POLICY BRIEF: ARB's U.S. Forest Projects offset protocol underestimates leakage – *Preliminary results*

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Barbara Haya, PhD, Research Fellow, Center for Environmental Public Policy, University of California, Berkeley, bhaya@berkeley.edu

Analysis of projects generating 90% of total offset credits issued by ARB under its U.S. Forest Projects offset protocol shows that 82% of the credits generated by these projects likely do not represent true emissions reductions, due to the protocol's leakage accounting methods. The total quantity of over-crediting across these 36 projects equals approximately 80 million tons of CO_2. For context, the U.S. Forest Protocol has generated 80% of the offset credits in California's cap-and-trade program; the estimated over-crediting is equal to one third of the total expected effect of California's cap-and-trade program on emissions during 2021-2030 (ARB 2017).

Share of issued credits that are over-credited

		If the timing of leakage deductions in the protocol: is fine	needs adjustment
Leakage rate:	20%	0%	35%
	40%	1%	51%
	60%	3%	67%
	80%	4%	82%

Leakage occurs when a reduction in timber harvesting at one project site causes an increase in timber harvesting elsewhere to meet timber demand. ARB's protocol accounts for leakage when calculating the number of credits awarded, but there are three serious problems with the protocol's leakage accounting methods. First, the protocol uses a 20% leakage rate when a rate of 80% or higher is supported by published studies of leakage rates from reduced timber harvesting in the United States (Gan & McCarl 2007, Wear & Murray 2004). Using an empirically unsupported low rate results in over-crediting. Second, there is an inconsistency between when on-site carbon storage and leakage are accounted. Most improved forest management projects credit a large reduction in timber harvesting in the first year of the project, but deduct the leakage associated with that avoided harvesting over 100 years. This means that most forest offset projects begin in global greenhouse gas debt; project landowners generate offset credits that allow emitters in California to emit more than the state's emissions cap today, in exchange for promises to sequester carbon over 100 years. Further, that promise can be difficult to keep since productivity slows in ageing forests and as forests respond to a warming climate. Third, it is unclear whether the protocol requires forestland owners to increase carbon stocks to cover leakage for 25 years or for 100 years. If the requirements is only for 25 years, it will be possible for participating projects to result in a net decrease in carbon storage over 100 years compared to the baseline. ARB could avoid this over-crediting by choosing an 80% leakage rate, and accounting for total net benefits at the same time that reduced harvesting is assumed to happen and is credited.

MORE DETAILS

The timing issue explained

Under ARB's protocol, almost all ARB improved forest management offset projects receive a crediting baseline that is well below their actual carbon stocks. On average across all compliance offset projects, these baselines equal 70% of current carbon stocks. This means that in the first year of a project, the land owner is issued a quantity of credits equal to, on average, around 30% of the carbon stocks on their project lands adjustment downward to account for leakage and carbon from harvested timber that is stored long-term in harvested wood products and in landfills.

To create a baseline, the land owner models the carbon stocks and fluxes associated with a 100-year timber harvest scenario that reflects the harvesting expected to take place without the financial incentives from the offset program. The modeled scenario should be financially feasible and fulfill all legal and contractual obligations. In order for most projects to earn credits under the protocol, the calculated average carbon stocks in the baseline scenario over 100-years should be no less than that of the average forestlands for the project's region and forest type.

This modeled scenario is used to generate the key parameters used to calculate emissions reduced and credits generated by the project. Baseline carbon storage and harvesting rates are assumed to equal the average rate over the 100 years of the modeled scenario. This simplified baseline is treated as equivalent, in terms of carbon accounting, to the range of financially feasible timber harvest scenarios that could have happened without the offset program. Flat average baseline values have the advantage of not requiring the land owner to calculate year-to-year increases in carbon storage against the harvest and growth swings in one specific baseline management regime for each of 100 years. But this approach has one important disadvantage—flat average baseline values for carbon storage and harvest rates are internally contradictory and physically impossible.

Figure 1 presents an example of a modeled harvesting scenario used to define the baseline for one large offset project – ACR360, a half million acre project in southern Alaska. The curved dotted line is the modeled business-as-usual scenario for above-ground standing live carbon stocks. The straight dotted line is the actual baseline used to generate credits, which is the average carbon storage in the 100-year modeled scenario. The solid line is the actual carbon storage on the project lands at the start of the project. A single baseline harvesting rate (not shown in this figure) is used for the 100-year project life that is equal to the average rate over the 100-year modeled scenario.

This simplified baseline scenario suggests that, if the project were not earning offset credits, its lands would be harvested to baseline levels in year 1 and maintained at those carbon stocking levels for 100 years. Contradicting this assumption, the baseline also assumes that a constant quantity of timber is harvested each year over the project life. This second assumption is used to calculate leakage.

These two assumptions are contradictory because it is not possible for both carbon storage and harvesting to be the average values over the project life. Carbon storage and harvesting rates are correlated with one another, and inextricably tied to the actual net growth rate of the project forest. If carbon storage is assumed to drop to the baseline in year 1, that would happen because of a large amount of timber harvesting. If the harvesting rate is assumed to be constant over 100 years,

