

***WEATHER, CLIMATE AND THE FUTURE***

Using Provincial Crown Resources to Create and Trade  
Offset Credits for Carbon Sequestration

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### Benefits of Using Provincial Crown Resources to Create and Trade Greenhouse Gas Emission Reduction Credits

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## *WEATHER, CLIMATE AND THE FUTURE*

### Benefits of Using Provincial Crown Resources to Create and Trade Greenhouse Gas Emission Reduction Credits

#### I. INTRODUCTION

Anthropogenic emissions of carbon dioxide and other “greenhouse” gases are widely considered a major cause of global climate change. International initiatives, most notably the Kyoto Protocol, are underway to reduce emissions (or to increase removals) of these gases from the atmosphere. An essential element of the current approach to climate change is the use of economic instruments to lower the costs of achieving the given reduction target. In particular, so-called “cap and trade” mechanisms allow certain emitters to meet their reduction targets by purchasing credits from other parties in a position to reduce atmospheric greenhouse gases (or increase carbon removals) at a lower cost.

The Kyoto Protocol provides mechanisms for international trade in such credits. Canada’s plan for meeting its Kyoto Protocol commitments provides for a domestic credit trading system and links to the international trading system.

Carbon “sinks” are processes or activities that remove carbon from the atmosphere. Incremental carbon removals are equivalent in effect to carbon (or other greenhouse gas) emission reductions. Thus, in a trading regime, carbon removal or carbon sequestration projects that create of incremental carbon sinks may have value.

British Columbia may have potential for increased carbon sequestration. Certain forest management practices remove carbon from the environment. In addition, there are techniques for injecting carbon dioxide into geological formations for long-term sequestration that may have application in B.C. Other forms of sequestration may also have potential.

The purpose of this report is to explore the potential economic benefits that might be available to B.C. from exploiting its potential for further carbon sequestration.

This topic has to do with ways of achieving a given target. In particular, it has to do with whether market mechanisms can be harnessed to encourage innovative, low cost solutions to the challenge of climate change. By its nature this approach introduces an element of economic calculation—is it in British Columbia’s economic interest to promote carbon sequestration? How much revenue can be generated for the Crown? It may, therefore, be worth emphasizing that this is not about British Columbia seeking to “get off the hook”. Canada’s commitments are what they are. If they can be achieved more cheaply, that is a good thing.

Estimating the potential for carbon sequestration is fraught with difficulty. The “rules of the game” are still evolving. Commitments and rules under the Kyoto Protocol beyond 2012 have not yet been established. Thus, the market opportunities that may emerge and the value of credits that will become established are highly uncertain.

Ultimately, it is more important to identify and, if possible, address possible barriers to carbon sequestration in British Columbia. This is recognized in British Columbia’s plan for addressing climate change, *Weather, Climate and the Future*. The plan includes a commitment, under Action # 18, that: *The government will develop a policy framework to provide business certainty and support the creation of incremental forestry sinks.*

The general notion here is that if at a small cost, the government can foster potential new business opportunities, it should seek to do so. Having done so, the opportunities, whether large or small, will take care of themselves. While this paper seeks to provide a perspective on the scope for incremental carbon sequestration, its main aim is to help identify the policy work that needs to be done to support the creation of incremental sinks—not just forestry sinks.

## **II. ECONOMIC ASPECTS OF REDUCTIONS, OFFSETS AND CREDITS**

### **II.1. Credits and Offsets**

#### *II.1.1. Nature and Source of Value of Credits*

In a pure “cap and trade” system, an upper limit (cap) on emissions from a specified set of emitters is fixed, presumably at a level that represents a reduction from recent levels. Each of the targeted emitters is assigned a maximum permit level consistent with the overall cap. However, those who are able to reduce emissions beyond their required amount are given a credit for the additional reduction and allowed to trade that credit to other emitters covered by the reduction requirement. In this way, the given reduction, as reflected in the cap, is achieved—but at a lower cost. In this model, the credits are *emission reduction credits* and, in the context of climate change, may apply to any of the six greenhouse gases covered by the Kyoto Protocol.

A variant of “cap and trade” allows for *offsets* and *offset credits*. An offset is an eligible reduction in greenhouse gas emissions or an increase in carbon removals from the atmosphere achieved outside the set of targeted emitters. Credits for such offsets may then be sold to targeted emitters. The latter then have three ways to achieve their reduction target: reduce emissions at source, purchase emission reduction credits from other covered emitters, or purchase offset credits from outside parties.

A further refinement of this construct is that the government itself may purchase offset credits. The federal government, through its Climate Fund, intends to do just that as part of its Kyoto Protocol compliance plan. In the discussion above, the implicit assumption is that the entire reduction is assigned to targeted emitters. In fact this is not the case; the federal government plans an array of initiatives to achieve greenhouse gas reductions, including traditional regulatory and subsidy instruments to be applied outside the set of targeted emitters. On the margin, it may be cheaper for the federal government to purchase an “offset credit” than to subsidize a particular reduction initiative.

In summary, the role of offsets in climate change strategy reflects a judgement that this is the most effective way to encourage certain types of potentially low cost reduction or removal options that cannot be as effectively advanced through specific targets, general regulations or conventional subsidy programs.<sup>1</sup>

As noted above, offset credits may be issued for greenhouse gas emission reductions or carbon removals from the atmosphere (i.e. carbon sequestration or incremental sinks). This paper deals only with sequestration.

Very simply, an offset credit for carbon sequestration certifies that the volume of carbon specified in the credit has been removed from the atmosphere and can be applied to meet a specified emission reduction requirement. The value of such a credit derives from the underlying regulatory regime which specifies the reduction requirement and the ways in which it can be met.

The actual value of offset credits is determined in the market place. The demand for offset credits will reflect the magnitude of the Kyoto reduction commitment and the costs to (i) targeted emitters of achieving their targets through source emission reductions; and (ii) the federal government of achieving the remaining reduction through other policy instruments. The supply of credits will reflect the costs of sequestration (or of reducing emissions in non-covered sectors). If large, low cost sinks are available, the market price of credits will be relatively low and sequestration projects will be used extensively. Alternatively, if low cost sequestration opportunities are not available, their price will be high and emitters will rely more heavily on emission reductions at source.

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<sup>1</sup> There is an element of judgment involved. It is worth noting that in the cases primarily considered in this paper, forestry and geological sinks, there is an argument that regulatory or conventional subsidy mechanisms might be as or more effective than offset credits in stimulating carbon removals. It would be open to the federal government to propose such measures. Whether provincial governments would wish to do so is another matter. That question is outside the scope of this report. The point here is that the focus on offsets does not preclude other approaches.

However, the value of credits will also depend on the trading rules—what counts as a credit, what restrictions on trade in credits apply and other features of the regulatory regime.

Although the notion of trade in carbon credits has been prominent now for many years and much work has gone into the design of workable trading mechanisms, the market is still very much in its formative stages. Much more attention has been paid to trading regimes for emission reduction credits than for offset credits.

The current state of market development largely reflects the fact that reduction targets are not yet in effect. Trading activity to date is in part experimental, part of the process of developing a functioning system for use when the targets do become effective.<sup>2</sup> As is normal in the early stages of a market's development, volumes traded are relatively low and prices are highly variable.<sup>3</sup> Over time, volumes traded should grow and prices settle down to a more stable value. Nevertheless, uncertainty about post-2012 requirements and restrictions on international trade in credits will affect the functioning of the market for some time.

### *II.1.2. Creating Property Rights in Carbon "Sinks"*

"Sinks" are related to but distinct from credits. A sink is a process or activity—such as a set of forest management activities applied to specified forest land—that may or may not have commercial value in itself. The value of an *incremental* sequestration project reflects the fact that its associated carbon reduction may be eligible as an offset credit. The value of the project, in turn, is the difference between the value of the credit—determined in the market place for credits—and the costs of sequestration. If it does not give rise to a credit, then it has no value as such.<sup>4</sup>

The concept of a sink as an asset having a commercial value is new. As a new type of asset, it is not surprising that property rights to sinks are not well defined. However, sequestration entails costs, which may not be incurred if there is ambiguity surrounding the ownership of the sink. In addition, any ambiguity as to ownership of the sink attaches to the prospective credit. Indeed, trade in credits generally presupposes that ownership is clear.

