Presentation to March 25, 2015 Meeting of the EPA SAB Panel on Biogenic Carbon

By

Caroline Gaudreault, NCASI, Montreal, Canada

Reid Miner, NCASI, Research Triangle Park, NC

Items to cover

1) Temporal issues associated with anticipated future baselines
2) Scales of biomass use when using anticipated future baselines

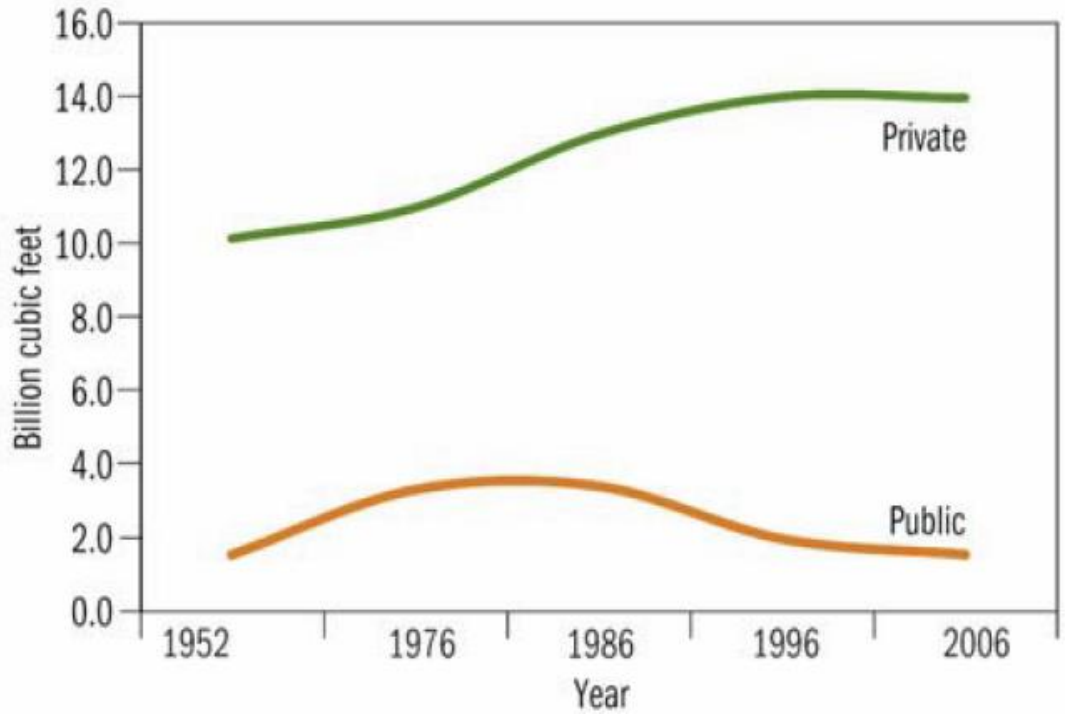
1) Cumulative radiative forcing over time

- IPCC has concluded based on climate modeling that, ultimately, cumulative emissions of CO_2 must be limited if peak global temperatures are to be moderated (IPCC's Fifth Assessment Report)
- It is important, therefore, that policies focused on near term emissions of GHGs not result in higher emissions of CO_2 in the long term
  - "Carbon debts" must be looked at in this context

1) What time frame should be used?

- Especially in the case of wood from private land, the timing of the investment response is critical
  - When demand increases, private landowners respond by making investments that tend to keep land in forest, expand forested area, and increase forest productivity
- Many examples available
  - See bibliography
- <u>Assessment horizons should extend long enough to capture the investment response</u>

Most wood in U.S. is harvested from private land



(Source: U.S. Forest Resource Facts and Historical Trends: http://fia.fs.fed.us)

1) It is important to consider regrowth over a time horizon that is consistent with that used to judge the warming impact of GHGs

Results of calculations based on increased production of bioenergy from planted loblolly pine on a 20-year rotation, *before considering the investment response*			
1 kg GHG emission		Net relative GW impacts	
		20 years	100 years
Fossil fuel CO_2		1	1
Methane (from IPCC 5th Assessment Report)		84	28
CFC-11 (from IPCC 5th Assessment Report)		6900	4600
Biomass fuel CO_2	Not considering regrowth that occurs over the time frame considered for fossil fuel	1	1
	Considering regrowth that occurs over the time frame considered for fossil fuel	0.54	0.12
	Considering regrowth and foregone sequestration that occurs over the time frame considered for fossil fuel	0.85	0.26

Calculations in Miner et al. (2014) Forest Carbon Accounting Considerations in U.S. Bioenergy Policy. *Journal of Forestry*, 112(6):591–606, November 2014

If the global warming (GW) impacts of other GHGs are judged using 100-year GWPs, then the net warming impacts of biogenic CO_2 should also be judged over 100 years.

