

Opportunities, challenges and markets for forest carbon offset projects

by Catalin Ristea¹ and Thomas C. Maness²

ABSTRACT

Forest-based activities can mitigate climate change by reducing carbon sources and enhancing carbon sinks. Under various emissions-reductions programs, credits (called carbon offsets) can be issued to forestry projects that can credibly demonstrate additional and lasting reductions in CO₂ emissions. The greatest potential for forest carbon offset projects currently exists in voluntary emissions reduction programs and markets, which, however, have a negligible value in the global carbon market. Unless their relevance can be proven, forestry-based carbon offset projects will play a minor role in compliance markets. This is mainly due to concerns about the additionality, permanence, and leakage of carbon offsets generated by forestry projects.

Key words: forest carbon offset project, emissions trading program, cap and trade, carbon market

RÉSUMÉ

Les activités en milieu forestier peuvent atténuer les changements climatiques en réduisant les sources de carbone et en améliorant les réservoirs de carbone. Selon différents programmes de réduction des émissions, les crédits (dénommés compensations de carbone) peuvent être remis à des projets de foresterie qui peuvent démontrer de façon crédible des réductions supplémentaires et durables des émissions de CO₂. Le plus grand potentiel de compensation du carbone forestier se retrouve actuellement parmi les programmes et les marchés de réductions volontaires des émissions qui, cependant, ont une valeur négligeable sur le marché mondial du carbone. À moins que leur importance ne soit prouvée, les projets forestiers de compensations de carbone joueront un rôle mineur sur les marchés d'échange. Cette situation découle principalement des questions soulevées par l'accumulation, la permanence et les fuites issues des travaux de compensation réalisés en foresterie.

Mots clés : projet de compensation de carbone forestier, programme d'échange d'émission, capture et échange, marché du carbone



Catalin Ristea



Thomas C. Maness

Context

Climate change mitigation has the ultimate objective of stabilizing and reducing greenhouse gases (GHG) levels in the atmosphere, primarily by decreasing CO₂ emissions (reducing carbon sources) and, to some degree, by increasing CO₂ sequestration (enhancing carbon sinks). Forests play an important role as carbon sources when biomass is permanently or temporarily removed from the landscape, and as

carbon sinks by sequestering CO₂ from the atmosphere through photosynthesis and storing it in biomass.

Climate Mitigation Opportunities

According to the Intergovernmental Panel on Climate Change (IPCC 2007), forestry represents 12% of the total mitigation potential of global economic sectors. Forest-based activities can mitigate climate change through both reducing carbon sources and enhancing carbon sinks:

- avoided emissions from deforestation and forest degradation (e.g., fire, insects). Avoided emissions represent 50% of the global forestry mitigation potential. This option can provide the largest and most immediate carbon stock impact (IPCC 2007).
- substitution for energy intensive materials or fossil fuels. Woody biomass can be used to replace other more energy-intensive materials in the manufacturing of various products, and also to substitute the use of fossil fuels for energy production. However, the reduction in fossil fuel carbon emissions is partially offset by the release of sequestered carbon due to harvesting, other emissions resulting from harvesting and transportation, and eventual changes of the landscape from initial forested condition.

¹Project Manager, Dept. of Forest Resources Management, the University of British Columbia, 2045–2424 Main Mall, Vancouver, British Columbia V6T 1Z4. E-mail: catalin.ristea@ubc.ca

²Professor, Dept. of Forest Resources Management, the University of British Columbia, 2045–2424 Main Mall, Vancouver, British Columbia V6T 1Z4. E-mail: thomas.maness@ubc.ca

- carbon sequestration in standing forests and durable wood products. Options for carbon sequestration include afforestation (plant forests where they do not exist); reforestation (restocking of forests previously harvested or destroyed by fire/insects); maintaining or increasing carbon density at the stand level (planting, site preparation, tree improvement, fertilization, uneven-aged stand management) and the landscape level (longer forest rotations, fire management, protection against insects); and, increasing the use of durable wood products that continue to sequester the carbon for their lifespan. IPCC (2007) considers that in the long term these sink-enhancement strategies will generate the largest sustained mitigation benefit.