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<sup>2</sup> Trading may also be motivated by public relations considerations and the expectation that some form of credit for early action will be recognized.

<sup>3</sup> For example, the price of a carbon credit on the new European trading system has more than tripled since the beginning of 2005.

<sup>4</sup> By definition, a sink is incremental and eligible for a credit only if it would not be created under "business as usual" conditions. Therefore, absent the credit, it would not be economic to create the sink. This does not mean that creating sinks does not generate other by-product revenues; indeed they may be critical to overall economics. See below for further discussion.

In the case of B.C., there is no doubt that the Crown's interest in the land and resources under its jurisdiction encompasses the essential components of forestry, geological and other sinks—forest lands, sub-surface geological formations, and so forth. What is less clear is whether existing tenures held by third parties have conveyed rights to sinks and any associated credits; or are well designed to facilitate investment in sequestration projects and generate revenue for the Crown. As well, this new form of asset raises issues revolving around the *New Relationship* with British Columbia's First Nations.

Clarifying these matters is an important first step to realizing the value that may attach to British Columbia's potential for creating sinks. They will be explored further below in specific relation to forestry, geological and other sinks.

In summary:

- offset credits derive their value from the policies and regulations of the federal government, adopted to meet its Kyoto Protocol commitments.
- given the above, sinks or sequestration projects derive their value from the policies and regulations of the British Columbia government, adopted to facilitate investment in carbon removal projects and capture an appropriate share of their value.

### *II.1.3. Challenges: Incrementality*

Emission reduction requirements are quite straightforward in principle. Assuming compliance with the regulations and subject to measurement error, one can be certain that the specified emission reduction was achieved *from those subject to the regulation*.<sup>5</sup>

If, however, emitters are permitted to count offset credits towards their emissions target, total emissions will come within the cap only if the offset credits pertain to sinks that are truly incremental—that the carbon reductions credited towards the cap have “really” occurred and that they would not otherwise have occurred.

It is difficult to demonstrate true incrementality, especially in the context of a compliance strategy that includes “targeted measures”—such as general regulations and incentives.

For example, if the project would have proceeded in any event and if the contribution of that project was implicit in the calibration of the emission reduction targets, then allowing the credit results in no net change in the global carbon stock. This might be the case if the removal occurred in response to a “targeted

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<sup>5</sup> This qualification is important inasmuch as a number of important contributors to global warming are not subject to the Kyoto Protocol reduction requirements. However, that limitation of the Kyoto Protocol is not a natural deficiency of the cap and trade mechanism.

measure” but was not specifically identifiable as such; and, hence, “double counted” when certified as an offset.<sup>6</sup>

Alternatively, if the creation of a sink is causally related to the creation of an offsetting source, the sink likewise has no net effect on the global carbon stock. For example, if a policy change does not affect the underlying demand for forest products, it is possible that an increase in forest conservation in one area will be offset by an increase in harvesting elsewhere.

Eligibility rules for issuing offset credits for sinks are largely focussed on the issue of incrementality. The challenge is to develop eligibility rules that are workable from an operational and administrative perspective, yet at the same time result in substantive environmental improvement.

## **II.2. Kyoto Protocol and Canada’s Action Plan**

The Kyoto Protocol came into effect in March 2005 upon its ratification by Russia. It defines the reduction targets applicable to its signatories during the First Commitment Period, 2008-2012.

The Kyoto Protocol does not specify how signatory nations are to meet their commitments. In this respect, the main requirement is that the parties be able to verify their reductions.

Under Kyoto, Canada is required to reduce its greenhouse gas emissions by an estimated 270 MT CO<sub>2</sub> per year.<sup>7</sup>

Canada’s Action Plan for meeting this commitment indicates that it expects to meet the target by:

- |                        |                |                            |
|------------------------|----------------|----------------------------|
| • Large Final Emitters | 36             | specific reduction targets |
| • BAU Sinks            | 10-30          | see below                  |
| • Other Actions        | <u>196-266</u> | targeted measures          |

Target	<u>270</u>
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Those identified as Large Final Emitters (LFEs) will be able to purchase emission reduction credits from other LFEs and offset credits from outside the LFE sector.

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<sup>6</sup> A “targeted measure” is a fiscal or regulatory policy instrument to reduce emissions/increase removals outside the “cap and trade” regime. See below for further discussion.

<sup>7</sup> MT denotes a megatonne, or one million tonnes, of CO<sub>2</sub> or its equivalent in terms of carbon or other greenhouse gases. Kyoto Protocol objectives are sometimes expressed in units of carbon (C); for reference 1 MT C = 3.67 MT CO<sub>2</sub>.

BAU sinks are “business as usual” sinks that Canada is entitled to claim in respect of existing agriculture, forestry and soil sinks. As discussed below, BAU sinks do not give rise to tradable offset credits.

“Other Actions” encompass a variety of targeted measures (e.g., regulations or incentives) many of them focussed on increasing energy efficiency, especially in buildings and in transportation.

Apart from BAU sinks, incremental sinks and their associated offset credits do not figure *directly* in Canada’s plan. Rather, incremental sinks may be substituted for emission reductions: (i) otherwise required of the LFE sector; or (ii) otherwise planned by Canada to be achieved through the “other actions” specified in its plan.<sup>8</sup>

### *II.2.1. Market for Offset Credits*

Offset credits will be saleable to the LFE sector, the Climate Fund and, potentially, other domestic buyers. They are also bankable. They are not saleable on the international market at least at this time.

The LFE sector may purchase emission reduction or offset credits through the domestic credit trading system and will also have access to the international mechanisms established under the Kyoto Protocol.<sup>9</sup> The federal government has assured the LFE sector that it will cap the cost of reductions at \$15.00 per tonne of CO<sub>2</sub>. This will effectively limit the sector’s “willingness to pay” for offset credits to that amount.

The Climate Fund is a federal government financing mechanism established for the purpose of purchasing, on behalf of Canada, emission reduction and offset credits from both domestic and international sources. The fund will purchase offset credits through a competitive process. Since these purchases are in lieu of more expensive regulatory or subsidy measures, the fund may be prepared to pay more than \$15.00 per tonne.

The Kyoto Protocol does not limit Canada’s overall ability to utilize offset credits from greenhouse gas reductions or carbon removals. But it does place specific limits on Canada’s ability to utilize agriculture, soil and forestry sinks. The special provisions for forestry are discussed below.

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<sup>8</sup> The rationale for this approach is suggested above in Section II.1.1.

<sup>9</sup> The Kyoto Protocol has established three such mechanisms—the Clean Development Mechanism (for investments in developing nations not subject to the Kyoto Protocol); Joint Implementation (for partnerships involving participating nations); and International Emissions Trading. Links between the domestic and international trading system that would enable firms to enter the international market are not yet in place.

### *II.2.2. Special Provisions for Forestry*

The Kyoto Protocol contains special provisions for forestry which (a) enable to Canada to claim credit for its BAU sink; but which (b) limits its ability to utilize incremental sinks.

Canada is obligated by paragraph 3.3 to account for the net change in carbon stocks attributable to afforestation, reforestation and deforestation (ARD). During the first commitment period, this is expected to increase Canada's liability for CO<sub>2</sub> reduction by 15 MT per year of CO<sub>2</sub>. This is an upward adjustment of the 270 MT CO<sub>2</sub> per year target noted above.

However, Canada may, pursuant to paragraph 3.4, no later than 2006, elect to include "Forest Management" within its carbon accounting framework; and, if Canada so elects, then, based, on actual changes in the carbon stock in the 2008-2012 period:

- apply up to 33 MT CO<sub>2</sub> per year of any net sink to offset any of the net source liability determined under paragraph 3.3 for ARD; and
- apply up to a further 44 MT CO<sub>2</sub> per year of any remaining net sink available to reduce the Kyoto target.

Canada is expected to make a decision this fall, in consultation with the provinces, whether to include "Forest Management" and, if so, to specify the land area subject to forest management for the purposes of carbon accounting.