- The impacts of growth/ regrowth over that period should be considered

2) Scales of biomass use when using anticipated future baselines

The charge to the SAB Panel asks –

"2d. Should shocks for **different feedstocks be implemented in isolation** (separate model runs), in aggregate (e.g., across the board increase in biomass usage endogenously allocated by the model across feedstocks), or something in between (e.g., separately model agriculture-derived and forest-derived feedstocks, but endogenously allocate within each category)?"

"2e. For **feedstocks that are produced as part of a joint production function**, how should the shocks be implemented? (e.g., a general increase in all jointly produced products; or, a change in the relative prices of the jointly produced products leading to increased use of the feedstock, and decreased production of some other jointly produced products, but not necessarily an overall increase in production)."

2) Modeling of co-products and multiple sources of feedstock

- The forest-based industry is complex and highly interconnected
- Policies that affect one part of it are likely to have ripple effects
- Modeling needs to encompass multiple parts of the fiber system in order to clarify;
  - The connections and interplay between sources of feedstock and
  - The effects of demand for primary products on supplies of co-products and the related carbon impacts

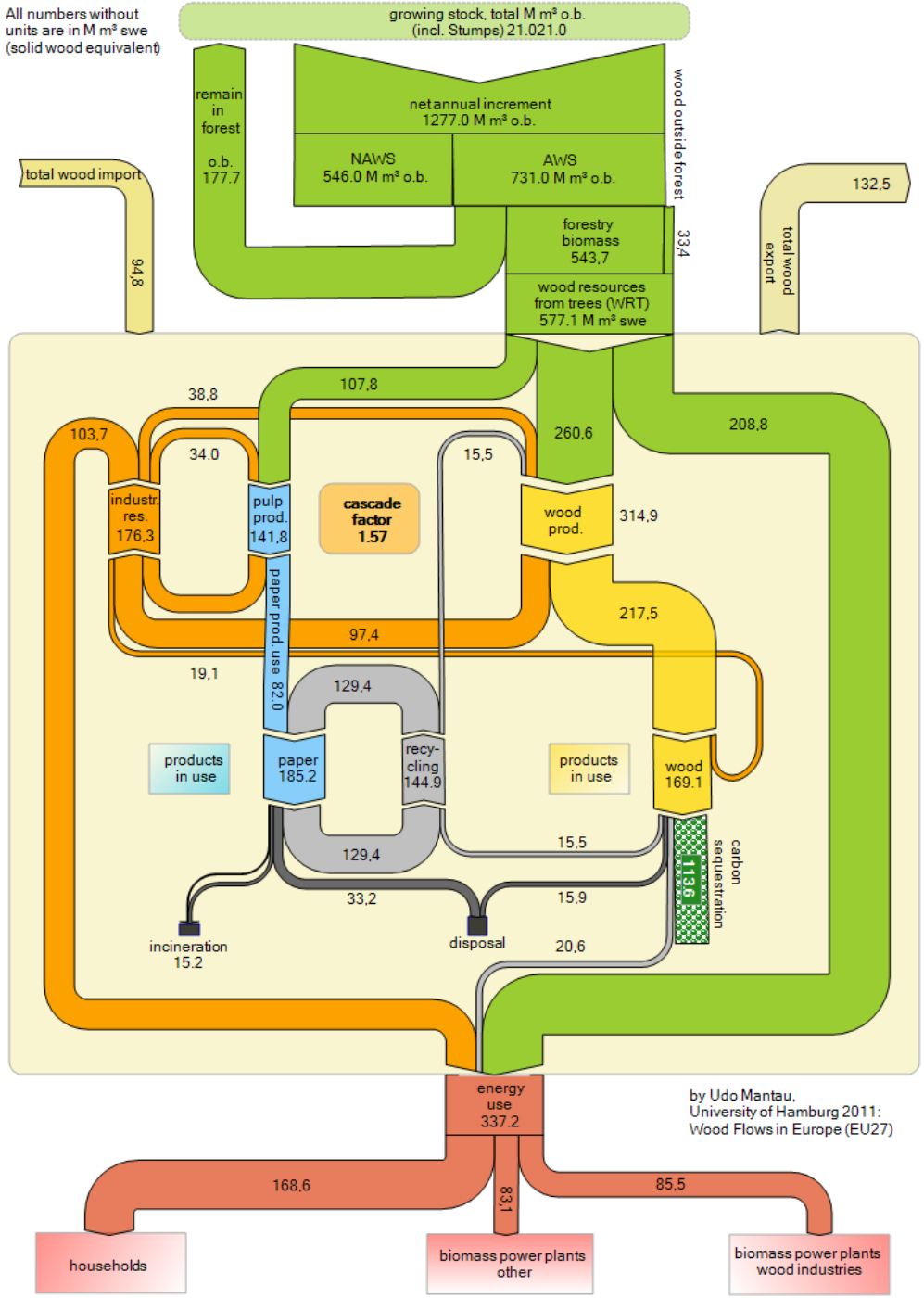


Figure from Mantau 2012 shows flows of wood fiber in the European forest-based industries

Summary

- When thinking about temporal scales, do not let the “carbon debt” issue limit assessments to time horizons that fail to capture impacts on long-term cumulative CO_2 emissions
- Consider the impacts of growth/regrowth on the net radiative forcing from biogenic CO_2 using the same temporal scales used on other GHGs for judging radiative forcing impacts
- Use temporal scales adequate to capture the investment response
- Be careful about artificially isolating parts of the forest-related industry in carbon studies because the connections and interactions are critical to understanding the carbon implications of different policies

Additional information and documentation on a number of these issues can be found in Miner, R., R. Abt, J. Bowyer, M. Buford, R. Malmsheimer, J. O’Laughlin, E. Oneil, R. Sedjo and K. Skog (2014) Forest Carbon Accounting Considerations in U.S. Bioenergy Policy. Journal of Forestry, 112(6):591–606, November 2014. Available at https://www.safnet.org/documents2014/Carbon_Article_Nov2014.pdf

