In Search of Standards for Forest Carbon Offset Projects in BC

A Review of Georgian and Californian State Standards

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Contents

Abstract

Forests represent both, one of the strongest drivers of, and solutions to, the rapid shift in the earth's climate. Integrating the use of forests as a cost effective solution into emerging global carbon markets however has proven extremely difficult. The incentive for companies to utilize carbon credits as a means to offset emissions is heavily dependent upon the credibility of the project that created it. The difficulty proving the credibility of forest projects is largely due to the inherent variation associated with forest environments. British Columbia's pine beetle epidemic provides an extreme example of just how quickly vast carbon sinks can suddenly become sources. As such, the creation of standards to ensure the security of carbon sequestered by forest projects has proven to be instrumental in encouraging their acceptance into the market.

British Columbia has recognized that its forests play an integral role in its contribution to the global carbon cycle. As a result, heavy consideration is being made as to how this resource may be integrated as a source of carbon offsets for its own Cap-and-Trade market. This will mean establishing specific standards for forest projects in a BC context.

This report reviews two regional standards from the states of Georgia and California, which could be applied as templates for a set of BC specific protocols for forest carbon sequestration projects. It is intended that through a comparison and analysis of these standards that potential problems faced in applying similar standards here will be identified.

1. Introduction

There has been increasingly rapid growth in interest among governments and the economic community over the potential for emerging Carbon markets to mitigate climate change, including here in British Columbia. Carbon markets do undoubtedly offer themselves as a strong part of the solution to this global problem. However it is imperative that uniform certifiable standards are in place to ensure the credibility of the projects associated with these markets. Attaining credibility means that standards regulating the development of sequestration projects need to be appropriate for the sector and region in which the project is located. Without such congruency, credibility for compliant projects under a given standard is likely to be compromised. Elements that need to be addressed to ensure credibility center around leakage, completeness, relevance or a number of other principles highlighted under benchmark standards such as the UNFCCC CDM standard and the ISO 14064.2 standard.

Degradation of forests due to climate change and mismanagement has caused forests to become the largest source of global CO2 emissions (Kollmuss et al. 2008). In spite of this, forestry projects have constituted only a small fraction of the voluntary carbon offset market. The deficit is even more pronounced under compliance markets such as the EUX, where only one such project had been approved under CDM as of 2008 (Merger 2008).

To explore how forest projects could be credibly implemented in future North American markets, two regionally based registries have been founded in the U.S. These are situated in the states of California and Georgia. Along with these registries, sector specific protocols have been developed to help guarantee any reported emissions reductions, including those attained through forest projects. Given the enormous complexity in governing policy associated with creating acceptable project standards, it is hoped that voluntary based programs such as these will serve to plug the leaks in future potential programs and markets.

1.1 Objectives

This review will be an investigation into how the states of Georgia and California have approached some of the key issues confronting the reliable implementation of project level forest carbon sequestration standards. The analysis will then be used to determine whether either of these standards will provide a suitable template for a set of forest project standards for BC. To accomplish this, the paper will:

- Compare the voluntary project level standards created for Georgia and California;
- Analyze the standards using the criteria laid out by the CSA-ISO 14062.2 standard for the development of project level standards GHG reduction removals or enhancements; and
- Identify implications for BC forest policy development in this area.

1.2 Carbon market overview

To get a sense of where offsets such as those certified by the forest project standards examined here fit in, a brief look at some fundamentals key in understanding carbon markets will be reviewed.

1.2.1 Cap-and-Trade markets

In a Cap-and-Trade market, government entities set a cap for emissions on sectors which it has identified as major emitters (Bonnie *et al*. 2002). This cap is measured in equivalent tonnes of CO_2 delineated as CO2-e[1]. The cap is then broken down into carbon credits equivalent to one tonne CO_2-e. These credits are then allotted to emitters based on their individual reported emissions and become known as allowance credits (Kollmuss et al. 2008). For each emissions reporting year, emitters then surrender these allowance credits. If due to some emissions reduction project, say the transition to a lower emitting energy source in a production plant, a company has surplus credits at the end of the reporting year, it may then sell those credits to an emitter which has surpassed its own allowed credits. In BC the idea is that over a given time period the number of allowed credits will be gradually reduced, guiding companies through a market-based mechanism to look for ways to decrease emissions.

