CHATHAM HOUSE
The Royal Institute of International Affairs

Mr Kees Kwant
Chairman, IEA Bioenergy
c/o ODB Technologies Limited
P.O. Box 12249
Dublin 9, Ireland

Friday 31 March 2017

Dear Mr Kwant

Re: *Woody Biomass for Power and Heat: Impacts on Global Climate*

Thank you for your letter of 13 March concerning the Chatham House research paper *Woody Biomass for Power and Heat: Impacts on Global Climate*, and in particular, the accompanying document compiled by four members of the IEA Bioenergy Technology Collaboration Programme. I refer to this document below as the 'IEA Bioenergy response', although I note that IEA Bioenergy is independent of the IEA, and understand the document was not signed off by the IEA Bioenergy Executive Committee, so may not represent the views of the participating governments.

The paper's author, Duncan Brack, has considered the points made in the IEA Bioenergy response, and I am pleased to include his reply here. I would be grateful if you could share this with the four IEA Bioenergy members concerned.

I do not accept that 'the major conclusions and policy-specific recommendations are based on unsubstantiated claims and flawed arguments.' On reading the various documents, what is clear is that the four IEA Bioenergy members and Duncan differ in their assessments of the risks and uncertainties associated with biomass for heat and power, for example regarding the implications of short-term carbon fluxes for climate tipping points; the credibility of assumptions and associated counterfactuals regarding how bioenergy demand affects forest growth; and the ability of sustainability schemes and chains of custody to ensure favourable outcomes. Duncan's less sanguine risk assessment is reflected in the paper's recommendations, which embody a precautionary approach to biomass subsidies.

I accept that the four IEA Bioenergy members are not alone in their differing assessment, but neither is Duncan alone in his. These differences seem to me the basis for further discussion and debate, as you suggest. They do not, however, justify the unwarranted request that the paper's recommendations be revised. This may be consistent with IEA Bioenergy's objective of accelerating bioenergy deployment, but it is extraordinary for an intergovernmental platform to demand the revision of policy recommendations with which it does not agree.

Chatham House has valued the input of IEA Bioenergy members in its research on biomass, and I hope that we can now revert to the more constructive modes of engagement enjoyed previously. In this spirit, and if you are amenable, Chatham House would be happy to convene an event at which we explore the different viewpoints.

Finally, for completeness, I would consider it a courtesy if you would post this letter and the following response on the IEA Bioenergy website, alongside the original IEA Bioenergy response to which it refers.

Yours sincerely,

Rob Bailey
Research Director, Energy, Environment and Resources Department

Response to IEA Bioenergy critique of Chatham House research paper, *Woody Biomass for Power and Heat: Impacts on the Global Climate*

Duncan Brack

On 23 February 2017 Chatham House published the research paper *Woody Biomass for Power and Heat: Impacts on the Global Climate*.[1] On 13 March Chatham House received a letter from members of the IEA Bioenergy Technology Collaboration Programme, plus a supporting document, which argued that the Chatham House paper's 'major conclusions and policy-specific recommendations are based on unsubstantiated claims and flawed arguments' and called on Chatham House to 'reconsider its recommendations'.[2] This is a response to the letter and supporting document.

Summary

Stripped down to their essentials, the letter and supporting document make two key arguments:

- First, that carbon emissions from the combustion of biomass energy do not matter, either at all or over a period which is not clear but could be as long as eighty years, to the end of the 21st century. To the contrary, as I argue in the paper, short-term increases in carbon emissions do matter because: (a) they increase the likelihood of irreversible climate tipping points; and (b) they are likely to be incompatible with the goals of the Paris Agreement, which require near-term peaking in emissions and steep reductions thereafter to net zero by mid-century.

- Second, that harvesting wood for biomass promotes forest growth. This conclusion is based on models that assume that the prospect of future earnings from bioenergy some 25–50 years in the future will induce additional forest planting now; it is not supported by empirical observations.

The letter and supporting document raise no major issues which are not already addressed in the paper, and I therefore stand by the paper's recommendations. A detailed response follows.

1 Emissions at the point of combustion

The letter argues that the paper blurs the 'distinction between fossil carbon and biogenic carbon, which is misleading'. In fact, although the term 'biogenic carbon' is not used in the paper (except when quoting other papers), this argument is fully addressed on pages 23–25. The idea that 'biogenic carbon', i.e. carbon emitted from the combustion or decomposition of biomass, is somehow different from 'fossil carbon' is certainly alluring but essentially specious. Whatever the source of the carbon dioxide, it is the same molecule and has the same impact on global warming. The fact that the forest carbon burned had been absorbed by forest growth in the past, and that other carbon dioxide molecules will be absorbed by forest growth in the future, does not prevent biomass emissions from contributing to global warming.

