

Carbon Accounting Protocols for Forestry:

A Review and Comparison

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Focus of the Protocol Study

- Review existing forest sector protocols for measuring carbon stocks and flows
 - Protocols offer accounting tools for tracking carbon emissions and removals from the atmosphere
- Compare advantages and disadvantages
- Identify technical gaps
- Recommend improvements for inventorying, reporting and registering forest-related carbon stocks and flows
- Emphasize forest-based activities and processes

Forestry Protocols

- General Reporting, Forest Sector, and Forest Project Protocols [California Climate Action Registry (CAR)]
- Baseline Greenhouse Gas Emissions for Forest, Range, and Agricultural Lands in California [Winrock International. 2004]
- Voluntary Reporting of Greenhouse Gases (1605(B)) Program. Technical Guidelines. Part I: Forestry Emissions [US DOE. 2006]
- Kyoto Protocol to the United Nations Framework Convention on Climate Change [United Nations. 1998]
- Good Practice Guidance for Land Use, Land-Use Change & Forestry [Institute for Global Environmental Strategies, IPCC]
- CCX[®] Forestry Carbon Emission Offsets [Chicago Climate Exchange[®]. 2006]
- Regional Greenhouse Gas Initiative Model Rule [Regional Greenhouse Gas Initiative. 2007]

General Findings

- CO₂ is the forest sector's main greenhouse gas concern
- Forest management choices influence the amount of carbon captured and stored in forests
- Forest product mixes influence the longevity of carbon storage after tree harvest
- Forest carbon projects mitigate carbon dioxide (CO₂) emissions
- Available and proposed forest sector protocols vary by:
 - Purpose (research interests, legislated emissions targets, emissions credits, carbon trading, or other uses)
 - Ease of Use (cumbersome to flexible)
 - Implementation cost (extremely expensive to prohibitively expensive)
 - Geographic scope, scale of application, and potential applicability or reciprocity in addressing out-of-region effects and influences (i.e., leakage)

General Findings

- Use and value of forestry protocols for carbon and GHG inventories is influenced by federal and state policies for climate stabilization, regulated emissions caps, trading mechanisms, recognition of forest carbon as mitigation, and value as a traded commodity
- Reporting in the U.S. is voluntary, so federal procedures are inconsistent and unpopular
- The forest sector is disadvantaged by the complexity of inventory requirements for unbiased carbon reporting, registration, and certification
- Society's desire for accurate and certifiable greenhouse gas information may exceed our collective ability to acquire it affordably

Overview: CAR's Forest Protocols

General Reporting Protocol (GRP)

- Accounting tool for enterprise-wide reporting of **non-biological** carbon sources and sinks
- Recorded and **certified annually**
- At least 95% of the total (direct and indirect) emissions must be reported
- Major categories of required non-biological emissions reporting are:
 - Indirect emissions: electricity use; imported steam, and district heating, or cooling (and electricity from a co-generation plant)
 - Direct emissions: mobile combustion; stationary combustion; manufacturing processes; fugitive emissions

Overview: CAR's Forest Protocols

Forest Sector Protocol

- Addresses a public or private organization's entity-wide inventory and GHG emissions from **biological** sources (living and dead)
 - Certified over five-year cycles, not annually

Forest Project Protocol

- Concentrates on **biological** emissions from a specific forest project site with a planned set of management activities
 - Cannot be used without applying Forest Sector protocol

Project Eligibility

- Forest Project protocol allows three forest project types:
 - Conservation-Based Forest Management projects: forest harvesting and regeneration consistent with CFPR Maximum Sustained Production “Option C” Rules
 - Reforestation projects: restore tree cover to forestland that has been treeless for at least 10 years
 - Conservation projects: prevent the conversion of native forests to non-forest use

Forest Carbon Pool Estimation

- Bonafide carbon inventory requires:
 - Minimum confidence standard
 - Sampling methodology
 - Inventory plots no older than 10 years
 - Stratification system
 - Description of analytical methods used to translate field measurements into volume/biomass
- Requires a complete inventory and direct sampling with use of approved models; pre-approved biomass models include Brown et al. (April 2004), CACTOS, CRYPTOS, FVS, SPS, VFP, FREIGHTS, and CRYPTOS emulator
- Carbon pools:
 - Required: live and dead tree biomass
 - Optional (i.e., not certified): wood products, soil, litter and duff, and herbaceous understory

Forest Carbon Pool Estimation

- Direct inventory using approved sampling methodology
- Permanent plots must be monumented for auditing
- Annual stock change accounting for carbon gains or losses (carbon fate derived through reinventory)
- Must demonstrate GHG benefits in excess of those derived from baseline conditions
- Methodology for estimating carbon that persists in wood products and decays over time

