heterogeneous geographic areas composed of diverse interacting ecosystems that range from natural terrestrial and aquatic systems such as forests, grasslands, and lakes to human-dominated environments including intensively managed agricultural and forest lands and urban areas.

Consequential comparative assessments addressing forest bioenergy policies need to compare the bioenergy policy scenarios with counterfactual scenarios. Because the future is uncertain, for both the reference "business as usual" (BAU) situation and the "with bioenergy" case, it is preferable to model several counterfactual scenarios to inform policy-making. BAU scenarios should reflect commonly accepted practice in forest management and land use, anticipated trends in both, and should include products pools, energy substitution, market dynamics (demand and supply responses) and market-mediated feedbacks (for example, indirect land use effects).

3 Policy Guidance

Decisions by government and the private sector should be informed by scientific understanding of climate change impacts of forest bioenergy. Such input should be based on comprehensive analysis of complex systems in the context of alternative policy options and energy technology pathways.

Decision makers are looking for near-term policy solutions while more sound scientific assessments are being developed. Given the complex nature of the issue, some have questioned whether decision makers should use categories of bioenergy feedstock production systems based on simplified system descriptions (e.g. sustainable forest management plus maintaining forest carbon stock) to identify acceptable bioenergy systems to support and implement.

Such approaches (including "go/no-go" lists) must be seen as very crude first-order estimates and are subject to significant uncertainty, and so caution should be used if such proxies are applied. It was agreed that risk-based approaches are preferable. For example:

- Multidimensional risk matrices covering spatial aspects, forest management, forest product types, downstream/upstream markets effects and energy substitution could be used to assess specific cases.
- Consequential modelling approaches should be applied for policy development, and large-scale projects as part of due diligence. Such planning processes require transparency, including stakeholder involvement.
- Methodological frameworks (guidance and rules) for risk-based approaches should be developed.

4 Research Needs

The following key research needs were identified:

- Case studies on consequential analytical approaches including alternative counterfactual scenarios for forest management, effects on forest product markets, and fossil fuel substitution;
- Collection of empirical data on forest product supply and demand and land use, at scales of resolution that enable consequential analysis.

The scientific base to inform decision-makers should be expanded beyond LCA, considering the role of integrated models, global monitoring systems and publicly available databases.

As bioenergy policy is currently being developed, for example in Belgium, Denmark, the Netherlands, the UK and the USA at national and state levels, the international community (including scientists and policy-makers from government and industry) should prioritise allocation of resources to conduct the necessary research and risk-analyses that would lead to deployment of sustainable bioenergy systems.

Adopted by the workshop participants

Copenhagen, May 20, 2014

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