[1] 1 tonne of Carbon produces 3.667 tonnes CO_2-e. Other green house gasses are converted into this metric based on their 100year global warming potential (The Carbon Trust 2007).

For some emitters, reducing emissions may be extremely costly. This is where carbon credits such as those provided by forest projects fit in to the Cap-and-Trade market system. Such offset projects provide additional credits for these "heavy" emitters to offset their own emissions in a cost effective manner. Most compliance markets only allow a certain portion of these credits to be included in an emitter's reduction portfolio. The reason for this is largely because they, unlike allowances, are not a finite source of credits and can therefore greatly influence the price of allowance credits (Kollmuss et al. 2008). Secondly, these credits must be equivalent to those provided by allowances in order to assure that real reductions are being made. As such, only offsets that can prove additionality[2] through a credible set of standards are acceptable.

1.2.2 Voluntary carbon markets

Voluntary markets are those which exist outside of established compliance markets, and provide credits for emitters not legally required to comply with emissions reductions targets set by governing bodies (Kollmuss et al. 2008). These markets do not necessarily provide the same guarantees of equivalence in all reduction credits required under compliance markets. Nevertheless they offer a means for unregulated sectors to reduce emissions that would not have occurred in the absence of such markets (Kollmuss et al. 2008). Also as is the case with the Georgia and California carbon registries, these markets provide a proving ground for the creation of reliable standards that might be implemented under future compliance markets.

1.2.3 British Columbia

Here in British Columbia under the directive of the newly formed Western Climate Initiative[3] and the Crown Corporation the Pacific Carbon Trust[4], the province plans to implement several measures to reduce emissions. One such measure includes the instatement of a regional Cap-and-Trade market that currently under development by the Western Climate Initiative. This market will require stringent standards on registered projects to ensure real results. Therefore

[2] Additionality: Refers to the emissions sequestered over and above what would have been sequestered under non-market circumstances (Kollmuss et al. 2008).
[3] The Western Climate initiative is a coalition of four provinces and seven states, that have come together to create a market based cap-and-trade system (Western Climate Initiative).
[4] The Pacific Carbon Trust is a newly formed BC Crown Corporation mandated with providing credible carbon offsets for the public sector in BC (Pacific Carbon Trust).

the performance of regional project level standards like those established in Georgia and California, will be scrutinized closely. Such standards will provide invaluable data on how to best address the wide range of potential problems accompanying the inclusion of forest projects as applicable providers of offset credits in the Carbon economy.

2. Description of Standards Reviewed

2.1 The California Climate Action Registry – Forest Project Protocol (CCAR-FPP)

The California Climate Action Registry (the Registry) was created to be used by companies that are interested in reporting their GHG information; the primary goal of this being to allow private entities to publish their actions undertaken to prevent climate change. As a means of developing reliable carbon credits to offset emissions for companies registered, several protocols guiding the development of projects to do so have been created. The Forest Project Protocol is one of these.

2.2 The Georgia Carbon Sequestration Registry (GCSR)

The GCSR provides a comprehensive overview of the proposed methodologies, protocols, and mechanics to be applied in the creation of forest projects. The program has four primary goals:

1. Encourage voluntary efforts to mitigate and reduce GHG emissions.
2. Provide new economic opportunities for Georgians.
3. Provide a legitimate, legal record of carbon sequestration.
4. Recognize registry participants' commitment to environmental stewardship.