Forest Carbon Pool Estimation

- Annual estimate for the wood products pool must be based on the current or most recent harvest volume reported to the Board of Equalization (BOE) (board feet or cubic feet volume, by species, delivered to the point of sale)
- Methodology includes factors for conversion to total carbon weight, and estimates 60% mill efficiency (the percentage of delivered log volume that is converted into wood product volume)
- Provides estimated carbon half-lives for 11 wood product classes, ranging from 6 to 100 years
- Non-wood forest products and landfill waste are not tracked
- The value of tree removals for biomass energy is not considered (although "it will be considered in the Registry industry-specific protocol for the power sector")

Carbon Baseline

- Point from which net change in carbon stocks is measured
- Project-Level: required long-term projection of forest management
 - Project proponent determines length of baseline
- Forest Sector: optional 100-year entity-wide projection of forest carbon stocks

Carbon Baseline

- Baseline characterization is a long-term projection of forest management practices or activities (beginning as early as 1990) that would have or have not occurred in the absence of the forest project
- Baseline must assume conditions constrained by mandatory forest management regulations and land use statutes that exist during the baseline period
- Baselines reflect carbon benefits under the Maximum Sustained Production "Option C" Rules of the California FPR

Carbon Baseline

- Commercial timber operations must support their assumed baseline by Sustained Yield Plans (SYPs), Option A Projections, Non-industrial Timber Management Plans (NTMPs), Programmatic Timber Environmental Impact Reports (PTEIRs), California Forest Improvement Plans (CFIP), or Coordinated Resource Management Plans (CRMPs)
- Baseline needs to be adjusted whenever the cumulative effect of changes to total carbon stocks is greater than $\pm 10\%$
- Forest Projects must demonstrate that reported activities are in addition to or exceed the project baseline characterization—the additionality requirement

Additionality

- Amount of sequestration that is additional to that which would have occurred without the project
- Calculated by subtracting baseline carbon from project carbon

Geographic Scale for Reporting

- Forest Project: certification limited to CA
- Forest Sector: option to report emissions nationwide or CA only
- Non-biological emissions will be certified at both levels; biological stocks/emissions can be reported at both levels, but are certified for CA only

Carbon Fate after Natural Disturbances

- Carbon emissions from fire, disease, and pests are assumed to be beyond the control of the entity, and not the result of activity-shifting leakage under “no management”
- Emissions from natural disturbances are deducted from annual carbon credits

Leakage

- Impact of a project on carbon stocks and flows outside the project boundaries
- Narrowly quantified, with emphasis on emissions interrelated to activities rather than reductions, and emphasis on carbon accounting within the entity rather than external influences
- Leakage reporting is not required, except “on-site activity-shifting” leakage; market leakage estimation for forest products is “encouraged”
- Non-biological emissions of wood harvesting and processing must be recorded as part of entity emissions under the General Reporting Protocol and must be flagged as upstream and downstream effects associated with the project activity

Accuracy

- Forest Project: requires sampling error less than 20% of the mean for the estimate at 90% confidence limit for acceptance; if estimate is within 5%, entity receives 100% of reported carbon credit, credit deductions are scaled for lower confidence levels, down to 0% credit for estimate with 20% of mean
- Forest Sector: estimate must be within 20% of the mean
- GHG inventories for non-biological carbon inventories must be within the materiality threshold of 5% of the certifier's estimate of total emissions

Verification of Protocol

- Contributors include authors, other contributors, and expert reviewers from numerous public, non-profit, and private organizations; agency and public review was sought
- Apparently not formally peer reviewed
- Over time, the Registry expects to refine and improve emissions reporting procedures and opportunities

Transparency of Analysis

- Inventories are subject to public reporting
- Alternative sampling or modeling relationships are subject to approval by Registry

Permanence

- Mandatory perpetual easement required

California CAR's Forest Protocols

Strengths

- Voluntary recording system for greenhouse gas (GHG) emissions established by California statute
- Reports may be used for future participation in private or government-sponsored trading programs
- Provide a system for monitoring forest carbon stocks and flows; distinguishes between biological (biomass) versus non-biological (e.g., fossil fuel combustion) sources
- Taken together, the CCAR protocols attempt a vertically integrated inventory of carbon stocks and flows for forest entities

California CAR's Forest Protocols

Weaknesses

- Procedures are time-consuming and expensive
- Forest Projects must provide “environmental co-benefits”
 - Potentially meritorious projects without recognized “eco-benefits” cannot be registered—a cross-purpose condition that focuses on non-carbon inventory functions and values
- Protocols do not provide incentives to conduct active forest management to maximize carbon sequestration over time
 - “No management” is an acceptable forest management option

California CAR's Forest Protocols

Weaknesses

- Under the additionality requirement, the amount of carbon sequestered must be additional to what would have occurred without the project
- No credit might be provided for carbon stocks and flows produced under mandatory requirements of applicable regulations, e.g., CFPRs
- If normal forest management practices are the baseline, the landowner must prove GHG benefits beyond those that would accrue under Maximum Sustained Production
"Option C" Rules of the California FPR
 - Potential for subjective interpretations of the additionality condition should be eliminated