Carbon Accounting Challenges

The United Nations Framework Convention on Climate Change (UNFCCC) assesses climate change mitigation activities using the criteria of additionality, permanence, and leakage. These criteria present unique challenges for forest-based mitigation projects:

- **Additionality:** Proof is required that a project's mitigation effect would not have happened otherwise. For forest projects this can be difficult to demonstrate, as no credible methods currently exist to separate the effects of forest management actions from naturally occurring processes. Also, carbon baselines (against which any change in carbon stocks is measured) are difficult to determine due to the inherent uncertainty of natural ecosystem dynamics.
- **Permanence:** Forest projects cannot provide permanent carbon storage with complete certainty, since natural disturbances and future harvesting may result in unexpected and unavoidable emissions.
- **Leakage:** The beneficial impacts of a project should not be negated by other impacts that the project induces outside its boundaries. Due to the complexity of forested ecosystems, and their interdependence with the surrounding landscape, leakage is difficult to measure for forest-based carbon offset projects.

Emissions Trading and Carbon Offsets

The IPCC indicated that reducing GHG emissions will have the largest and most immediate impact on climate mitigation (IPCC 2007). Therefore, mitigation initiatives in the short term (next 2 decades) are mainly concerned with decreasing carbon sources or avoiding emissions.

One of the key climate change mitigation policy instruments is emissions trading—a market-based approach to control emissions by providing economic incentives for achieving emissions reduction. To give an example at the international level, a body (partnership of countries) sets a limit—a cap—on the emissions allowed for each “polluter”—participant country. Because of the set cap on emission limits, this is referred to as a mandatory program. The sum of the country-specific caps is reduced from year to year, thereby aiming to achieve emissions reduction over time. Countries are issued emission permits—also called emission allowances or credits—up to the specified cap. Then, countries allocate internally these allowances to their industrial operators. If regulated operators need to increase their own emission allowance (because they are unable or unwilling to reduce

their emissions as much as it is targeted), they must purchase credits from others who pollute less and have credits to spare. Essentially this is equivalent to paying a “fine” for polluting more than what is targeted. This transfer of credits is called a trade, and the system is called a cap-and-trade mandatory program.

Besides trading of unused emission allowances, regulated industrial operators are allowed to purchase credits from emission-reduction projects. These credits, often referred to as carbon offsets, are issued for projects that can credibly demonstrate reductions in CO₂ emissions compared with what would have happened without the project. Any company can propose a carbon-offsetting project and then apply to approved registrars to have it certified, thereby generating carbon offsets, which in turn can be traded. A carbon offset represents a reduction in GHG emissions, and is measured in metric tons of carbon dioxide equivalents (tCO₂e). One carbon offset represents the reduction of 1 tCO₂e. The possibility of trading emission allowances and carbon offsets essentially created the carbon market.

Mandatory Emissions Trading Programs

The *Kyoto Protocol* is a cap-and-trade emissions trading program of the UNFCCC (2009a). Signatory countries can meet their set emission-reduction targets—expressed in assigned amount units (AAUs)—primarily by reducing domestic GHG emissions of their industrial operators. In addition to meeting their targets by simply polluting less, the Kyoto Protocol offers two types of market-based mechanisms: trading unused emissions allowances, and trading carbon offsets obtained from emission-reduction projects. Essentially this means that regulated operators can meet their specified emissions reduction targets by a combination of 3 means: (1) pollute less; (2) buy unused emission allowances from other operators; (3) buy carbon offsets from registered emissions reduction projects. Three categories of carbon offsets were developed under Kyoto, each equal to 1 ton of CO₂e:

- Certified Emission Reductions (CER) are carbon offset credits generated by companies (from industrialized countries) who initiate emissions reduction projects in developing countries. Of 1509 projects registered with this program, called Clean Development Mechanism (CDM), only 3 are forestry-related projects, specifically afforestation/reforestation (UNFCCC 2009b);
- Emission Reduction Units (ERU) are carbon offset credits issued to companies from industrialized countries through a similar program as above, with the difference that the project is implemented in another industrialized country. No forestry projects are registered in this program, called Joint Implementation (JI).
- Removal Units (RMU) are carbon offset credits obtained from Land Use, Land-use Change and Forestry activities (LULUCF). This program is still under development.