2.3 CSA-ISO 14064.2

The ISO 14064 family of standards is an internationally recognized set of guidelines for the quantification, monitoring, reporting and verification of GHG emissions and or removals. It is made up of three distinct parts pertaining to these actions at various levels of governance. Applicable here, the ISO 14064.2 standard, focuses on project based GHG emissions and or removals. It broadly outlines principles designed to enhance the credibility and consistency of

project level GHG management strategies, and provides a professionally recognized backbone for the creation of registration and reporting initiatives.

3. Comparison of CCAR and GCSR Regional Standards

The following will demonstrate that while these regions have adopted many of the same strategies to achieve similar objectives, they employ greatly differing degrees of stringency and specificity in nearly all areas. The comparison will focus on several areas which have been noted among the international community as points of contention when judging the credibility of offset projects. These areas are: project eligibility; baseline setting and additionality; modeling; leakage; quantification; monitoring and reporting; and permanence.

3.1 Eligible Projects

Maintaining equivalency in the carbon credits created by projects means that standards must clearly specify the projects to which they are applicable. Narrowing the scope of projects which may be registered, helps ensure that standards are comprehensive, and cover any potential gaps which could undermine a project's credibility. A focused set of standards also streamlines the development of projects by proponents[5], as well as the processes of auditing and monitoring for project verifiers[6].

3.1.1 CCAR

Under the CCAR all projects must adhere to a project implementation agreement which states the land owner's obligations for the project duration, as well as rights and consequences for non-compliance. Obligations include but are not limited to the requirement to use only native species as well as limitations on project boundaries. This applies to the following eligible project types:

- Reforestation;
- Improved forest management;
- and Avoided conversion.

[5] A proponent is anyone who creates and submits a carbon sequestration project.
[6] A project verifier is generally a third party entity who confirms reported emissions and ensures that the standards for a given project have been met before allowing registration.

To aid potential proponents in determining eligibility, qualifiers to prove that a project falls under one of the aforementioned project types are explicitly described.

3.2.2 GCSR

The GCSR forest project standards apply to the following eligible project types:

- Afforestation projects
- Forest management projects

These are further divided into two categories restricted and unrestricted. Restricted projects do not imply that they are restricted from eligibility, but instead are those projects which are shown to provide long term protection for sequestration. This might include municipal forest projects or conservation easements. All projects must be reviewed by an RPF prior to registry.

3.2 Baseline setting and Additionality

Baseline setting and Additionality are essential to the credibility of any GHG offset project, and consequently are two of the most controversial points in the debate over the carbon offsets in cap-and-trade markets. Baseline refers to the normal or "business-as-usual" management regime that is employed in the absence the proposed project. Additionality refers to the sequestration of carbon which occurs in addition to the defined baseline (Kollmuss et al. 2008). The regional standards compared in this paper take substantially differing approaches to regulating these two characteristics.

3.2.1 CCAR

Under the directive of the CCAR, baseline establishment is given fairly strict guidelines. These guidelines include: the establishment of 100 year post project initiation stand stocking models; proof of compliance with local land use legislation and forest practice rules; and alternative business-as-usual projects must be shown to be physically possible and financially feasible under the current conditions. The project owner must sufficiently demonstrate that these requirements are satisfied through documentation where necessary (for example financial analysis of baseline activities must be made available along with examples of similar activities in areas similar to that of the project).

3.2.2 GCSR

The GCSR utilizes much less prescriptive means to try and ensure additionality above what they deem a credible baseline. It simply asks for all acceptable forest projects that the baseline date be 1990 or later. For all projects initiated prior to the present date the estimated amount of carbon storage in all pools must be reported to the registry. Few details as to the particulars or required proof to accredit said reductions are included under the protocol.

3.3 Leakage and Identification of Sources and Sinks

Leakage, or the extent to which a project shifts the release of emissions to other areas, goes hand in hand with additionality. Two types of leakage exist, internal and external (Canadian Standards Association 2006). If for instance a conservation project led to increased harvesting somewhere else on the project proponents land base to compensate for lost timber production, this would constitute a form of internal project leakage. External leakage would be exemplified if this project meant that other forest owners had to increase their harvest volumes to meet the drop in supply caused by the project. In any case leakage must be accounted for in order to accurately calculate the additionality for which the proponent will gain credit for (Forestry Journal 2008).