Analysis to date suggests that, under the broadest definition of land subject to forest management, Canada as a whole is a net sink. Using the median estimate, 48 MT CO<sub>2</sub> per year, Canada could offset its expected ARD source liability (15 MT CO<sub>2</sub> per year) and reduce its Kyoto target by 33 MT CO<sub>2</sub> per year.<sup>10</sup>

However, there is some risk that adverse events (e.g. unusual fire activity or insect infestations) could convert the sink to a source, thereby increasing the Kyoto reduction target. If "Forest Management" turns out to be a net source, the change in carbon stock is added to the Kyoto reduction target and taken into account in the second commitment period (post 2012).

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<sup>10</sup> Canada's most recent "green plan" indicates the contribution from BAU forestry sinks will be 0-20 MT CO<sub>2</sub> per year—this is the estimate embedded in the 10-30 MT CO<sub>2</sub> per year contribution summarized in Section 2. The estimates in this paper are more recent staff estimates but will not be finalized until fall 2005.

In summary, if Canada elects to invoke Paragraph 3.4 and if the median estimate of the net BAU forestry sink contribution turns out to be correct, then that contribution will use up 33 of the 44 MT CO<sub>2</sub> per year available under Paragraph 3.4:

- an additional 11 MT CO<sub>2</sub> per year would be available for incremental forestry sinks.<sup>11</sup>
- but, if Paragraph 3.4 is not invoked, there would be no ability to use incremental forestry sinks<sup>12</sup>

### *II.2.3. Canada's Offset System*

Canada has not yet determined whether to invoke Paragraph 3.4 in order to claim the possible “forest management” contribution. Nor has it yet finalized the policies and regulations that will apply to offsets. However, Canada has recently released two discussion papers outlining its current proposals for dealing with offsets.<sup>13</sup>

Under the proposed plan, offset credits will be issued pursuant to an application and approval process initiated by the project proponent:

- Proponents will be required to file a *Project Document* meeting exacting specifications for project description and for monitoring, quantifying and reporting. Projects with reductions/removals occurring after January 1, 2000 may be eligible.
- The federal government will review and assess the application to confirm clear ownership and conformance with eligibility criteria. If approved, the project will be registered.
- Following the eight-year registration period, the proponent will be required to quantify actual reductions/removals in accordance with a specified quantification methodology; and have the result verified by an approved third party validator. The federal government will then certify the reductions/removals and issue the offset credits.
- For longer-lived projects, the cycle will repeat for a further eight-year registration period.

Eligible projects must demonstrate that the reductions/removals are quantifiable, achievable in the registration period, real, surplus and unique—in other words incremental. Eligible reductions/removals must be based on specific, identifiable

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<sup>11</sup> The cap applies to both sink projects and the results of “targeted measures”, the latter being regulations or incentives affecting forest management as opposed to discrete “projects”. Note, the implementation of targeted measures do not give rise to tradable offset credits.

<sup>12</sup> However, the recently released federal discussion paper on offsets indicates that forestry offsets may be allowed even if Canada does not invoke Paragraph 3.4.

<sup>13</sup> The papers, Offset System for Greenhouse Gases (overview and technical background document) are available at website: [www.climatechange.gc.ca](http://www.climatechange.gc.ca)

actions that are surplus to any reductions/removals attributable to other climate change regulatory or incentive programs and are measured net of any “leakage”.

Results will be quantified and verified in accordance with strict standards—as indicated by the fact the federal discussion document includes 65 paragraphs with specific details on these requirements. In some cases, the federal government will issue *Offset System Quantification Protocols* and *Offset System Verification Protocols* to apply to certain types of projects.

As noted earlier, these proposals aim to strike a balance between administrative workability and substantive achievement. The provisions appear to be appropriate to the objective but, necessarily, quite onerous and rigorous.

#### *II.2.3.1 Treatment of Canada’s Business as Usual Sink*

It is also noteworthy that, under Canada’s proposed implementation plan, only incremental sinks give rise to offset credits. Thus, the contribution of British Columbia’s “business as usual” sink or any incremental removals attributed to “targeted measures” has no economic value to the Crown—they simply reduce the national Kyoto target.

#### **II.2.4. Issues in Second Commitment Period**

Commitments under the Kyoto Protocol apply only to the first commitment period, 2008 to 2012. Clearly, British Columbia’s potential for sink creation is predicated on a longer-term market for carbon credits. Inevitably, it will take time to establish a sound policy basis for sink creation in British Columbia; and, following that, to establish sink creation as a viable business activity able to begin developing British Columbia’s potential. While some investments in sink creation could be made in the near future and could potentially achieve payback by 2012, the potential for sink creation in B.C. will largely be determined by the commitments and rules established for the second and later commitment periods. Canada has committed to issue offset credits for reductions/removals achieved post-2012 for projects previously approved but, of course, their market value will be determined by conditions post-2012.

Negotiations to define the Parties’ commitments in the post-2012 second commitment period are scheduled to commence in 2005. It is premature to speculate what will emerge from these discussions. However, some risks and issues should be noted.

First, the apparent natural evolution of the Kyoto Protocol would seem to lie in the direction of bringing more countries into the protocol and, thus, expanding the geographic scope for trade in credits. This would improve the overall functioning of the credit market; create more market opportunities for B.C.; but, also, create more international competition.

Second, having noted this possible trend, it is essential to note that the US remains outside of Kyoto and has recently aligned itself with other countries, including China and India, favouring a softer approach to dealing with climate change.<sup>14</sup>

Third, logic suggests certain pressures on the rules. The economic case for the Article 3.4 “business as usual” forest management credits is quite weak. Will they continue? If not, will that ultimately affect Canada’s emission target? On the other hand, there appears to be a fairly strong case for recognizing that carbon is stored in long-lived forest products; if that were taken into account in the carbon accounting system, it might make certain forestry sinks more valuable. Finally, as noted above, incrementality is, potentially, a serious challenge; it seems logical to expect that the eligibility rules for carbon credits will eventually be tightened or loosened depending on whether experience indicates problems demonstrating incrementality.

### **II.3. British Columbia Issues**

#### ***II.3.1. Recognition of the “Business as Usual” Sink***

British Columbia’s plan for addressing climate change includes a statement, Action \$ 17, that: *The government will continue to assert ownership of any forest sink and associated benefits, and call for recognition of the cost of maintaining that sink.*

As noted above, Canada’s BAU forest management sink could contribute 48 MT CO<sub>2</sub> per year to Canada’s Kyoto Protocol obligations—by offsetting the expected liability arising from ARD and by reducing Canada’s reduction target. British Columbia contributes about 70% of this net sink.

This contribution has no direct economic value to the Crown within the proposed offset credit system. The reason, simply, is that the contribution arises from so-called “business as usual” activities. If Canada recognized this sink as a tradable credit that could be purchased by other emitters in order to meet their assigned reduction targets, Canada would not meet its Kyoto targets. In order to do so, the target reductions assigned to other emitters would have to be increased by the amount of the BAU sink. In addition to the costs they would bear to achieve “real” emission reductions, these emitters (or the federal government) would be forced to pay B.C. for carbon reductions that would have occurred in any event. From a federal government perspective, there is no rationale for imposing such payments on the LFE sector or itself.

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<sup>14</sup> The agreement, called the “Asia Pacific Partnership on Clean Development and Climate”, is non-binding and emphasizes technology transfers to reduce emissions of greenhouse gases, rather than the fixed targets and caps of the Kyoto protocol.

Notwithstanding that there appears to be little rationale for recognizing BAU “credits” within the Canadian trading system, the fact remains that BC forest management policies are enabling Canada as a whole to meet its Kyoto Protocol commitments at lower cost.

It is also noteworthy that these same forest management policies increased British Columbia’s susceptibility to the ongoing mountain pine beetle infestation in the interior region of the province. British Columbia would seem to have a strong case that the federal response to the infestation should be “generous” in order to appropriately reflect the province’s BAU contribution. Alternatively, some other form of recognition of this contribution may be appropriate for British Columbia to pursue.

### ***II.3.2. Long Lived Forest Products***

As noted above, there is a good case in logic for recognizing the fact that carbon is stored for long periods in many forest products. This has three effects:

- Carbon Accounting: an immediate one-time impact to increase the measured “business as usual” forest sink
- Incremental Sinks: increases the measure of carbon sequestration in many types of incremental forest sinks
- New Industrial Projects: increases measured emissions from new industrial forestry operations that do not produce long-lived forest products

The first effect is by far the largest. But its significance depends on how it affects Canada’s future reduction target. Presumably other countries will not agree to a set of *real* reduction targets for Canada (and other similarly situated countries) that have been *artificially* reduced due to an accounting change. Thus, the benefit to Canada from the change will be offset in whole or in large part in the accompanying negotiations over the reduction targets.