This is not a new conclusion. The European Environment Agency's Scientific Committee, the European Commission's Joint Research Centre and the European Commission itself, among many others, have all observed that the premise that biomass combustion does not result in carbon

[1] https://www.chathamhouse.org/publication/woody-biomass-power-and-heat-impacts-global-climate
[2] http://www.ieabioenergy.com/publications/iea-bioenergy-response/

accumulation in the atmosphere is wrong.[3] Similarly, the IPCC has pointed out that its approach of not accounting for biomass emissions in the energy sector 'should not be interpreted as a conclusion about the sustainability or carbon neutrality of bioenergy'.[4]

In fact, it is the IEA Bioenergy approach that appears to be muddled. On the one hand, the description of IEA Bioenergy's 'Task 38' study ('Climate Change Effects of Biomass and Bioenergy Systems') includes the statement that carbon emissions from the combustion of biomass can be ignored as long as they derive from sustainably managed forests.[5] This discounting of biomass carbon emissions underlies almost all current biomass policy frameworks, which generally treat combustion emissions as zero. On the other hand, the letter and supporting document accept (on page 4 of the document) that carbon emissions *do* increase, but are not of concern because they are later absorbed by forest growth, over a period which is not specified but could be as late as 'the late 21st century'. But radiative forcing from carbon dioxide is instantaneous, and it is therefore essential to construct a policy framework that reflects how the atmosphere experiences concentrations of carbon dioxide in real time, not over a period of years or decades.

2 Impacts of harvest on forest carbon stock

The letter argues that 'Impacts of bioenergy on forest carbon stock should be assessed as impact [*sic*] on long-term average forest carbon stocks at a landscape scale'. As the letter does not refer back to any part of the paper, I cannot be sure of the point being made, but I assume that the letter is arguing that emissions from wood extracted from one part of a forest are offset, and can therefore be ignored, as long as forest carbon stocks remain constant or increase.

This argument, which is addressed on pages 24–27 of the paper, is unsound, because one cannot assume that these other parts of the forest would have stopped growing in the absence of extraction of wood for bioenergy from one or more stands. The fact that 'large fluctuations [in carbon stock] observed at the stand level … are not observed at the landscape level' does not, as the letter and supporting document appear to imply, mean that those impacts have somehow disappeared. Unless the harvest of trees causes trees elsewhere to grow *faster*, the net effect of the harvest is to reduce stored carbon in the forest, and also to lose future carbon sequestration from the harvested trees.

Nowhere does the paper dispute that it is *possible* to manage forests so as to preserve levels of stored forest carbon. (Various papers by authors of the IEA Bioenergy response are based on this assumption. For example, a 2017 paper by Cintas et al assumes that 'When bioenergy demand is larger and bioenergy prices are higher, more intensive forestry including more fertilization and the use of genetically improved seedlings is implemented'.[6] In the model discussed in Hanssen et al (2017), forest harvest is exactly matched by growth every year, thereby offsetting all emissions

[3] 'Opinion of the EEA Scientific Committee on Greenhouse Gas Accounting in Relation to Bioenergy', 15 September 2011; Agostini, A., Giuntoli, J. and Boulamanti, A. (2013), *Carbon accounting of forest bioenergy: Conclusions and recommendations from a critical literature review*, European Commission Joint Research Centre; European Commission (2016), *Impact Assessment: Sustainability of Bioenergy, Accompanying the document Proposal for a Directive of the European Parliament and of the Council on the promotion of the use of energy from renewable sources (recast)*, Brussels: European Commission, p. 16.

[4] IPCC Task Force on National Greenhouse Gas Inventories, 'Frequently Asked Questions', http://www.ipcc-nggip.iges.or.jp/faq/faq.html, Q2-10.

[5] IEA Bioenergy Task 38: 'Climate Change Effects of Biomass and Bioenergy Systems', http://task38.ieabioenergy.com/wp-content/uploads/2013/09/task38_description_2013.pdf

[6] Cintas et al (2017), 'Carbon balances of bioenergy systems using biomass from forests managed with long rotations: bridging the gap between stand and landscape assessments', *GCB Bioenergy*.

completely; how this situation persists when harvests increase is not explained.[7]) But this is not the same as arguing that forests *are in practice* managed to preserve levels of stored forest carbon. This is discussed on pages 24–25 of the paper.