Under Kyoto, only afforestation and reforestation methodologies have been approved for creating carbon offsets. According to the UNFCCC this is mainly due to potential reversibility and non-permanence of carbon stocks generated by forestry-related projects (UNFCCC 2009c).

The *European Union Emissions Trading System* (EU ETS) is the largest multi-national, emissions trading program in the world (Ellerman and Buchner 2007). It sets national emission

caps on its member states, which in turn allocate the allowances to their industrial operators. The tradable emission units (EUAs) under EU ETS are identical to Kyoto's AAUs. Like Kyoto, the EU scheme allows an operator to use carbon offset credits to comply with its obligations. Besides EUAs, operators are allowed to trade CERs and ERUs, but not RMUs. Currently, the EU does not allow carbon offsets under ETS to be obtained from sinks, so forest carbon offset projects that enhance carbon sinks are not eligible in this system.

The *Regional Greenhouse Gas Initiative* (RGGI) is a 10-state program in the US Northeast for reducing GHG emissions from the power sector. It is the first mandatory cap-and-trade emissions program in the US, and its first compliance period began January 1, 2009. Taken together, the 10 individual state programs will function as a single regional compliance market for carbon emissions. Regulated power plants buy "RGGI allowances," issued by any of the participating states, through quarterly auctions. Besides allowances, operators can use carbon offsets generated by other projects that reduce or sequester emissions, although the use of offsets is constrained to 3.3% of an operator's compliance target. The only forestry activity eligible for carbon offset credits is afforestation. To date, no forestry projects have been registered with the RGGI³.

Australia's *NSW Greenhouse Gas Reduction Scheme* (GGAS) establishes annual state-wide greenhouse gas reduction targets, and then requires electricity retailers and other parties who buy or sell electricity in NSW to meet mandatory targets. The emission units are called New South Wales Greenhouse Gas Abatement Certificates (NGACs). The only forestry activities eligible for carbon offsets in GCAS are afforestation and reforestation⁴.

Voluntary Emissions Reduction Programs

Not all countries have assumed obligations under mandatory emissions trading programs. However, many industrial operators and even individuals wish to voluntarily offset their own GHG emissions caused by industrial processes and air travel, for example. This need has created voluntary emissions reduction programs, also called voluntary carbon markets, where carbon offset credits generated by various emissions reduction projects can be bought by polluters. The voluntary market is not regulated, and there is no generally accepted standard for what constitutes a carbon offset. There are, however, emerging standardization efforts such as the Voluntary Carbon Standard (VCS), which recognizes 3 categories of forestry-based offset projects: 1) afforestation, reforestation and revegetation; 2) improved forest management; and, 3) reduced emissions from deforestation and degradation⁵. VCS has recently launched a global registry system that ensures that all carbon credits issued—Voluntary Carbon Units (VCUs)—can be tracked from issuance to retirement.

The *California Climate Action Registry* (CCAR) is a regional voluntary reporting system. Its carbon offset program, known as the Climate Action Reserve (CAR), establishes guidelines for emissions reduction projects, generating

carbon offsets credits called Climate Reserve Tons. Regarding forestry projects, CAR recognizes offset credits generated from afforestation, improved forest management, and avoided deforestation. Only 1 forest carbon offset project has been registered to date⁶. Currently, CCAR is now referring all emissions inventory reporting to its sister organization, the Climate Registry.

Canada's *Offset System* for GHG (Environment Canada 2008) is a voluntary program that recognizes afforestation, reforestation, avoided/reduced deforestation, and forest management projects to increase carbon sequestration and reduce or avoid emissions. The program is under development, and the first project applications will be ready for review in 2009.

The *Western Climate Initiative* (WCI) is an initiative of western US states and some Canadian provinces. It plans to lay the foundation for an international cap and trade program that would involve both the United States and Canada. The first phase of this plan would be implemented on January 1, 2012. Procedures are currently developed for an offset program.

Over the counter (OTC) transactions are direct sales (i.e., not through financial exchanges) of carbon offsets to organizations and consumers who want to offset emissions resulting from their own activities, such as travel. The carbon offsets (called Voluntary Emissions Reductions—VERs) are generated by companies (project developers) who initiate emissions reduction projects. Then, OTC suppliers act as intermediaries and sell the VERs to consumers (polluters). OTC suppliers are a fragmented group of for-profit and non-for-profit organizations such as the Climate Fund, Conservation Fund, Pacific Forest Trust, Terrapass, and The Nature Conservancy.