3.3.1 CCAR

Specific contingencies are provided, along with a project appropriate decision tree, to determine whether sources of leakage exist and where they might be. Sources of leakage covered range from shifted land usage and loss of cropland, to emissions released in the process of silviculture treatment.

3.3.2 GCSR

Aside from requirements to allow random checks by verifiers, have project approval by a registered forester, and the request that participants report in “good faith”, there are no specific directives to account for, or aid in the identification of sources of leakage.

3.4 Modeling

Modeling of carbon stocks may be necessary for carbon pools where reliable inventory data is unavailable, or very difficult to attain. As well, the process is essential to determine how carbon will be accumulated by the project over time, in order to provide buyers with an idea of how the project will perform. It is imperative that both buyers of potential credits and project proponents be aware of the accuracy of this data, as it will have a major effect on the quality and value of the credit registered. The highly variable nature of forest ecosystems, both on a temporal and spatial scale, poses major issues in this regard (Forestry Journal 2008).

3.4.1 CCAR

Under the CCAR system there are seven approved computer models which are all based on empirical data. Any use of these requires that careful record be kept of any and all assumptions and/or constraints used in the model. Along with this list of models is a set of approved equations for calculating biomass in various pools from forest inventory data. Other models/equations may be used by a proponent however these must be proved to the verifier of the project, to adhere to an extensive list of outlined criteria.

3.4.2 GCSR

Calculations are provided which allow for calculation of carbon stocks in two situations: timberlands which have reliable forest inventory; and those that do not. For those that do not, a registered professional forester must determine, to the best of his/her ability, several parameters to be entered for calculation. No required protocols for computer modeling are available, nor is there mention of plans for the development of any in future revisions.

3.5 Quantification

In order to maintain confidence in the quality of offsets over the life of the project, all relevant sources and sinks must be properly quantified and reported on a regular basis. Insurance that reductions are not overestimated is dependent upon conservative measurements. This is especially the case where values employed in quantifying emissions or reductions, are the result of estimations (Canadian Standards Association 2006).

3.5.1 CCAR

Standards for acceptable quantification and conservativeness are outlined in detail for the following primary and secondary sources and sinks:

- Primary
    - Living biomass
    - Onsite Dead biomass
    - Offsite Dead biomass (wood products)
    - Soil
- Secondary
    - Vehicle/Equipment operation
    - Maintenance activities
    - Harvesting
    - Wood products transport

To aid in the calculation of dead biomass, tables and equations are provided to calculate the storage of carbon in wood products over time up to 100 years post harvest.

3.5.2 GCSR

Standards for the quantification of the following primary sources and sinks are provided by the GCSR:

- Primary
    - Aboveground living biomass
    - Belowground living biomass (optional)
    - Offsite Dead biomass (wood products)
    - Soil (optional)

The details guiding specifics behind the quantification of these pools, aside from provided equations for biomass – carbon conversion, is limited and left largely to the discretion of the overseeing forester.

3.6 Monitoring and Reporting

To keep track of changes in the state of a given project, periodic reporting is a necessity. This is especially the case where the commodity is something as intangible as Carbon. The task is paramount for forest projects, as disturbances either human or naturally induced causing

decreases in carbon stocks are inevitable. Above all the report filed needs to be detailed enough such that verifiers of the project, and potential buyers of the credits it creates, are able to deem whether a project is living up to its submitted projections.

The ability to accurately validate and measure the degree of transparency a project has, is dependent upon how well quantified carbon flows are tracked. Transparency, as it applies to this process, relies upon specific explanation of any assumptions involved in the monitoring and quantification process and the provision of any and all data used to calculate any reported reduction (Canadian Standards Association 2006).