Measured carbon sequestration from incremental sinks may include a similar element of “windfall” gain – that Canada would be unlikely to credit in the offset system – but may also involve a genuine or creditable increase in sequestration. The latter effect would be small because it involves the incremental storage in afforestation or reforestation activities from the distant future point of harvest forward.

New industrial projects may have an opposite effect. If Canada’s renegotiated reduction target reflects a “business as usual” adjustment for the accounting windfall but the forest industry output mix subsequently shifts away from long-lived forest products, the real compliance burden would actually increase. For example, if in future British Columbia were able to generate significant amounts

of electricity from beetle-infested timber, the increased carbon emissions would count against Canada.

Whether or not the accounting change is in Canada's best interests is not entirely clear. Further analysis would appear to be warranted.

### ***II.3.3. Business as Usual, Project Baselines and Targeted Measures***

The concept of "business as usual" plays an important role in climate change policy. Credits for sink or offset projects may be issued for certified and verifiable carbon removals relative to a defined "base line". Although these "base lines" will be established on a project-specific basis, collectively the set of project "base lines" will constitute the operational definition of "business as usual".

Establishing the "base line" for measuring the contribution of incremental sinks is to be negotiated on a project-specific basis between the proponent and the federal government. These negotiations are apt to be contentious and represent an added cost in the project design and initiation phase. However, the federal government has an interest in approving genuinely meritorious projects that stand to lower the cost of Kyoto compliance.

As discussed further below, British Columbia may be able to facilitate the negotiation of project base lines, for example through clarifying the core obligations of tenure holders for forest management.

The change in carbon stocks attributable to forest management less the reductions attributed to approved forest sink projects becomes the "business as usual" contribution. It will include the true "business as usual" contribution plus the contribution from any new "targeted measures".

From a carbon accounting perspective, there is no meaningful distinction between true "business as usual" and incremental removals attributed to "targeted measures" or approved offset carbon sequestration projects: under the Kyoto Protocol all are treated the same.

From an economic perspective, of course, there is a difference. The federal government has an interest in achieving incremental carbon removals through enhanced forest management or afforestation to the extent that that is cheaper than other reduction/removal options. It will choose a mix of policy instruments, consistent with its jurisdictional authority, that it believes to be most cost effective. In the realm of forestry this will include offset policy and, perhaps, some incentive mechanisms; in general, however, given the role of provinces in forest management, the federal government has limited scope for applying "targeted measures" to forestry even if they were the most cost-effective approach. Provincial governments have an interest in supporting a workable

offset credit mechanism but, not being accountable for Kyoto, little interest in other measures.

### ***II.3.4. Shaping the Canadian Trading Rules***

As noted above, the federal government has recently released two discussion papers on offsets and the mechanisms for acquiring and trading offset credits. These papers are intended to provide a basis for consultations with various interests, including provincial governments. It is beyond the scope of this paper to address this topic.

Although it is beyond the scope of this paper to examine the federal proposals in detail, two general points are worth noting. First, British Columbia has an interest in encouraging the federal government to adopt rules that provide the maximum scope for investment in sinks. The province should examine the federal proposals in detail to assess their operational workability. At the same time, British Columbia should be cognizant of the risks of excessive liberality—if future monitoring reveals that sinks fall significantly short of true incrementality, the use of offset credits may be curtailed in future agreements.

Second, although perhaps not an immediate priority, the current asymmetry in trading rules (i.e. the LFE sector may purchase credits from abroad; while sink proponents cannot sell abroad) operates against the long-run interests of the sink sector. Although the federal government, through the Climate Fund, may operate in the international market, there is no provision at present for sharing the potential rents derivable from this position with provinces or project proponents.

### ***II.3.5. Facilitating Sink Creation***

The main issue facing B.C. – and the focus of this report – is how best to facilitate the creation of sinks that may directly benefit the province. As discussed below, these are matters largely within the control of the Crown. B.C. has little influence on the basic features of the global “cap and trade” regulatory regime. However, it can establish an environment conducive to investment in sinks so that the private and public sectors are in a position to take advantage of the trading opportunities afforded by the larger system.

In general terms, the goal would be to put in place a tenure and resource management system that:

- ❑ removes institutional barriers to private and public sector investments in creating sinks;
- ❑ facilitates the certification of the associated carbon reductions as credits; and
- ❑ captures for the Crown an appropriate share of the value of sinks, bearing in mind the respective private and public sector contributions.

Several steps are involved. First, ownership of sinks should be confirmed. Second, efficient mechanisms for conveying tenure rights and capturing the value of sinks should be created. Third, ownership and tenure rights must somehow be reconciled with First Nations rights and title. Finally, the overall management framework should be reviewed to identify opportunities for facilitating compliance with the federal rules.

We shall examine these matters in subsequent sections dealing specifically with forestry sinks and geological sequestration.

### **III. POTENTIAL FOR INCREMENTAL CARBON SEQUESTRATION IN BRITISH COLUMBIA**

The cost of achieving the Kyoto Protocol targets for greenhouse gas emission reductions will be high. The use of economic instruments, such as offset trading, is intended to encourage innovative approaches to greenhouse gas reductions and carbon removals that will lower these costs. It appears to be working, at least in the sense of stimulating a good deal of activity on the part of business, entrepreneurs, researchers and others.

In British Columbia, most interest attaches to two broad types of carbon sequestration: incremental forestry sinks and geological sequestration of CO<sub>2</sub>. However, under Canada's proposed approach for offsets and offset trading, a variety of reduction or removal projects could be considered, including methane capture from landfills, soil sequestration, and energy efficiency improvements. This paper also considers some of these other possibilities.

#### **III.1. Forest Sinks**

##### *III.1.1. Afforestation, Reforestation and Deforestation (ARD)*

Under the Kyoto Protocol, afforestation and reforestation mean the creation of a permanent new forest on land that has not been forested since 1990 at the latest. Avoided deforestation means the permanent maintenance of a forest on land previously subject to forest management.

Globally, ARD projects attract a good deal of interest. In warmer climates, the conversion of marginal agricultural lands to fast growing timber plantations holds out considerable promise. As well, there are potentially high returns to avoided deforestation, especially in tropical countries, although under Kyoto Protocol trading rules, projects for avoiding deforestation are not eligible for offset credits.

The main determinants of a successful ARD project are the biological and climatic factors influencing carbon uptake in the forest/soils; and the opportunity cost of the land. Studies in other jurisdictions have shown that ARD sinks are potentially quite attractive. A recent study for the U.S. indicated that the U.S.

could potentially achieve at least 300 MT CO<sub>2</sub> per year of carbon removals at a cost ranging from US \$7.50/t to US \$22.50/t. Costs in other countries are even less.

In B.C., opportunities are very limited. First, due to British Columbia's relatively low population and short history of intense economic development, the permanent conversion of forest land to other uses has been quite modest. This means there is little land naturally suitable for forest cover that is not already forested; and that most of the limited land use conversions that have taken place are probably not readily reversible. Indeed, continued population growth and associated economic growth and diversification are more likely to lead to future deforestation. Second, unlike other parts of the world, British Columbia's forests are slow growing.

This is not to say that there may not be niche opportunities to afforest marginal agricultural or range lands; or to limit the deforestation associated with forest conversions in the urban fringe. There has already been an apparently successful afforestation project on old oil and gas lands in the Peace River region.

### *III.1.2. Forest Management*

In the terminology of the Kyoto Protocol, incremental forest management sinks refer to carbon sequestration due to enhanced forest management practices on land currently under forest management. By "enhanced" is meant that the practices go beyond "business as usual".

As noted above, in section II.3.2, from the standpoint of Canada's Kyoto Protocol obligations, the distinction between "business as usual" and "enhanced" is meaningless: if Canada invokes Article 3.4, it is accountable for the total change in carbon stock in the designated forest management area. However, the distinction does matter from a domestic policy perspective.