Carbon Exchanges

Some of the emission allowances and carbon offset credits generated under the programs described above can be converted to financial instruments, which then can be traded by industrial operators in specialized financial exchanges, also called carbon exchanges.

*BlueNext*⁷ and the *European Climate Exchange* (ECX)⁸ are the main European carbon exchanges for contracts on EUAs and CERs—for which, however, forestry projects are not eligible, as mentioned above. As of August 2009, the value of a metric ton of CO₂ was about CAD\$18.50, down from a 2008 year high of about CAD\$42.00.

The *Chicago Climate Exchange* (CCX)⁹ operates North America's only cap and trade system for GHG. Participant companies in the CCX make voluntary, but legally binding, commitments to meet annual GHG reduction targets. CCX currently recognizes 3 forestry-based carbon offset project categories: afforestation, durable wood products, and sustainably managed forest projects. As of August 2009, the value of a metric ton of CO₂ dropped below CAD\$0.50, down from a 2008 year high of about CAD\$7.40.

³www.rggi.org [Accessed 29 Jan 2009]

⁴www.greenhousegas.nsw.gov.au [Accessed 29 Jan 2009]

⁵www.v-c-s.org [Accessed 23 Mar 2009]

⁶www.climateregistry.org [Accessed 29 Jan 2009]

⁷www.blunext.eu [Accessed 23 Mar 2009]

⁸www.ecx.eu [Accessed 23 Mar 2009]

⁹www.chicagoclimateexchange.com [Accessed 23 Mar 2009]

Market Value

In 2008, the global carbon market was valued at CAD\$145 billion by New Carbon Finance (2009), accounting for 4.9 billion tons of CO₂e. The market share of EUAs represented 80% of the total market value, while CERs and ERUs were almost 19%. It is important to note that all of these emission allowances and offset credits, totalling 99% of the market value, are created under mandatory programs for compliance purposes. The voluntary carbon offset credits currently represent only a small fraction of the global carbon market value.

Conclusion

The greatest potential for forest carbon offset projects currently exists in voluntary programs and markets, which, however, have a negligible value in the global carbon market. Moreover, the carbon price in voluntary markets is about 1/7th of that in compliance markets, making forestry mitigation projects economically unattractive. Unless the forestry profession can prove the relevance of forestry-based carbon offset projects, they will play a very minor role in compliance markets—where only afforestation and reforestation projects are currently eligible for generating carbon offset credits. This is mainly due to concerns about the additionality, permanence, and leakage of carbon offsets generated by forestry projects.

References

- Ellerman, A.D. and B.K. Buchner.** 2007. The European Union Emissions Trading Scheme. *Review of Environmental Economics and Policy* 1(1): 66–87.
- Environment Canada.** 2008. Turning the Corner: Canada's Offset System for Greenhouse Gases [online]. Available at www.ec.gc.ca/doc/virage-corner/2008-03/526_eng.htm [Accessed 26 Jan 2009].
- IPCC.** 2007. Climate Change 2007: Fourth Assessment Report of the Intergovernmental Panel on Climate Change. Synthesis Report. S. Solomon *et al.* Eds. Cambridge University Press, NY.
- New Carbon Finance.** 2009. Carbon Markets up 84% in 2008. Press Release [online]. Available at www.newcarbonfinance.com [Accessed 23 Mar 2009].
- [UNFCCC] **United Nations Framework Convention on Climate Change.** 2009a. Kyoto Protocol [online]. Available at http://unfccc.int/kyoto_protocol/items/2830.php [Accessed 23 Mar 2009].
- _____. 2009b. Clean development mechanism [online]. Available at http://unfccc.int/kyoto_protocol/mechanisms/clean_development_mechanism/items/2718.php [Accessed 23 Mar 2009].
- _____. 2009c. Land Use, Land-Use Change and Forestry [online]. Available at http://unfccc.int/methods_and_science/lulucf/items/1084.php [Accessed 26 Jan 2009].