Comments from Environmental Defense Fund to the Science Advisory Board Biogenic Carbon Emissions Panel on the SAB review of EPA's "Framework for Assessing Biogenic CO2 Emissions from Stationary Sources"

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Background

Environmental Defense Fund (EDF) appreciates the opportunity to comment on the Science Advisory Board's (SAB) crucial review of the revised "Framework for Assessing Biogenic CO_2 Emissions from Stationary Sources." EDF is a non-profit, non-governmental, non-partisan organization, with over one million members, dedicated to preserving the natural systems on which all life depends. Our comments reflect our longstanding interest in the biogenic accounting issue, as well as our commitment to using sound science to craft appropriate and workable environmental policy. EDF has been central to raising the importance of correct accounting for greenhouse gas (GHG) emissions from biogenic feedstocks in the scientific literature.[1] We have followed and provided comments to inform EPA's process for accounting for biogenic emissions from the beginning.[2] Bioenergy can play an important role in meeting America's energy and climate needs under a robust and practical policy and accounting framework that recognizes that there are limits on how much biomass can be used before it becomes a detriment to the climate.

EPA's November 2014 "Framework for Assessing Biogenic CO_2 Emissions from Stationary Sources" is a critical next step in EPA's ongoing effort to understand the extent to which GHG emissions from biogenic feedstocks are net to the atmosphere when these feedstocks are used in stationary source facilities such as power plants. We congratulate EPA for its diligent work on this difficult issue, and we look forward to following the SAB's technical review.

EPA's actions on this front are groundbreaking. The Agency's work to define, in quantitative terms, the actual net emissions to the atmosphere from the production, processing, and use of biogenic feedstocks leads the way for other nations to follow. The technical issues involved are complex and the science is still emerging: even so, it is important that the Agency get this right. **The accounting framework must be:**

- **simple to implement,**
- **transparent to the market,**
- **and predictable.**

It must also be faithful to the actual situation on the ground: in other words, it must accurately reflect the true emissions to the atmosphere from the utilization of biogenic feedstocks.

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[1] See, for example: Searchinger, T., Hamburg, S., Mellilo, J., Chameides, W., Havlik, P., Kammen, D., Likens, G., Lubowski, R., Obersteiner, M., Oppenheimmer, W., Robertson, G.P., Schlesinger, W., Tilman, G.D. 2009. Fixing a critical climate accounting error. *Science* 326: 526-527.

[2] See, for example: EDF Comments (2010) in response to EPA's Call for Information on Greenhouse Gas Emissions Associated with Bioenergy and Other Biogenic Sources (Docket ID No. EPA-HQ-OAR-201-0560).

Key point: As it reviews the November 2014 version of the Framework, the reconvened SAB Panel should include consideration of a modeled anticipated future baseline based on a constant projection of a relevant subset of historical data on carbon stocks. Specifically, SAB should consider this interrelated set of questions:

What criteria should be used to evaluate the appropriateness of the baseline approaches used in the Framework?

- What are the risks of implementing a baseline based on different types of forward modeling? What are the risks of implementing a baseline based on projections of relevant historical data (as proposed by EDF below)?
- How might those risks be mitigated?
- How might the modeled shifting historical baseline (as proposed by EDF, below) allow for the consideration of additionality in order to satisfy the SAB Panel's concern about the reference point baseline in the original 2011 Framework?[3]

Background: Charge to SAB

In its review of the original 2011 Framework,[4] SAB expressed concern that the baseline developed for that analysis could not address the question of additionality -- that is, "the extent to which forest stocks would have been growing or declining over time in the absence of harvest for bioenergy" (SAB letter, p. 2). An analysis that accounts for additionality, SAB found, ought to apply an anticipated future approach, though the SAB also acknowledged the "uncertainty and difficulty associated with modeling future scenarios." (SAB letter, p. 2)

EPA has responded to the SAB's original comments on the baseline issue by developing and presenting a detailed forward modeling approach for baseline development in the revised Framework. Case studies developed using a "fixed reference point" baseline and a "modeled future" baseline are presented side by side in order to demonstrate the biogenic assessment factor (BAF) calculated when either approach is applied.[5]

Background: Modeled baseline

The type of forward modeling conducted by the EPA for this analysis demands a complex set of assumptions about future trends, including trends in demographic, economic, and biophysical phenomena. As explained by Buchholz et al. (2014):[6]

> "…an anticipated future baseline has one major caveat: being a forward-looking tool

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[3] See "SAB Review of EPA's Accounting Framework for Biogenic CO2 Emissions from Stationary Sources (September 2011)," published September 2012. At http://yosemite.epa.gov/sab/sabproduct.nsf/0/2f9b572c712ac52e8525783100704886!OpenDocument&TableRow=2.3#2.