3.6.1 CCAR

For any forest project under the CCAR, the project proponent must have all biological sources verified by an RPF and report all pools including any leakage on an annual basis. Immediate reporting of any disturbance which has altered pools significantly must be done as soon as reasonably possible once observed. All reporting is facilitated by an online reporting center. As further incentive to ensure the program is not abused, a penalty scheme is currently under development to deal with non-compliance during the reporting process.

3.6.2 GCSR

The GCSR takes a very similar approach to that of the CCAR. In order to remain a registered project, the proponent must report all identified relevant pools annually. This is to be done through an established registry web site. A report of all pools must also be filed in the event of any significant changes to pools due to harvest or natural disturbance immediately (though no penalties aside from temporary removal from the registry are mentioned).

3.7 Permanence

Permanence is the degree to which an offset project is able to guarantee the longevity of sequestered carbon stocks (Forestry Journal 2008). There are several opponents to the inclusion of forest carbon offsets in the market setting due to the fact that no matter how long lived the tree, the carbon stored will inevitably be released. In spite of this, recognition that

forests play an important role even as a stop gap measure to mitigate climate change, mean that some standard for permanence must be in place to give weight to credits created by such projects (Forestry Journal 2008).

3.7.1 CCAR

Currently all projects as a requirement must be planned for 100 years. As further insurance for this, the project must also contain reserve areas sufficiently similar to the project area to replace stands within the project area which may become damaged or degraded due to any number of causes.

3.7.2 GCSR

No protocols requiring demonstration of permanence for any specified length of time exist for this standard.

4. Analysis

Having briefly demonstrated how these two protocols satisfy the long list of requirements to ensure the credibility of the offset projects they register, we can now judge to what extent they satisfy these requirements. The process will provide an opportunity to look at the problems and implications such regional standards may face in a British Columbia context.

The overall comprehensiveness of the GCSR and CCAR standards will be judged based on a set of criteria augmented from the ISO 14064.2 principles for project level standards. These principles are:

- *Relevance;*
- *Completeness;*
- *Consistency;*
- *Accuracy and conservativeness;*
- *Transparency and;*
- *Permanence*

Permanence is not an explicit principle under the CSA-ISO standards; however it is included here due to concerns expressed by several environmental non-government organizations (ENGO's) that forests do not constitute a permanent carbon sink.

For each criterion, explanation of how it should be applied to the creation of forest project protocol will be provided before using it to analyze the standards reviewed here.

4.1 Relevance

Relevance applies to the appropriate selection of the following project elements: sinks and sources; baseline scenarios; procedures for quantification; and procedures for monitoring. Judgment on whether the principle of relevance has been satisfied, is made by assessing the degree of influence which a given procedure or choice of element will have on decision making throughout the project process. Such decisions might include deciding whether offsets are additional to that of a chosen baseline. To simplify this process, it has been suggested that reporting thresholds be set in order to make determining whether a source is relevant easier and cheaper for proponents. It is noted, while comprehensiveness is necessary to maintain credibility, that choice of elements to be used in a project can to a large extent determine the overall cost of GHG projects.

The GCSR falls short of meeting the requirements to satisfy the relevance principle when considering procedures for the selection of relevant sources and sinks. It provides little to no guidance on the identification of secondary sources of emissions. Secondary sources may include emissions resulting from actions such as stand tending activities or cropland displacement. Potential leakage as a result of this omission makes the credits produced under this standard questionable.

The CCAR goes to much greater lengths to ensure this principle is satisfied. For example, it has addressed the issue of identifying relevant secondary sources by creating a decision tree for each eligible project type, which helps proponents identify such sources. Corollary to this risk assessment are assigned values for aid in quantifying the size of these sources. An example of

the values provided, is the projected magnitude of potential crop displacement resulting from reforestation projects.[7]

While provisions like this one add to the credibility of projects which use the CCAR standard, there are still notable weaknesses associated with the methodology. Illustrated in the assumptions for this part of the protocol, is the wide regional variability for such values like crop displacement (Pacific carbon trust 2009). It should be noted that this downfall only applies to the protocols for reforestation projects however.