Selected references

- Abt, K.L et al. (2012) Effect of bioenergy demands and supply response on markets, carbon, and land use. *For. Sci*. 58:523–539.
- Abt, R.C., and K.L. ABT. (2013) Potential impact of bioenergy demand on the sustainability of the southern forest resource. *J. Sustain. For.* 32:175–194.
- Abt, R.C. et al (2010) The near-term market and greenhouse gas implications of forest biomass utilization in the southeastern United States. Nicholas School of the Environment, Working Pap. CCPP 10-01, Duke University, Durham, NC. 34 p.
- Daigneault, A.B. et al., (2012) Economic approach to assess the forest carbon implications of biomass energy. *Environ. Sci. Technol.* 46:5664 –5671.

Selected references (cont.)

- Galik, C.S. et al. (2012) The effect of assessment scale and metric selection on the greenhouse gas benefits of woody biomass. *Biomass Bioenergy* 44:1–7
- Hardie, I. et al. (2000) Responsiveness of rural and urban land uses to land rent determinants in the US South. *Land Econ*. 76:659–673
- IPCC (2013) Climate change 2013:The physical science basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change
- Lubowski, R.N. et al. (2008) What drives land-use change in the United States? A national analysis of landowner decisions. *Land Econ*. 84:529 –550.

Selected references (cont.)

- Mantau, U. 2012. Wood flows in Europe (EU27) Project report. Celle 2012, 24 pp. published by the Confederation of European Paper Industries and the European Confederation of Woodworking Industries. www.cepi.org (accessed February 2015).
- Miner et al. (2014) Forest Carbon Accounting Considerations in U.S. Bioenergy Policy. *Journal of Forestry* 112(6):591–606
- Nabuurs, G.J. et al. (2007) Forestry. Chapter 9 in Climate change 2007: Mitigation. Contribution of Working Group III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change
- Nepal P. et al. (2014) Net change in carbon emissions with increased wood energy use in the United States. *Glob. Change Biol. Bioenergy.*

Selected references (cont.)

- Nepal, P. et al. (2014) Net change in carbon emissions with increased wood energy use in the United States. *Glob. Change Biol. Bioenergy*. doi: 10.1111/gcbb.12193.
- USFS (2009) U.S. Forest Resource Facts and Historical Trends: FS-801, http://www.fs.fed.us/