[4] Ibid.

[5] See "Response to the SAB Panel Peer Review Advisory" (February 2015), http://yosemite.epa.gov/sab/sabproduct.nsf/5295DAC6053510F285257DFD0075C181/$File/OAR+Response+to+SAB's+2012+Advice.pdf

[6] Buchholz, TB, S Prisley, G Marland, C Canham, and N Sampson. 2014. Uncertainty in projecting GHG emissions from bioenergy. *Nature Climate Change* 4: 1045- 1047.

relying on additional assumptions beyond measureable data points (as applied with a constant reference baseline), the uncertainty associated with an anticipated future baseline increases over time. Relevant but highly uncertain variables include behavioural economics (market trends, anticipated future revenues, and so on) or ecological factors (soil quality, rainfall patterns, natural disturbances, climate change)."

Projecting modeled assumptions beyond the bounds of the data leads to uncertainty that grows over time. Buchholz et al. (2014) went on to demonstrate the danger of this approach, by comparing projected baselines of timber volume in forests from USDA made as part of its Resources Planning Act (RPA) Assessments over the last 30 years with the actual measured data from the USDA Forest Service FIA Program. The results are instructive: at no time in the last 30 years was USDA's modeled anticipated future baseline as accurate as a constant projection based on historical levels would have been.

The USDA's most recent projections of forest carbon stocks underline this uncertainty when results are projected into the future. The most recent RPA assessment models forest growth to 2060 under multiple climate change and policy scenarios.[7] The results from this modeling show a large amount of variability in predictions of the future, as shown for the Southern Region below. Predicted modeling results for the other Regions are similar.

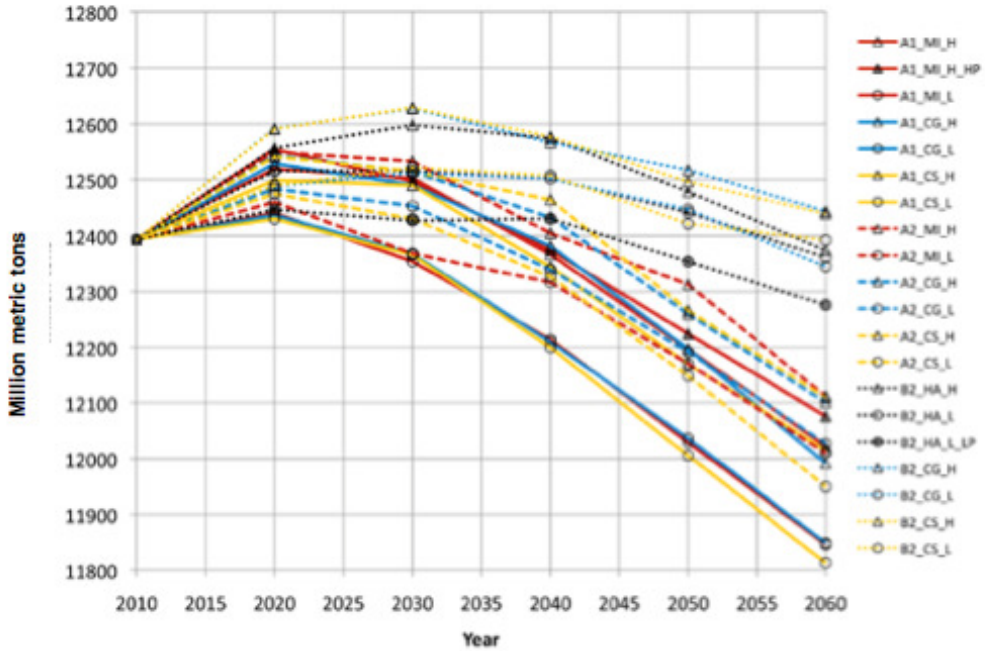

Figure 1. From Wear et al. 2013. Original caption reads: "Figure 24. Forecasts of total carbon stored in forests in the South Region, 2010–60, for 20 Resources Planning Act (RPA) scenario-climate-timber price combinations. RPA A1B scenarios are represented by solid lines; RPA A2 dashed; RPA B2 dotted. MIROC3.2 general circulation model (GCM) is represented by red; CGCM (CGCM3.2 for A2 and CGCM2 for B2) by blue; CSIRO (CSIRO-Mk3.5 for A1B and A2 and CSIRO-Mk2 for B2) by yellow; HadCM3 by black. Lines marked by triangles indicate scenarios with increasing prices; circles indicate scenarios with decreasing prices."