While plenty of models may predict that bioenergy demand will increase forest carbon stocks, the evidence available to date from the US does not support this. The overall increase in US forest cover observed since the 1950s predates the impact of EU biomass subsidies, and has therefore no connection with it; and, as the paper argues, forest cover in the five southeastern US states where most US wood pellet mills are found did not display the same level of increase between 2011 and 2014, a period during which the wood pellet and biomass industries were both expanding. Furthermore, as the latest inventory of US greenhouse gas emissions and sinks (published just before the paper was released) shows, carbon uptake in US forests has in fact declined since 1990, and even since 2011.[8]

3 Counterfactual scenarios and climate mitigation potentials

The letter argues that 'In most cases, it is implausible to suggest that the forest would remain unharvested and continue to grow if no biomass was used for bioenergy'. This argument is a straw man: nowhere does the paper suggest that forests are *only* harvested for bioenergy purposes or that ceasing bioenergy use would mean that all forests remained unharvested. The paper simply makes the points that (a) harvesting trees for bioenergy – to the extent that this is made more likely by bioenergy policy – will generally be counterproductive from a climate perspective; and (b) where feedstocks originate as an indirect consequence of harvesting for other purposes, the question of decay rates and competing uses is key to determining the likely climate impacts of its use for bioenergy.

The letter also argues that the paper overstates the climate change mitigation value of unharvested forests. This issue is addressed on pages 25–27 of the paper, which cites studies suggesting that: (a) 'large, old trees do not act simply as senescent carbon reservoirs but actively fix large amounts of carbon compared to smaller trees';[9] (b) management for conservation can maintain the carbon uptake of mature forests; and (c) harvesting operations themselves can have major negative impacts on soil carbon levels. The letter and its supporting document discuss the first of these arguments but ignore the second and third.

Finally, while the issue of what would happen to forests in the absence of demand for bioenergy is an important element of the debate, and one I hope to explore in more detail in future papers to be published under this Chatham House project, that is a separate question from what bioenergy policy should actively incentivise. In any case, the paper does not argue that the use of biomass energy should be *banned*, merely that for most types of feedstock it should not be *subsidised* – as it is now by many EU member states.

[7] Hanssen et al (2017), 'Wood pellets, what else? Greenhouse gas parity times of European electricity from wood pellets produced in the south-eastern United States using different softwood feedstocks', *GCB Bioenergy*. The supporting information to the paper (available online) includes the assumption that 'carbon sequestration and immediate biogenic CO2 emission cancel each other out on landscape scale'.

[8] US EPA, *Draft Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990–2015* (14 February 2017), Table 6-10.

[9] Stephenson, N. L. et al. (2014), 'Rate of tree carbon accumulation increases continuously with tree size', *Nature* 507, DOI:10.1038/nature12914.

4 Focus on short-term carbon balances

The letter asserts that 'It is the cumulative emissions of CO_2 [rather than short-term concentrations] that largely determine global warming by the late 21st century and beyond'. This point is fully addressed on pages 30–31, where I argue that since the evidence for 'climate tipping points' following from short-term increases in carbon dioxide emissions is now stronger than it was in 2013 (when the IPCC concluded that the evidence was weak), there is real reason to be concerned over the short-term impact on carbon concentrations in the atmosphere resulting from the use of biomass for energy. The letter's supporting document (page 4) agrees that 'the possibility of climate tipping points is reason for deep concern' – but then goes on to argue that short-term carbon balances are irrelevant. This is inconsistent.

The paper also draws attention to the Paris Agreement goals of limiting temperature rise to well-below 2°C, and preferably 1.5°C, and on the need for global emissions to peak as soon as possible.[10] It is very difficult to see how the higher emissions of carbon dioxide in the short term from the use of biomass for energy is compatible with any of these goals, since their realisation require near-term peaking in emissions and steep reductions thereafter, to net zero by mid-century for 2°C for example. The letter ignores this issue.