4.2 Completeness

Completeness relates to the assurance that all selected relevant sources and sinks contain enough detail when reported, so that they may be reasonably compared to selected baseline scenarios. Assurance depends on the thoroughness and accuracy of any models used to create estimations, conversion factors, as well as the appropriate use of professional guidance when needed to apply and interpret these models.

Assurance of completeness in sequestration projects will be only marginally possible under the GCSR. It simply provides highly simplified suggested equations for converting reliable inventories to tons of carbon yet makes no contingency for long run modeling. This simplification creates significant speculation in the comparison of reported offsets against a credible baseline scenario.

While the CCAR does provide superior guidance to that of the GCSR in attaining completeness, there is some concern over the lack of long term plans for improvement in this area. The CCAR states that cost may be used by proponents as a justification for not undertaking more detailed inventories of certain carbon pools such as decaying organic matter (Gero 2009). This in turn may discourage the innovation necessary to improve current tools used to estimate difficult to measure pools.

[7] CCAR page 12

4.3 Consistency

For a set of standards to prove consistency, uniform procedures, units, assumptions, and expert judgment must be applied to all projects and baseline scenarios. The CSA-ISO standard expresses this should not limit proponents and standard setters from employing more accurate procedures, technology, or methods when they become available.

The project protocols reviewed here on the surface do maintain high standards of consistency. This is achieved in both cases by providing detailed descriptions of what constitutes an eligible forest project, thereby ensuring that the standards listed will leave minimal openings for oversight caused by subjective judgment from project proponents.

Part of the CCAR's approach to ensuring consistency among accepted projects and baselines is known as the "Performance-based approach". This approach uses a predetermined thresholds for determining whether a specific proposed baseline is realistic and acceptable for the given project type (Gero 2009). Though this involves some subjectivity on the part of standard setters, it ensures that this subjectivity is uniform among projects.

The GCSR displays some significant gaps in maintaining consistent standards for all registered projects. The primary gap originates from the varied requirements for the reporting of carbon pools. Listed are all reportable eligible carbon pools. However three of these are stated as optional in the reporting process. These pools are: soil organic matter, wood products, and belowground biomass. It could be argued that given the difficulty in measuring the contribution of these sources accurately that their inclusion is irrelevant. Nevertheless these sources can constitute large contributions to emissions as result of altered forest management practices, and conservative estimates can go along ways towards balancing out inaccuracies.

One of the most important places where it is imperative that consistency be applied is in the establishment of project start dates. It comes as no surprise that the further back the claim of an initiated start date the more difficult it becomes for the verifier to confirm the credibility of a project, an issue inherent in the GCSR protocols. This results from the fact that it allows the registration of projects initiated as far back as 1990. In an attempt to mitigate problems in

associated with verification the CCAR has instated the requirement that any project must be registered with in six months after the start of the project.

4.4 Transparency

For any proposed or registered carbon sequestration to be and remain credible, there must be complete project transparency. Transparency is the degree to which information is reported in a truthful, unbiased, clear and auditable manner. To achieve it, proponents need to be directed by standards to record, analyze, and compile information in such a way that verifiers, consumers, and regulators can sufficiently assess and trust any reported emissions reductions.

The GCSR leaves room for variation in the transparency of the projects it registers. Variation is namely due to the lack of requirements to report secondary sources and external influences which may alter decisions of project verifiers. Furthermore the protocol does not clearly reference the source the background material used to create standard values, such as the conversion factor for determining belowground living biomass.

The GCSR otherwise provides a comprehensive list of required information that is intended to aid in satisfying the principle of transparency. This information is updated on an annual basis and made publicly available on GCSR website.

Contrary to the GCSR, a trademark of the CCAR has been and continues to be strong adherence to the fundamentals of transparency. To help would be purchasers of the credits the registry provides an intricate tracking system has been established. The System provides serial numbers for every verified ton so that purchasers may trace any and all information about how that CRT was calculated and registered (Gero 2009). The serial number, and information associated with it, may be accessed along with all project information on the registry's web-site.