[7] Wear, DN, R Huggett, R Li, B Perryman, and S Liu. 2013. Forecasts of Forest Conditions in US Regions Under Future Scenarios: A Technical Document Supporting the Forest Service 2012 RPA Assessment. General Technical Report SRS-170. Asheville, NC: USDA Forest Service Southern Research Station. 101 p.

The alternative: A shifting historical baseline

If a historical reference level remains static over time, the SAB Panel noted in 2012, it potentially "gives away" sequestration that might otherwise occur on the landscape in situations where forest growth is increasing. The difference between the projected carbon stock on the landscape and the historical reference level is sometimes termed "headspace," in the form of forest carbon emissions that might be allowed if bioenergy facilities demand additional feedstock (Figure 2). The SAB sought to take out the headspace under a "business as usual" scenario, by suggesting that an anticipated future baseline be created as a safeguard against encouraging emissions of terrestrial carbon that might otherwise have been sequestered if forest stocks were increasing.

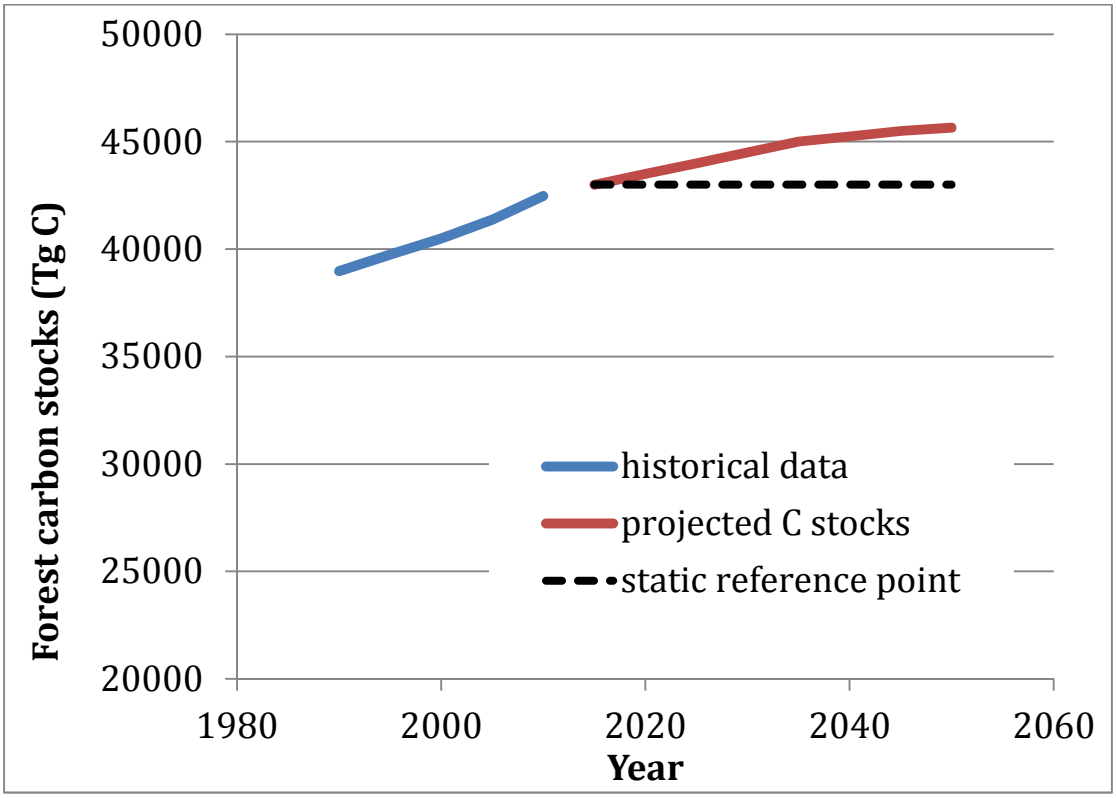

Figure 2. Under the static reference point approach as described in EPA's 2011 Framework, the "headspace" between the projected C stocks and the static reference point baseline represented potential emissions and foregone sequestration. This headspace is removed, and the sequestration secured, when forest C stocks are increasing under the shifting historical baseline (Figure 3). This figure uses the national scale for illustrative purposes. Historical data (1990-2012) are taken from the US EPA Inventory of US Greenhouse Gas Emissions and Sinks: 1990-2012 (April 2014), at http://www.epa.gov/climatechange/ghgemissions/usinventoryreport/2014.html. The "projected C stocks" line is hypothetical and used for illustration only.