5 Biomass feedstocks

The letter claims that the paper makes misleading assertions on the biomass feedstocks used for bioenergy, mainly because it focuses on US sources which in reality provide only a small proportion of EU biomass; the letter argues that EU-origin feedstock is more likely to be sourced from by-products. While it is true to say that the discussion on pages 17–23 of the paper mostly focuses on US feedstocks, nowhere does the paper assert that this represents the majority of EU supplies at present. As noted on page 14, however, imports from outside the EU, mainly from the US, have grown rapidly in recent years and are likely to continue to grow if the current EU policy framework is maintained. Other analyses have suggested that continued expansion of the use of biomass energy in the EU is also likely to result in the intensification of the use of EU forests, alongside an increase in imports.[11] In any case, the conclusions of the paper apply to feedstocks wherever they are sourced.

6 Energy system transition

The letter argues that the paper 'largely overlooks the role bioenergy can play in supporting the urgently-needed energy system transition', with implications for whole-system costs of reducing carbon emissions. The role of biomass within energy systems, its cost compared to competing renewable technologies, its value as a dispatchable power source and the development of alternative balancing options such as grid interconnection, storage and demand-response technologies are all important issues which will be discussed at more length in one of the future papers to be published under this project. This paper focuses on the impacts on the climate of the use of biomass for energy, which is of course also a critical component of any strategy for reducing carbon emissions overall, particularly when, as argued in the paper, the use of some biomass feedstocks has the potential to increase carbon emissions.

The letter also ignores the related point made in the paper (page 68), that biomass energy may be more likely to displace other sources of renewable energy rather than fossil fuels, given EU

[10] Paris Agreement, Article 4(1).
[11] See, for example, Forsell, N. et al (2016), *Study on impacts on resource efficiency of future EU demand for bioenergy (ReceBio)*. Luxembourg: European Union.

member states' overall renewable energy targets and fixed budgets for providing subsidy to renewables. It is also worth noting that as fossil fuels are increasingly taken off electricity grids, the carbon payback periods for the use of biomass will lengthen, potentially to infinity, as the carbon intensity of the electricity it replaces falls.

7 Greenhouse gas accounting for bioenergy

I welcome the letter's recognition of the paper's argument that current greenhouse gas accounting rules do not fully capture the impact of biomass use on the climate, and its agreement with the recommendations on revising accounting rules in the land use sector.

The letter disagrees with the other option discussed in the paper, of accounting for bioenergy emissions in the energy sector. While it is true, as the letter argues and the paper acknowledges, that this would require a major revision of accounting rules, it cannot be said that this would create a 'disproportionate disincentive for all bioenergy options'. Rather, it would shift the incentives from biomass-consuming (and importing) countries to biomass-producing (and exporting) countries.

8 Sustainability criteria

The letter makes a number of claims about the proposed new EU sustainability criteria, the criteria in place in some EU member states and the voluntary biomass certification schemes.

The reason why the paper argues (on pages 66–67) that these schemes are not satisfactory is because they fail to account, comprehensively or at all, for changes in forest carbon stock. If one accepts the argument that biomass feedstocks have different impacts on the climate depending partly on their relationship with forest carbon stock, then sustainability criteria – which are designed, among other things, to ensure that financial and regulatory support is only given to renewable energy that delivers greenhouse gas savings compared to the fossil fuels it replaces – *must* take account of changes in forest carbon stock; otherwise, what is the point of them?

The letter and the paper agree on the desirability, in an ideal world, of a full life cycle assessment for each type of feedstock, including changes in forest carbon stock alongside supply-chain emissions associated with harvesting, processing and transport. But in reality, as the paper argues, it is very difficult to make this kind of assessment, not least because it depends so heavily on the (inherently subjective) counterfactual chosen, and it is wholly impractical to expect government agencies to be able to carry out this exercise for all the many feedstocks which their industries might choose to source.

I conclude that only mill residues and post-consumer waste should receive subsidies because only these feedstocks can be assumed with confidence to reduce net carbon emissions in the short term (and even then only if there is no likelihood of diverting them from competing uses). This conclusion reflects: (a) a precautionary approach to the risk of raising carbon concentrations in the atmosphere in the short term (see point 4); (b) scientific uncertainty over issues such as the impact of the removal of forest residues on soil carbon levels and tree nutrients; and (c) a practical approach to implementation, realising the difficulties regulators would face in distinguishing between similar types of feedstock (e.g. different categories of forest residues).

Pages 22–23 of the paper discuss the apparent discrepancies that have emerged in the reports of the feedstock sourced by US pellet plants and UK biomass plants, and the weaknesses in the UK

regulator's definitions of feedstock categories; the more complex the range of allowable feedstocks, the more widespread problems like this would be.