4.5 Accuracy and Conservativeness

Accuracy in the context as a principle for guiding forest projects means the elimination of bias in estimations of emissions, and the description of uncertainties where they might exist. This definition is meant to acknowledge that for most forest carbon sequestration projects, a fine degree of accuracy is unattainable due to the hypothetical nature of baselines (Canadian

Standards Association 2006). Conservativeness is to act as a balance between the accurate measurement/estimation of emissions and ensuring the credibility of reported reductions.

Conservativeness is to be applied when highly uncertain data, and/or parameters, are relied upon to quantify emissions or reductions that result from a given forest project. Conservativeness means: using appropriate technology where possible and feasible; making conservative assumptions, so that underestimation of reductions is more likely than overestimation; and balancing relevance, cost effectiveness, and accuracy when choosing between the use of empirical data or estimations (Gero 2009).

The CCAR's standards highlight the necessity of conservativeness repeatedly, while GCSR has made minimal efforts to direct proponents on the appropriate means to ensure the satisfaction of this principle. The GCSR in fact removes incentive for attaining real accuracy and conservativeness by waiving its own credibility under the additional terms and conditions section (Section 2.10). Real steps towards achieving conservativeness are demonstrated by the CCAR's guidance on how to insure permanence.

4.6 Permanence

Permanence is not directly addressed in the CSA-ISO principles however the permanence of sequestered carbon has been, as mentioned in the standard comparison for this element above, one of the most pertinent points of contention over global acceptance of forestry based sequestration projects. Therefore it was felt some analysis of how well the GCSR and CCAR have addressed this issue was necessary as part of a complete review.

The President of the CCAR asserts that ensuring permanence is possible for forest projects if reserves are established to make up any reversals[8]. This caveat, as already mentioned, is included as a requirement in all projects which the CCAR registers. To bolster the assurance that credits are permanent, on top of reserve areas all credits must be proven secure for 100 years.

[8] Reversal: A reversal is any loss of stored reported emissions which might occur due to any number of human induced or natural causes (CCAR 2008).

Even with the directives employed by the CCAR, the argument that forests only provide a quick fix is still left wide open. First, there is no means by which one can reasonably assess what constitutes a reasonable size reserve to accommodate potential reversals (Pacific Forest Trust 2008). One suggested remedy to this problem has been to create a base requirement for reserve areas that must be satisfied regardless of assessed risk for reversal. In doing so, some subjectivity in this area will be eliminated (Pacific Forest Trust 2008). As for the 100 year requirement, this essentially only prolongs the inevitable re-release of stored carbon.

Despite the shortcomings of the CCAR in addressing permanence, these measures create a greatly superior alternative to that of the GCSR. This system makes no contingency to ensure the long term security of credits whatsoever.

5. Issues and Implications for Standards imposed in BC

The analysis and comparison above, clearly demonstrate that the CCAR Forest Project Protocol provides a superior template for guiding the creation of standards for BC's future cap and trade market. It has also been acknowledged here though, that despite the comprehensiveness of the CCAR protocol, problems remain inherent in both the standards themselves and forest projects in general. Under BC's unique policy and forest environment, these issues are likely to be accompanied by a number of additional setbacks.

The remainder of this review will be dedicated to looking at what the major shortcomings in the state standards reviewed, could imply for the application of similar standards in the BC environmental-political setting. Accompanying these, several probable issues unique to BC will be identified, and their potential impact on the acceptance of forest projects into a BC Cap-and-Trade market assessed.

5.1 Ensure completeness

Large ranges of variation, in forest environments, and estimates from prescribed modeling procedures, were identified as hurdles in achieving completeness for both the CCAR and GCSR. This is also likely to pose a serious threat to project credibility BC's Cap-and-Trade market.