There is an alternative to EPA's approach to constructing the anticipated future baseline from complex modeling of hypothetical future scenarios, however: rather, a modeled anticipated future baseline can be created from simple projections based on recent historical observations. This alternative approach would be appropriate if:

1) the historical data is taken from the "managed" landscape rather than from all forest lands in a region, many of which may not be subject to management and in many cases would be increasing carbon stocks under business-as-usual; and

2) the projections based on the historical data are adjusted over time to reflect updated information.

As EDF has indicated in its prior comments to EPA, it is important to focus the analysis on data from the "managed" landscape by excluding reserved lands and other "non-working" lands from the baseline, as these are not relevant to evaluating the impacts of bioenergy feedstock production and use.[8] Moreover,, adjusting the baseline using updated historical data over time ensures that the most recent data is being used and the analysis stays true to actual carbon stock changes on the land.

A shifting historical baseline approach addresses the additionality concerns referenced in the SAB report and also leverages the vast amounts of empirical data available at the landscape scale to measure carbon stocks in real time. The approach is much simpler and more transparent and is demonstrably better at predicting actual trends in carbon stocks than complex modeling relying on numerous untestable assumptions, as suggested by the SAB and EPA.

To apply the shifting historical level approach, historical measured data for a relevant subset of the landscape would be used to set the anticipated future baseline, and the baseline would be reset periodically based on remeasuring the carbon stocks on the landscape, based on FIA data (see Figure 3 for a hypothetical illustration). By shifting the baseline up or down as a step function in response to measured changes in forest carbon stocks, we effectively ratchet the baseline up over time in order to remove any "headspace" between forest growth and allowable biogenic feedstock harvest. This could be done with new data every 5 to 10 years upon completion of one or more FIA inventory cycles or could be updated on a rolling average basis, more frequently incorporating updated information as it becomes available.

In practical terms, the change in carbon stocks over time relative to the baseline would determine the emissions factor that would be used as a basis for permitting decisions. In the illustration in Figure 3, under Scenario A, C stocks are increasing and the shifting historical level is adjusted every five years, following the trajectory of C stocks. Under Scenario B, C stocks are declining and the shifting reference point is adjusted downward. Updated baselines would be applied for the permitting of new facilities. If C stocks go down, as in Scenario B, then existing facilities would remain in operation because they

[8] Tracking changes only on the policy-relevant portion of the landscape could be based on simple criteria for defining reserved and other non-working lands, as well as a system of empirically derived weights based on historical growth/removal removal rates.

would already be permitted, but there would be additional constraints on new facilities in the form of more stringent requirements for permitting given the decline in carbon stocks.