The forest management practices usually considered in this context include:

- increased management effort to reduce timber losses due to forest fires and insect infestations<sup>15</sup>
- more intensive silviculture (e.g. thinning and fertilization) to promote faster growth of the timber stock
- more selective harvesting or increased timber conservation for non-timber purposes
- increasing the rotation age

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<sup>15</sup> Expected difficulties in establishing a baseline for these activities has led Canada to discourage offset projects premised on fire suppression or pest management.

It is generally accepted that these practices have limited commercial applicability in the British Columbia context. With respect to fire suppression, the emerging view is that past successful fire suppression activities have simply allowed a latent problem to build up and that a more naturalistic approach should be followed. More intensive silviculture has always been considered sub-economic throughout most of the province; and, in any economic trade-off analysis, timber values usually dominate non-timber values.<sup>16</sup> The availability of offset credits could tip the balance in some circumstances but most experts believe the potential is limited.<sup>17</sup>

### *III.1.3. Potential Forest Management Opportunities*

In the previous section, “forest management” was implicitly identified with the active management of areas under forest tenure by tenure holders following commercial principles in their forestry operations. However, there are some special cases that warrant separate treatment.

#### *Eco-based Forest Management (EBM)*

On the Coast, the Central and North Coast land use planning tables are working to define an eco-based management approach for forestry. Although the concept is not fully worked out, it is likely that EBM, compared to conventional forestry, will have a lighter footprint and sequester more carbon. The “conventional wisdom” referenced above would suggest that EBM would not be commercially attractive to tenure holders even with offset credits. However, in the context of the land use plan, EBM may be selected anyway for a mix of social, environmental and economic objectives. In this context, the availability of offset credits could prove attractive as a way of reducing the cost of going to EBM. Eligibility for offset credits may depend on how EBM is put into place—to the extent EBM is imposed as a government requirement, it may not be criteria for incrementality.

#### *Protected Areas*

B.C. Parks is considering a demonstration reforestation project in Manning Park to restore damaged habitat on the basis that it may be eligible for offset credits. Such projects would seem likely to meet the eligibility criteria. Although, as discussed below, there are certain disadvantages to operating in protected areas, one positive factor is that they do not raise the same kind of tenuring issues as other projects and may, if economic, be easier to initiate.

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<sup>16</sup> As discussed further below, this general view is in large part responsible for lack of action to date on the kinds of tenure reform considered in the next section. Thus, the view may be to some extent self-fulfilling.

<sup>17</sup> For example, one of the most knowledgeable B.C. foresters in this area, Bill Bourgeois, believes that some form of regulatory/incentive system would be required in order for licensees to adopt these practices on any significant scale: offset credits would not be sufficient.

### **III.2. Geological Sequestration**

Geological sequestration of CO<sub>2</sub> is the long-term storage of CO<sub>2</sub> in secure geological formations. The potential sinks include depleted oil and gas wells, deep aquifers, salt caverns, and coal seams. There is also a potential for mineral carbonation which is the fixation at surface, rather than deep underground, of CO<sub>2</sub> in the form of inorganic carbonates. Depleted oil and gas wells in the northeast are the most promising near term sinks.

Geological sequestration is best viewed as a process involving the capture of CO<sub>2</sub> from an emission source; its transportation, usually by pipeline, to a suitable storage site; its injection into the formation; and post-injection storage.

The economics of geological sequestration is heavily dependent on the first stage. The economics of capturing CO<sub>2</sub> require that the emission source generate a sufficiently large and rich gas stream. Considerable work is underway internationally to develop new capture technologies that can lower the costs of capturing CO<sub>2</sub> from leaner streams.

Once captured, CO<sub>2</sub> can be safely transported, even over fairly long distances, and stored at a reasonable cost.

There are only a few existing geological sequestration projects in the world. However, the technologies for capturing CO<sub>2</sub> are proven, if presently high cost; and there is considerable experience with commercial injection projects such as acid gas injection and enhanced oil recovery that involve similar technologies. The latter projects are not sequestration projects per se but do in fact sequester some CO<sub>2</sub>.

Geological sequestration raises a number of technical issues and will require that provincial regulations be updated or modified in a number of areas. These are discussed further below.

#### **Potential for Geological Sequestration in B.C.**

British Columbia has significant CO<sub>2</sub> sequestration capacity in the northeast region (and, over the longer term, elsewhere in the province) in suitable geological formations for long term storage.

The challenge is capture. According to CERI only two percent of the CO<sub>2</sub> emissions in western Canada are sufficiently rich to be captured economically with current technology. The richest sources are in Alberta, in particular the hydrogen production facilities at the oil sands and, to a lesser extent, coal-fired power generation facilities.

Compared to Alberta, British Columbia emission sources are, with the exception of the northeast gas plants, quite lean. Duke Energy is presently using acid gas injection to dispose of a small portion of its CO<sub>2</sub> emissions.

### **III.3. Other Carbon Sequestration Projects**

The federal government has identified a number of different types of projects that it may consider as eligible offsets. Outside of forestry and geological projects, landfill projects are the most likely other candidates for British Columbia. Landfill projects involve the capture of methane gas from the landfill and its use to generate electricity or, in some cases, thermal energy. Although not all landfills are amenable to methane capture, a good many of the larger ones are.<sup>18</sup> In British Columbia, Victoria and Vancouver are developing landfill projects as is the Regional District of Fraser-Fort George.

Landfill electricity projects are considered relatively attractive, with energy costs at the low end of the range for most so-called alternative energy projects. It is expected that many such projects would be viable on a commercial basis with offset credits or the equivalent. Smaller projects may require other forms of support. For example, the Federation of Canadian Municipalities in conjunction with the federal government is seeking to promote a number of pilot projects across Canada, including Fraser – Fort George, with financial assistance.

These projects may not be developed as offsets per se. If a utilities' target is expressed as the carbon content of the electricity it distributes, the landfill energy it acquires will be treated as if it were a source reduction rather than an offset. Instead of receiving an offset credit, the landfill project instead might receive a premium price (to cover the higher costs of the project compared with conventional energy) from the utility.

Although these projects may be viable, they appear to offer little scope for a financial return to the Crown. First, we expect that relatively few landfills, and then mainly the smaller ones, are situated on Crown land. Second, and more important, the Crown contribution to the project is very small. The existing landfill already occupies the Crown land in question, the methane source is garbage deposited on the site, and most of the value in the project is attributable to the capital invested by the project proponent to capture the methane and convert it to electricity. There is likely to be little economic rent available for the Crown to capture.

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<sup>18</sup> According to the United States Environmental Protection Agency, of the approximately 2,300 currently operating or recently closed municipal solid waste landfills in the United States, about 365 have landfill gas utilization projects. The EPA estimates that over 600 more landfills could turn their gas into energy.

### **III.4. Assessment of Market Potential**

In this section, we consider the potential market for carbon sequestration projects in British Columbia. Three points should be stressed at the outset:

- ❑ The market under consideration is the market for *incremental* carbon sequestration. As noted above, British Columbia's "business as usual" forest sink has no economic value within Canada's offset and offset trading system.
- ❑ Forest sequestration projects will only be eligible for offset credits if Canada invokes Article 3.4 of the Kyoto Protocol or is otherwise able to negotiate an exception that would allow forest projects to be considered.
- ❑ If Article 3.4 is invoked, Canada is subject to a cap of 44 MT CO<sub>2</sub> per year during the first commitment period on what can be claimed under forest management for "business as usual" and incremental forest sinks. Using the median estimate of the BAU sink leaves 11 MT CO<sub>2</sub> per year as the cap for Canada for incremental forest management projects. As the following discussion suggests, this cap is unlikely to prove binding.

The potential for incremental carbon sequestration in British Columbia depends, fundamentally, on how much carbon can be sequestered in the province and at what cost. As is well known, a greenhouse gas emission reduction or carbon removal at one locale is as good as the same reduction or removal at any other locale. Thus, despite some restrictions on international trade in credits, carbon sequestration projects are, ultimately, in competition with every other reduction or removal opportunity anywhere in the world.

The market for carbon sequestration projects (and other reduction/removal options) is new and rapidly evolving. The Kyoto Protocol reduction targets are just now coming into effect. The Canadian "rules" for certifying offsets and awarding offset credits have still not been finalized. Planning for the second Commitment Period, post 2012, does not start officially until the fall of 2005 and will be clouded by the positions of the United States and other key nations to take a "softer" approach.