California CAR's Forest Protocols

Weaknesses

- Forest Sector protocol only tracks decreases in carbon stocks (i.e., emissions) over time, not atmospheric carbon reductions; the entity must follow Forest Project protocol guidance to qualify for and calculate GHG reductions
- Forest Projects must be monitored annually, by an approved certifier
- Inventory of carbon stored in wood products is optional
 - Ownership of the carbon associated with wood products is considered “beyond the scope of the Registry”
 - An entity's decisions to send forest products to the wood products carbon storage pool are not rewarded

California CAR's Forest Protocols

Weaknesses

- Accounting for carbon leakage is incomplete and inconsistent
- Three types of leakage—“activity-shifting leakage,” “market leakage,” and “upstream/downstream effects”
 - Forest Project Protocol requires all but the market leakage to be “assessed” annually, but only the on-site activity-shifting leakage to be quantified
 - On-site upstream/downstream effects must be quantified under the forest Sector (entity) Protocol
 - Non-biological emissions of wood products must be flagged under GRP as upstream/downstream effects associated with the project activity
- Focus on leakage is aimed at quantifying GHG emissions rather than the reductions possible through forest product substitutions and offsets

California CAR's Forest Protocols

Weaknesses

- The minimum forest size for assessment is 100 acres
 - Multiple entities may not aggregate ownerships
- Qualifying forests must be located in California, be placed under perpetual easement dedicated to permanent forest use, and be subject to natural forest management (i.e., “promote and maintain native forests that are comprised of multiple ages and mixed native species in the forest overstory and understory”)
- Re: permanence, the Registry's requirement for perpetual easements is an economic disincentive to industrial forest landowners

How Can It Be Made Better?

- Modify the protocols to use rules similar to other global registries
 - The Registry creates a potential impediment for interstate carbon trading and addressing leakages across state (and international) lines
- Provide more flexibility for acceptable carbon inventory procedures, and seek to reduce inventory and monitoring expenses such that they can be more in line with the value of carbon
- Incorporate a penalty system for catastrophic CO₂ emissions generated by avoidable wildfire and natural disasters that are predisposed by non-management of forests

How Can It Be Made Better?

- Require tracking of all leakage from Forest Projects, including off-site and out-of-state market leakage
- Improve and expand estimates of carbon fates of forest products, including decomposition rates of wood waste in landfills
- Track harvest volume (i.e., carbon) that does not become forest product, e.g., biofuels

How Can It Be Made Better?

- Allow carbon sequestered in products to be "certified"; the accuracy of estimates is strictly a policy decision
- Forest Sector Protocol says, "the Registry recognizes other direct carbon pools as optional reporting [i.e., wood products]
 - While optional carbon pools will not be certified, they may also be reported to the Registry...The Registry may certify these pools in the future as the policies, science, and/or efficient measurement strategies are developed..."
- Product carbon sequestration cannot be assumed to "receive appropriate consideration" by the state under future regulatory regimes

How Can It Be Made Better?

- The transparency of GHG reporting is both strength and a weakness
- The strength lies in the credibility that publicly available data adds to certification process
- The weakness is that entities may be reluctant to engage in the potential public disclosure of their organization's inventory value and position, and the economic vulnerabilities that could ensue

Proposed Improvements to Carbon Accounting Procedures

- Incorporate a comprehensive, vertically integrated carbon life cycle model
- Incorporate detailed accounting of carbon pools and flux rates for managed forests (e.g., decay rates by species and region)
- Strive for consistency and reciprocity among forestry protocols (e.g., setting carbon baselines, eligibility of actively managed forests, monitoring methods, verification procedures, and types of carbon pools (e.g., harvested wood products) that can be registered)
 - Multiple protocols and registries provide impediments to address “leakage” when monitoring GHGs or trading credits across state and international borders

Proposed Improvements to Carbon Accounting Procedures

- Promote opportunities to export emission allowances or emission reduction credits outside the U.S.
- Acknowledge and reward forest owners for forest practices that reduce carbon emissions and increase sequestration
- Strive to overcome scientific challenges for developing baselines for forest management projects and for harvested wood products

Proposed Improvements to Carbon Accounting Procedures

- Seek alternatives to perpetual easements for assuring the permanence of sequestration benefits
- Develop cost-effective, transparent, accurate, and precise monitoring methods
- Conduct technical and logistical discussions with forest sector stakeholders to develop fair and equitable accounting and crediting systems that acknowledge efforts to reduce GHG emissions

Next Steps

- ARB adopted the CCAR forestry protocols on Oct. 25th
- ARB Resolution 07-44 directs staff to "initiate a stakeholder process working with government agencies, private and commercial land owners, and other interested parties, to develop additional approaches for forest carbon accounting"
- Amended resolution directs ARB staff to report to ARB by June 2008 with draft revised protocols
- Western Climate Initiative aims to have a cap-and-trade system in place by August 2008; wants to partner with European Union's and RGGI's trading systems
- Present opportunity to promote expert discussions on improving the forestry protocols