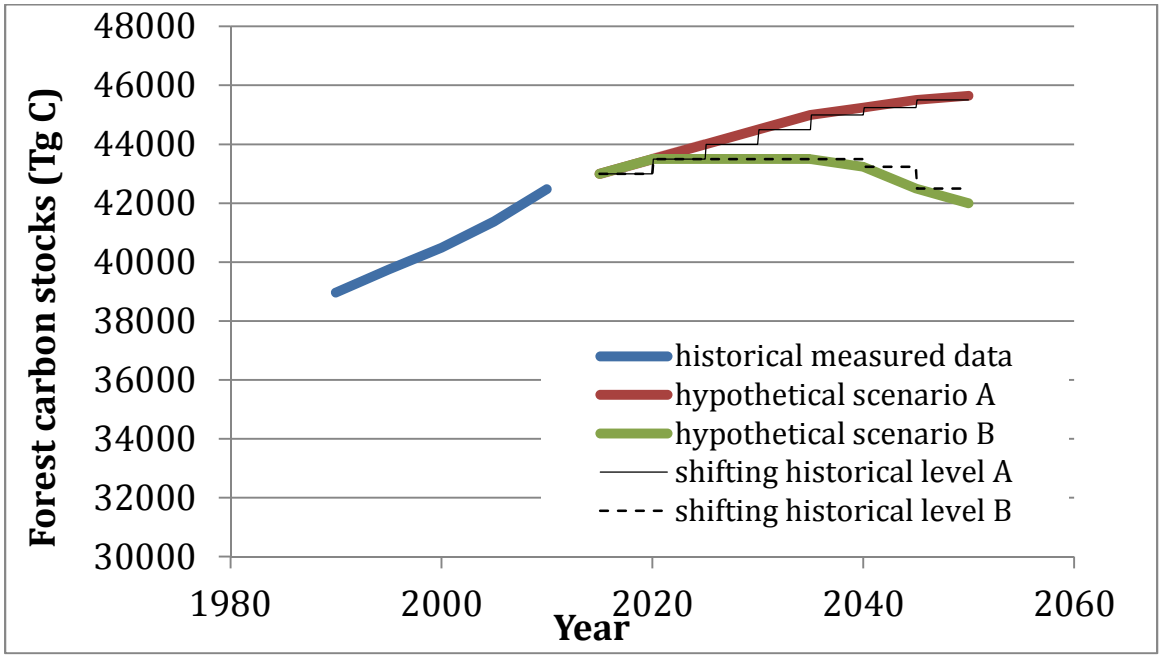

Figure 3. Graphic representation of the shifting historical baseline under two hypothetical future cenarios with different C stock trajectories. National scale historical inventory data (1990-2012) are used here for illustration of the scale only, as in Figure 2. The hypothetical Scenarios (A and B) are also only illustrative. Note that in this Figure, the historical level is set at the annual carbon stock level every time the baseline resets. In practice, robust carbon stock data may not be available annually, and the baseline could be set as an average or rolling average over some period of years (e.g. 5 years).

What does the baseline mean?

Our comments are predicated on our original understanding of the baseline, as in the original 2011 Framework, as a tool for understanding what would have happened in the absence of bioenergy harvest. Using this definition of the baseline, the GROW term should represent the difference between net growth with and without bioenergy harvest. In the original Framework, GROW was calculated as (growth minus removals), which typically – because growth exceeds harvest in most US forests across large regions – resulted in a positive value that could be interpreted as the "headspace" available for bioenergy harvest before C stocks begin to decline.

In the 2014 Framework, the BAF equation has been recast and the GROW term is calculated as [(removals – growth) /removals]. This results in a negative value for GROW, because growth typically exceeds removals. But in standardizing GROW as a function of current removals, the Framework dilutes any effect of bioenergy harvest on forest C stocks, because removals occur for all sectors, not just for bioenergy, which typically accounts for a small fraction of total removals. Under the current formulation, the incremental carbon impact of using biomass feedstocks will appear more favorable when other removals are higher, even in the context of rapid depletion of carbon stocks. We encourage the SAB to review the new formulation of the BAF equation, as well as the way in which the GROW term is calculated, in order to ensure that GROW (and BAF) do indeed reflect net carbon

stock growth in absolute, rather than relative, terms as intended. This review is critical, as the current version of the equation will lead to the use of BAFs that do not accurately reflect net carbon emissions from the use of bioenergy feedstocks. If deployed as currently structured the equation will result in a large undercounting of the climate impacts of increased use of bioenergy.

We also encourage the SAB to require that the analysis for this and all other terms in the Framework restrict attention to just potentially managed or "working" lands, excluding all non-managed ("non-working") lands from the calculations since these are irrelevant for examining impacts of biomass feedstock production.

Shifting historical level and REDD policy

We note the approach described above, in which reference levels for tracking changes in forest emissions are set based on historical data rather than on complex forward modeling simulations, is similar to the approach adopted by the UN Framework Convention on Climate Change (UNFCCC) and other emerging policy frameworks for Reducing Emissions from Deforestation and forest Degradation (REDD+). The UNFCCC has agreed that reference levels for measuring reductions in forest emissions in developing countries under REDD+ will be established using average historical deforestation and associated emissions levels as the principal variables, with some flexibility for "adjustments" under unique and limited circumstances, subject to a process of scientific review to ensure robustness and transparency.[9]

Summary

Our proposed shifting historical baseline approach, focused on the managed landscape and incorporating the best available information over time, meets the criteria outlined by EPA in the original Framework for a workable approach to this issue (Executive Summary, p. v). Specifically, the shifting historical level:

- Accurately reflects the carbon outcome;
- Is scientifically rigorous/defensible;
- Is simple and easy to understand;
- Is simple and easy to implement;
- Is easily updated with new data; and
- Uses existing data sources.

In addition, the shifting historical level is transparent to policymakers and to the market and it is generalizable for multiple geographies. Most importantly, it reflects the actual transfers of carbon between land and atmosphere and it is much more likely to be closer to the truth than any modeled future projection.

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[9] For a good discussion of issues regarding REDD+ reference levels, see: Meridian Institute. 2011. Guidelines for REDD+ Reference Levels: Principles and Recommendations. Prepared for the Government of Norway, by Arild Angelsen, Doug Boucher, Sandra Brown, Valerie Merckx, Charlotte Streck, and Dan Zarin. Available at:www.redd-oar.org/links/REED+RL.pdf. For a more practical application, see: Forest Carbon Partnership Facility (FCPF). 2013. *Carbon Fund Methodological Framework*. World Bank, Washington, DC. https://www.forestcarbonpartnership.org/carbon-fund-methodological-framework