Despite these uncertainties, there is, as noted above, plenty of activity. But much of it, although not all certainly, is still at the research, exploratory or feasibility stages. We do not know yet what approaches will work best, what they can achieve in terms of reductions or removals, and what they will cost.

Eventually, some sort of stability will emerge. In economic terms, the shape of the supply curve of reductions/removals will become better understood. And, at that point, we will have a better idea of the likely market price of offset credits and a firmer base for evaluating sequestration projects. But we are a long way from that point today.

This makes it very difficult to estimate the potential for offsets in British Columbia with any confidence. For some time to come, the potential will be revealed only as it is explored. And for that to occur on any larger scale a number of issues and challenges will have to be addressed—as discussed in the following section.

In the meantime, our assessment must reflect what can reasonably be inferred from what we do know. We think the following are key factors:

- ❑ timing: although there is no reason why some projects, if economic, could not be implemented for the first commitment period, 2008-2012, it seems likely that it will be into the second period before the province's potential begins to be realized.
- ❑ project risks: offset projects involve significant risks: a rigorous federal government approval process to determine eligibility; certification and issuance of credits determined ex post based on independently verified removals; and considerable price uncertainty. These factors will tend to deter investment in marginal projects.
- ❑ marketability: small projects are considered to be more difficult to market; to the extent opportunities in British Columbia are niche opportunities they may face marketing constraints.
- ❑ competitiveness of forestry offset projects: globally, there appears to be considerable potential for carbon sequestration in fast growing forest plantations (and avoided deforestation). British Columbia is not in this position—because of its geography, climate and history of development there are only niche opportunities for afforestation. In the area of forest management, climate again limits the potential.
- ❑ geological sequestration: although British Columbia has the geological capacity for considerable sequestration, the potential to use the capacity is limited by the relatively small volumes of suitable CO<sub>2</sub> sources within economic transportation distance.

Based on these considerations, we believe a prudent assessment of British Columbia's potential should assume there is limited potential to penetrate the

international market, especially given Canada's control over access to this market<sup>19</sup>; and that focus should be placed on the domestic Canadian market.

The domestic Canadian market for offset credits is the 36 MT CO<sub>2</sub> per year reduction target for the large final emitter (LFE) sector plus Climate Fund purchases in the domestic market. The Climate Fund is slated to acquire between 75 and 115 MT CO<sub>2</sub> per year per year. Thus, in total, the potential market is some 110-150 MT CO<sub>2</sub> per year.

It should be noted:

- if other measures planned by Canada achieve their planned reductions, offset purchases by the Climate Fund will be at the low end of the indicated range, otherwise higher.
- both the LFE sector and the Climate Fund will acquire offset credits at the lowest possible cost and will have access to the international market

Using this potential market as a reference point, the following table illustrates the potential annual revenues to British Columbia that could be available at some point in time. The table is based on:

- a range of assumptions respecting market share—i.e. how much of the Canadian LFE reduction target can be met through British Columbia sequestration projects; and
- the value of the British Columbia sinks. Note that the annual revenues to the Crown are based on the value of the *sink*, which is the value of the offset credit less the costs of creating the credit—i.e. the costs of the carbon sequestration project. Even if the market value of offset credits rises above the \$15 per tonne “cap” set by the federal government, the value of the sink to the Crown is likely to be significantly less.

The scenarios shown in the table are illustrative but they do seem likely to capture the range of possibilities.

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<sup>19</sup> domestic suppliers of offset credits do not have direct access to the international market. This may simply reflect a view that Canada cannot generate a surplus supply of credits for the international market.

### Illustrative Annual Revenues from Carbon Sequestration Hypothetical Scenarios (\$ Millions)

		Market Share of BC Sequestration Projects (Percentage of total market of 150 MT CO <sub>2</sub> per year)					
		1%	5%	10%	15%	20%	25%
Value of Sink (\$/tonne CO <sub>2</sub> )	\$0.50	\$0.75m	\$3.75m	\$7.5m	\$11.25m	\$15.00m	\$18.75m
	\$1.00	\$1.5m	\$7.5m	\$15.0	\$22.5m	\$30.0m	\$37.5m
	\$2.00	\$3.0m	\$15.0m	\$30.0m	\$45.0m	\$60.0m	\$75.0m
	\$5.00	\$7.5m	\$37.5m	\$75.0m	\$112.5m	\$150.0m	\$187.5m
	\$10.00	\$15.0m	\$75.0m	\$150.0m	\$225.0m	\$300.0m	\$375.0m

The table illustrates the very wide range of potential annual revenues but—and this is the main point—suggest that the potential is probably best measured in the tens of millions of dollars.

As a final point, two factors of limited current relevance are worth bearing in mind for the more distant future.

First, there is a natural limitation to the long-run potential for forestry (and other terrestrial sinks)—the volume of stored carbon achieves a maximum and thereafter starts to “leak” out to the atmosphere; the best that can be done is to maintain a carbon balance through regular harvesting and replanting. With rising marginal costs of sequestration projects, at some point obtaining further increases in the stock of carbon stored terrestrially will become prohibitively expensive.

Second, over time, technological developments in the energy field (energy efficiency and alternative energy sources) are likely to strongly dominate all other options for addressing climate change.

#### IV. ISSUES AND CHALLENGES

##### IV.1. Choice of Policy Instruments

As discussed further below, there appears to be little doubt that the Crown owns sinks on Crown land. However, much of this land is presently encumbered by existing tenures awarded for other purposes. Accordingly, while the government has some choice among policy instruments, the choice is constrained. The main choices appear to be:

- ❑ Crown acts as the proponent and claims the offset credit: although this might be feasible for some projects, we assume that in general government would prefer not to take on projects directly.
- ❑ Crown issues new tenures for projects which authorize the holder to undertake sequestration activities and claim the offset credit subject to some form of payment for the right to utilize Crown land and resources in the sink: this is probably the preferred approach to geological sequestration projects and most afforestation projects.
- ❑ Crown modifies existing tenure rights enabling the holder to undertake sequestration activities and claim the offset credit subject to some form of payment for the right to utilize Crown land and resources in the sink: this is probably the preferred approach to most forest management projects given that the allowable annual cut attributable to the current timber harvesting land base is fully committed. It is difficult to see how new “forest management” rights over this land base can be created without affecting the rights of existing tenure holders.

The last option, for extensive forest tenure reform, is exceedingly complex and challenging. For this reason, we consider two alternative approaches as well:

- ❑ Crown requires that existing tenure holders carry out sequestration activities; reimburses their costs, perhaps through a market-based stumpage pricing system; and claims the credit. This approach:
  - is quite feasible; bypasses difficult tenure reform and revenue issues; and has the further advantage of consolidating the credit in a more marketable form.
  - presumes that the government can formulate general regulations applicable to tenure holders that efficiently target viable offset opportunities. This is doubtful. Given the general sense that the opportunities for forest management credits are somewhat marginal, this approach is economically risky. [Note that much of the impetus behind the concept of offset credits is precisely to avoid the inefficiency of this type of regulation.]
  - raises a difficult philosophical issue in that it creates two types of forest practices regulation—some for the general public good, some also for government’s commercial advantage. Of course, increasing carbon removals is in the public interest. But if the motivation for the regulation is government revenue from offset credits, it invites the question whether the government ought not promote the carbon removal in the public interest and forego the revenue.

- Crown, as a short-term measure, makes ad hoc tenure arrangements specifically to facilitate targeted opportunities, for example the eco-based forestry and beetle opportunities.

The regulatory approach may or may not be attractive as a general strategy; however, the example of eco-based forest management discussed below provides an opportunity to test the appeal and workability of the mechanism. The ad hoc approach is discussed further in Section IV.3 below.

#### *A Note on Ownership*

The question of “ownership” arises quite frequently in discussions of carbon credits. This note seeks to clarify the matter.

There does not appear to be any doubt that the Crown owns the carbon on Crown lands and included in Crown resources. However, this does not give the Crown any entitlement to offset credits. The latter are a creature of the federal government.

Notwithstanding the Crown’s ultimate ownership of the carbon, existing tenures may convey rights to undertake activities that sequester carbon and may convey some rights to the carbon. However, they do not explicitly convey any rights to claim offset credits from the federal government. Without an explicit conveyance of such a right, it would be imprudent for a tenure holder to assume it possesses one; but, no doubt, the point could be argued.