Currently there are two primary programs in use for the modeling of baseline and management scenarios in BC (there are several others which may apply) (Grieg and Bull 2009). These are, CBM-CFS3 developed by the Canadian forest service and Forecast. These, like the models used for quantification in the regional standards compared here, could suffer from a shortcoming which may lead to inaccuracy in quantification. This pertains to the large amount of variation and lack of documentation for pools such as soil, and DOM. Forecast, which is more heavily dependent upon empirical data, is likely the more accurate of the two. However its use requires extensive site data, training, and expertise to reliably run the program (Grieg and Bull 2009).

Until more efficient and accurate means of measuring carbon stored in the pools identified are developed, potential project proponents will have to assure that the estimates they provide are highly conservative.

5.2 Establish a Baseline Start Date

Mimicking the CCAR standards for establishing baseline start date in BC is more than likely to set the stage for opposition from some in the BC forest industry. Currently industry is leaning towards establishing 1990 as the base year for carbon offset projects. Under the CCAR standard projects must be registered within six months of project initiation. This means that companies which have undertaken management choices post 1990, such as establishing conservation easements or old growth management areas (OGMA's), may not receive credit for them. Arguing for amendments that might see credit for such action will however be difficult. The tumultuous nature of the forest policy and market streams in BC undoubtedly makes establishing baselines for forest projects such as those mentioned above a highly subjective task.

5.3 Integrate Standards with British Columbia's Tenure Structure

Perhaps the most perplexing issue to face BC forest carbon policy makers will be to decide how of if forest project standards could be integrated with the complicated BC forest tenure structure. The foundation for difficulty in accomplishing this task stems namely from the question of ownership.

One thing that voluntary markets have shown is that clear ownership is part of the key to ensuring the value and credibility of credits (Journal of Forestry 2008). The past decade has seen particularly major shifts in tenure rights, with actions such as the BC governments 20% take-back of forest tenure from licensees providing lucid evidence of the fragility of forest land rights. Also, while licensees play the largest role in determining the on site management of their tenures, the rights to potential carbon credits created as a result of management practices are not part of the tenure agreement currently (Bull 2008).

To bridge the implied gap between management and ownership, BC's provincial government has posed a potential solution. This solution, highlighted in recent media coverage of BC Forest Minister Pat Bell, is to encourage licensees to invest in carbon positive management practices (silviculture) and in return using the credits and the revenue they produce to subsidize silvicultural costs; according to Minister Bell this could potentially triple silviculture investment (Williams 2009). It is noted though that this is based on the highly liberal market price estimate of $30 per CO_2e.

Despite the complexities associated with remedying the issue of ownership, one thing is certain, without a clear solution to the problem only private lands will provide a credible source of forest offset credits. Taking this route will tragically disable the use of the 94% of BC's forest under public tenure (Ministry of Forests and Range 2007) as a tool in the provinces arsenal to combat climate change.

6. Conclusion

The CCAR provides a superior set of regional based standards when compared to the GCFS. As such, taking into account the recommendations put forth here, it will serve as a much more appropriate template for the creation of regional forest carbon offset project standards here in BC. This assertion shows a sign of coming to fruition, as it has been reported by Carbon Point (a credible observer of standards for carbon markets) at the time of this report, that the WCI will likely be adopting CCAR standards for forest projects later this year (Carbon Point 2009).

Internationally, much of the issue with the inclusion of forest projects in carbon markets relates to the fact that standards for forest carbon accounting were developed prior to their inclusion as a means for emitters to meet reductions targets (Journal of Forestry 2008). The regionally produced voluntary standards reviewed here however take significant steps towards bridging the policy gaps highlighted by opponents. To add to this, with the continual improvement of forest carbon accounting software the values used to assert offsets are becoming increasingly accurate.

It is true that carbon stored in forest ecosystems is not stored in perpetuity. In spite of this, forestry sourced offsets will serve to fill the current deficit present in the availability of cost effective means to reduce emissions. The creation of reliable standards in BC to monitor the projects producing these offsets, will assure the credibility of this important step towards real action on mitigating further climate change. In the process a strong incentive to invest in the future BC's forests will be created.

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