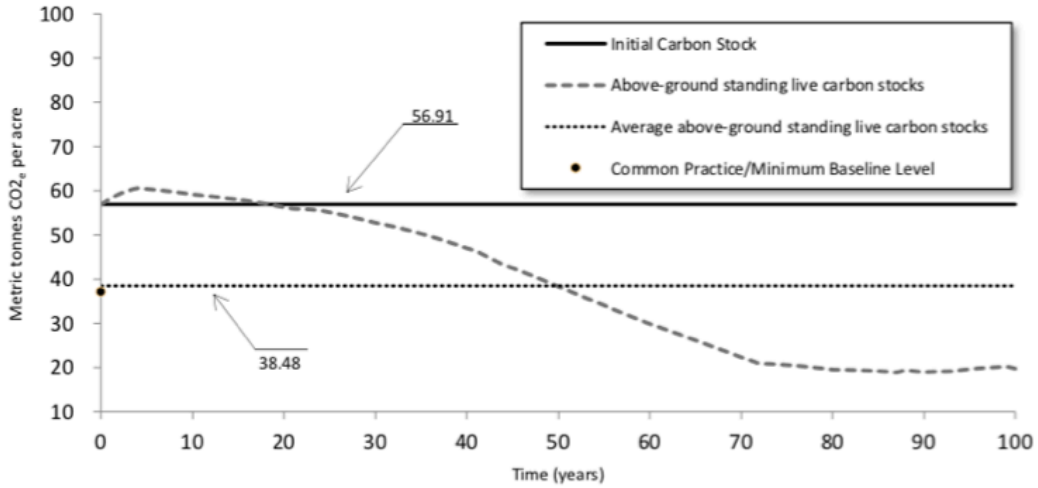
however, then the carbon storage on the land will also decrease slowly, rather than abruptly in year 1. By mixing these two assumptions into a physically impossible baseline scenario, the protocol maximizes credits generated without reflecting the actual rate at which emissions to the atmosphere are avoided. The protocol calculates gains in carbon against the baseline using the first assumption, and losses in carbon from leakage using the second assumption. The project thereby generates a large quantity of credits in its first year, and the leakage associated with the reduced harvesting needs to be paid back over 100 years.

This over-crediting allows emitters in California to emit more than the state's emissions cap today in exchange for promises of forest carbon sequestration over 100 years. Emissions today are not equivalent to reductions decades from now given the urgency of climate mitigation to avoid tipping points. Further, these promises could be hard to keep. On project lands with less harvesting, fewer older trees will be replaced with younger trees, and the average tree age will increase over the 100 years of the project. Net growth slows in ageing forests (Gray et al 2016), while forest carbon losses are also expected from the impacts of climate change.

Lastly, it is unclear whether the protocol requires forestland owners to account for leakage for 25 or 100 years. If forestland owners are only required to include leakage in their reversal reporting for 25 years, crediting for reduced harvesting in the first year of the project will be awarded in full, while potentially, as low as only 1% of the leakage associated with that reduced harvest is deducted each year for only 25 years. It will then be possible for participating projects to result in a net decrease in carbon storage over 100 years compared to the baseline.

ACR360 generated close to 15 million offset credits in its first year, equal to more than 60% of the expected average annual effect of California's cap-and-trade program on emissions during 2021-2030.

Figure 1



From: ACR360 "Finite Carbon – Ahtna Native Alaskan IFM" Version 1.3, Attachments G and H: Baseline Carbon Stocks, Submittal Date: 1/19/2018

Methods

Landowners report how they calculate their requested credit issuance in Offset Project Data Reports (OPDRs) based on instructions laid out in the protocol. These reports are made public through the offset registries. We reproduce these calculations for all credits issued to 36 projects as of March 23, 2019. We use data provided by the landowner in their OPDRs and supplemental materials, and adjust the projects' assumptions for leakage and the timing of harvesting in the baseline to investigate the impact of over-crediting.

Adjusted leakage rate

Using data reported in the OPDRs, we reproduce the calculations of leakage (also called secondary effects), carbon in harvested wood products and landfills (HWP&L), and total reductions achieved using leakage rates of 40%, 60%, and 80% instead of 20%.

Adjusted timing of baseline harvesting

We recalculate the credits that would have been generated if the protocol's leakage calculations matched its assumption that timber is harvested in year 1 of the baseline scenario to bring carbon storage down to baseline levels, and continues to be harvested at smaller rates needed to maintain the baseline carbon storage level for one hundred years.

We do this in the following manner:

First, the baseline harvesting level prior to delivery to the mill (PDM) in the first year of the project is calculated as the difference between standing live carbon in the project compared to the baseline.

Second, we calculate the baseline carbon in trees harvested in years 2 to 100 so that the sum of the baseline PDM over 100 years is the same as the sum using ARB's current methods. We calculate the baseline PDM in years 2 through 100 (99 years) as:

$PDM_{annual\ after\ year\ 1} = (PDM_{total} - PDM_{year\ 1}) / 99$

Third, we recalculate the carbon in HWP&L in a similar manner, by:

a) using the ratio of HWP&L to PDM in year 1 of the baseline in the OPDR to recalculate carbon in HWP&L in year 1 of the baseline for the revised PDM value;

b) calculating carbon in HWP&L in years 2 through 100 using the same process as for leakage, to make sure that the sum of carbon over 100 years is the same in our estimates as it is in ARB's current estimates over the project life;

Fourth, we apply the methods used to recalculate emissions reductions using these revised leakage and carbon in HWP&L figures.

When baseline or project PDM figures are missing from any of the OPDRs, we calculate the missing PDMs mathematically from other reported figures when possible, and apply the following assumptions as needed:

- The ratios of carbon in HWP&L to PDM remain the same across reporting periods.
- When the first reporting period does not equal exactly one year, the PDM in the first year is a prorated amount, reflecting what most projects with at least two reporting periods have done.

- The ratio of carbon in HWP&L to PDM is the same in both the baseline and project scenarios.

Other than the changes and assumptions described above, we repeat the methods used in the OPDRs to re-estimate emissions reduced and credits generated.

References:

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