However, while it may be an interesting theoretical question whether rights to create offsets and claim offset credits have already been conveyed in certain tenures, the question does not seem particularly relevant. Canada will only issue offset credits where ownership is clear—any ambiguity that may now exist is unhelpful to the tenure holder. Perhaps more important is the question whether existing tenures are well designed for the purpose of encouraging investment in carbon sequestration. If not, the question becomes moot.

For these reasons, this report focuses on the kinds of tenure reforms necessary to facilitate carbon sequestration. Clarifying rights to claim credits is one important aspect of tenure reform but it is not the only one.

## **IV.2. A Supportive Policy Environment**

This section addresses the main elements of a provincial policy regime that would facilitate private sector investment in incremental sequestration projects.

### *Ownership:*

Project proponents need to be able to demonstrate clear ownership of any “sink” for which they are seeking certification. As discussed above, for sequestration projects on Crown land, it will be necessary for British Columbia to award proponents the right to claim any offset credit for which they are eligible.

### *Linkages to Canadian Offset System:*

As noted above, the Canadian requirements for approving and certifying offset credits are quite onerous. As a general rule, project proponents should be primarily responsible for addressing these federal requirements. However, it seems likely that British Columbia can play a facilitation role. For example, clear rules pertaining to tenure holder obligations could be helpful in defining the “baseline” for measuring incremental sequestration. Provincial inventory and carbon accounting systems could be used to assess any “leakage”. Several years ago, British Columbia set up an office to facilitate third party certification of tenure holder forestry operations in the province. A mechanism along the same lines might prove useful if demand warranted.

### *Revenue System*

The Crown should be entitled to revenue generated by offset projects utilizing Crown land and resources. A key requirement of a revenue system is that it recognize the nature of the sinks and the various costs and risks that are involved in sequestration projects. It should be anticipated that the economic rents associated with sinks will be highly variable. In that case, simple revenue systems will likely deter investment unless they are designed to collect only a small fraction of the available rent. In order to capture a larger share, more complex systems will be required.

A second key requirement is that the revenue system provide appropriate incentives. In particular, there should be some mechanism that ensures that any revenue foregone by expanding carbon sequestration is more than offset by the incremental revenue associated with the sink.

These are both challenging requirements, especially in the case of forestry projects.

### *Tenure System*

Apart from conferring rights to the sink, the tenure systems should be designed to facilitate investment in sequestration projects. Typical sequestration project requirements will include:

- rights to undertake the activities involved in sequestration
- rights to the associated credit and any by-products (e.g. mature timber)
- sufficient control over the site—to prevent actions that interfere with the performance of the sequestration project

While these issues appear to be quite manageable for geological sequestration projects they raise very difficult issues, to be discussed below, for forestry projects.

### *Regulatory Requirements*

Sequestration projects will be subject to all generally applicable regulations for the activities in question. For many types of project, existing regulations appear to be adequate. This may not always be the case. For example, it is likely that geological sequestration projects may require updated or modified regulations in some areas.

## **IV.3. Opportunities and Actions**

To date there has been relatively little pressure on the province to address the issues noted above. This may simply reflect the apparent limited opportunities for carbon sequestration in the province. Nevertheless, there are opportunities. Part of a good business and investment climate is an ability to foster their growth. It is possible that with action along the lines indicated, the potential will prove greater than presently anticipated.

Making headway on forest management sequestration projects appears, in general, to be a long-term proposition. This topic is discussed in the following section. Here we focus on what might be done in the nearer term future. The types of opportunities discussed are:

- geological sequestration
- afforestation of marginal lands
- selected forest management opportunities in tree farm licenses, protected areas and eco-based management areas

### ***Geological Sequestration***

As noted above, geological sequestration projects raise a number of issues from both a regulatory and tenure perspective.

In a recent report, the CO<sub>2</sub> Task Force set by the Interstate Oil and Gas Compact Commission (IOGCC), which comprises 37 oil and gas producing U.S. states and 4 affiliate Canadian provinces (including British Columbia), has found that current regulations for the capture, transportation and injection of CO<sub>2</sub> are reasonably adequate, and that they need only minor adaptation.

However, there are key unresolved issues pertaining to long-term storage. This is not surprising, bearing in mind that the carbon sequestered is intended to remain securely stored over geological time scales. The main issues that arise for British Columbia appear to be:

- **Assured Long Term Storage:** appropriate geological formations are believed to provide virtually permanent storage with minimal leakage. However, it is not yet possible to predict with confidence storage volumes, sequestration integrity, and the fate of injected CO<sub>2</sub> over long periods of time. There is a need to develop better predictive models and protocols and mechanisms for verifying storage and measuring leakage. This is likely to involve a significant technical effort.
- **Potential Environmental Impacts:** As well the regulatory framework must be updated to address the potential impacts of leakage on the environment. Leakage of CO<sub>2</sub> from a sequestration site may contaminate groundwater; if it seeps towards the surface, it may affect vegetation and animal life. Leakage may also contaminate adjacent energy or mineral resources.
- **Ownership:** at present there is no mechanism for providing rights for the use of the pore space to be occupied by injected CO<sub>2</sub> or for the right to any available offset credit. The tenure system will also have to address how to deal with the potentially conflicting rights of other tenure holders be they surface or sub-surface rights holders. Revenue systems will also have to be adapted.
- **Liability:** given the geological time scales involved and the potential risks, the assignment of liability for the various risks is critical. Without means of adequately quantifying the risk and providing acceptable financial security, liability will likely revert to the Crown at some point. This should be borne in mind.

These issues could prove to be quite challenging. However, these same issues are all faced by other jurisdictions. There is no reason why, with a focused effort, British Columbia could not attain a leading edge position in developing a responsible tenure and regulatory regime to govern long-term CO<sub>2</sub> injection and storage. Given the long-term nature of these issues, this would likely involve a significant public involvement process.

It seems likely that the issues, however challenging, can be resolved. In that case, British Columbia would be in a position to compete for these geological sequestration opportunities.

The main constraint to geological sequestration at the present time is that only a small fraction of the total gas stream (from the set of emitters within economic distance of suitable sites) is economically recoverable. New lower cost recovery techniques for leaner streams are under development and may eventually come into widespread use.

### ***Afforestation of Marginal Lands***

Afforestation projects by their nature involve a conversion from one land use to another. Typically, in British Columbia, that requires a change in tenure. Thus, these projects raise two separate issues: the efficiency of the tenuring process and the design of suitable tenures for the projects.

#### *Land Use Conversions*

With respect to conversion, in principle government supports changes from lower-valued to higher-valued land uses. If the potential value of an offset credit triggers a re-ranking of alternative land uses, the tenuring system should accommodate the change.

In practice, there are challenges. Higher valued uses of Crown land should generate higher revenues for the Crown. But, given the differing types of revenue instruments and their varying approaches to resource rent capture, this cannot be assured. There is nothing in place that requires approval of a new land use to be contingent on the new use paying the opportunity cost of alternative uses.

Setting aside the government revenue issue, there are other institutional barriers. The difficulties experienced by the former Land and Water B.C. and Ministry of Forests dealing with prospective conversions of forest land for development purposes illustrate the point.

#### *Tenure Design*

Turning to tenure design, it is clear that the appropriate form of tenure depends on the desired end use of afforested sites. The two most obvious options are conservation and forest management (i.e. including periodic harvesting); but there may be mixed options as well.

Where forest operations are envisaged, the economics of the project may depend on future harvesting. At present, Crown forestry tenures do not convey rights to the “next crop”.

In either case, offset projects involve “up front” costs with the offset credit issued later upon verification of actual carbon removals. Project sponsors will no doubt want to be able to control the project risk, and are likely to require some form of authority to manage the site and prevent interference with carbon uptake. This would take the province in the direction of some form of tenure conveying more exclusive rights to an area, a major departure from traditional practice with implications for public infrastructure planning and other stakeholders (e.g. mineral, oil and gas, guide outfitters, and others).

At present there appears to be little demand for afforestation. Should such materialize, presumably in connection with marginal agricultural or range land, it would be worth considering an ad hoc approach whereby the responsible agencies could work together to arrange for an efficient transfer of management responsibility and develop a tenure instrument suited to the specific circumstances. This might be done under the *Land Act* or new legislation. At least in the near term future, it should *not* be approached as a forest tenure reform issue.

### ***Selected Forest Management Opportunities***

Sequestration through enhanced forest management has limited potential in British Columbia; and the current tenure system certainly does not help. There may be certain situations where the constraints of the present system matter less. These include:

#### *Tree Farm Licenses*

Tree Farm Licenses are area-based and given the holder more management responsibility over the area. This would tend to make sequestration projects more viable under this form of tenure than under volume-based tenures. Nevertheless, TFLs do not convey rights to the next crop and are not exclusive. However, it would be easier to strengthen certain of the tenure rights conveyed in TFLs than in volume based tenures.

#### *Protected Areas*

Reforestation of damaged habitat in protected areas may have potential for carbon sequestration. B.C. Parks is presently planning a pilot reforestation project in Manning Park.

Projects in protected areas have certain disadvantages: they will typically be small scale; they may entail higher costs in order to meet park objectives; and they will not generate future timber values. However, because they are in protected areas, there are no conflicts with other tenures that might otherwise interfere with carbon uptake. BC Parks’ direct authority over protected areas eliminates institutional barriers that might affect other Crown lands.

The potential turns simply on economics. Work done by BC Parks to date suggests that the volumes are very small and the overall return very sensitive to initial cost.

#### *Eco-based Forestry Management Areas*

Eco-based forest management is being proposed for the Central and North Coast LRMPs. Although the details are not finalized, it seems likely that EBM will result in increased carbon sequestration.

Assuming that EBM is in some sense imposed as some kind of regulatory requirement, the features of the tenure system that would otherwise facilitate or discourage sequestration become irrelevant. The sequestration will occur whether or not the practices are economic. Further assuming that the incremental costs of complying with EBM are recognized in the timber pricing system, all or most of the value of any offset credit could rightfully be claimed by the Crown, possibly subject to revenue sharing with First Nations.

Although EBM should result in increased carbon sequestration relative to conventional forestry, the fact that it is imposed as a regulatory requirement may raise issues respecting eligibility for offset credits. In further planning for EBM consideration should be given to the mechanics of implementation in order not to unnecessarily weaken the case for eligibility.

#### **IV.4. Long-term Forest Tenure Reform**

There has been interest in the past in extensive forest tenure reform, generally involving a shift to area-based tenures with stronger property rights, including rights to future timber crops and, perhaps, certain non-timber forest values. As discussed above, a shift in this direction seems to be essential to any significant increase in forest management sequestration beyond the special cases already noted.

The concept has not, however, advanced very far. This is in part due to public concerns that such a shift would weaken public oversight of the forest and weaken public access rights to the forest. However, there have also been other significant barriers:

- ❑ technically, the conversion of volume-based tenures to an area-based system raises very difficult issues: current rights to volume have to be translated into specific areas on the ground in a manner which preserves some equity among tenure holders. The current mountain pine beetle infestation further complicates this challenge.

- ❑ tenure reform on this scale has generally been seen as practically impossible until such time as significant further progress has been made in resolving First Nation treaty issues.
- ❑ finally, given the above, there is a general perception that for the most part the gains from such a reform do not warrant the effort: given British Columbia's growing conditions, stronger property rights are not expected to lead to a significant increase in private sector investment in forest management.

Notwithstanding these concerns, there is still some validity to the argument that tenure reform along the lines indicated is a natural continuation of recent market-based forest policy reforms. If associated with a stronger separation of forest management and processing operations within industry, there could be benefits to both sides: greater specialization in forest management by tenure holders; a stronger role for market forces to allocate logs to their best uses; and a greater focus on the part of forest companies on product and market development.

The potential for incremental revenue from carbon credits—and, importantly, other non-timber forest values—strengthens the case, perhaps only marginally, for moving in this direction. In addition, as discussed below, the proposed New Relationship with First Nations may provide a vehicle for moving forward while addressing First Nation concerns. This remains, however, very much a long-term directional shift.

In the short to medium term, there may be some potential for further encouraging carbon sequestration through the Defined Forest Area Management (DFAM) initiative. DFAM is an initiative for engaging tenure holders within timber supply areas on joint forest management initiatives at the TSA level. DFAM was envisaged as a vehicle for transferring some government responsibilities, such as for inventory, forest health, and timber supply analysis, to the TSA level. Progress has been slow, in large part because decisions have not yet been made on a new timber pricing system for the Interior and, without this, there is not a firm basis for transferring government costs to tenure holders. If this issue is resolved and DFAM proceeds there may be opportunities to explore carbon sequestration possibilities in some TSAs.

#### **IV.5. First Nations**

Carbon sequestration projects are projects. As such, prior to being approved there must be good faith consultations with First Nations. The consultations will reflect the nature of the projects, as illustrated with the following examples.

- changes in forest management practices to sequester carbon would generally be in a direction consistent with First Nations conceptions of good stewardship and, incrementally, may raise few issues respecting

possible aboriginal rights' infringements. Moreover, these may not raise new consultation obligations but simply alter the scope of consultations that would have been required in any case to address forest management plans.

- afforestation projects, however, involve a permanent change in land use; these may well raise more significant rights issues. Geological sequestration entails the shipment, likely by pipeline, of CO<sub>2</sub> from the emitting source to the sequestration site and could entail consultations with a fairly large number of First Nations potentially impacted by the pipeline.

Likewise, the conveyance of new tenures or the creation of new or modified forms of tenure creates an obligation to consult. The report has already noted how long-term forest reform raises significant First Nations issues, the resolution of which is likely dependent on further progress in treaty talks. This has two dimensions:

- on one hand, the modification of existing tenures to add to the current “bundle of rights” might well frustrate First Nations, notwithstanding there may be sound technical reasons for doing so;
- on the other hand, there may be opportunities to expand the range of rights incorporated within First Nation forestry tenures; this might be of considerable interest if it gave First Nations more flexibility to manage their tenures more in accordance with their views of good stewardship.

More generally, First Nations would likely expect that any Crown revenues derived from the sale of credits would be included among the revenue sources eligible for revenue sharing under accommodation agreements.

## **V. CONCLUSIONS AND RECOMMENDATIONS**

### **V.1. General Findings**

- Addressing climate change in a serious way will be very costly. The use of economic instruments, such as an emission reduction and carbon removal credit trading system can reduce the costs.
- There has been much attention given to the potential for forestry sinks. This in part reflects the provisions of “business as usual” forestry sinks in the Kyoto Protocol and their prominence in Canada’s Kyoto compliance plan. It also reflects the high potential for carbon sequestration in fast growing plantations in warmer climates. However:
  - British Columbia’s potentially significant forest “business as usual” sink does not *increase* carbon removals from the atmosphere; is not eligible for offset credits; and has no direct economic value to the Crown.

- the potential for *incremental* forest sinks in British Columbia is quite limited.
- The value of an offset or incremental sink is the difference between the value of the offset credit and the net costs (taking by product revenues into account) of creating the offset. Despite some global restrictions on the creation and trade of offset credits, it is a global market. In particular, large final emitters in Canada can purchase credits to apply against their reduction requirements on the international market. Thus, British Columbia carbon sequestration projects are in competition with other reduction and removal options from around the world.
- British Columbia's potential for forestry offset credits is limited by its climate, its low population and its short history of development.
  - Most areas naturally suited for forest cover are still under forest cover, hence there is only limited potential for incremental afforestation or avoided deforestation.
  - Forest management may also increase carbon sequestration by encouraging faster timber growth through enhanced silviculture; reducing timber losses due to fire or infestation; or by reducing harvesting through more selective harvesting or conservation. These activities generally involve high costs either or direct outlays or foregone timber revenues.
- British Columbia has good geological potential for geological sequestration—the injection of CO<sub>2</sub> into deep geological formations for secure long term storage. However the capture of CO<sub>2</sub> for sequestration is presently very expensive except for emission sources with large and rich gas streams. Only two percent of western Canadian emissions meet this criterion. There may be longer term potential as continued technical improvements bring down the cost of capturing CO<sub>2</sub> from other emission sources.
- For these reasons, British Columbia's potential is probably quite modest. As a rule of thumb, this report suggests that Crown revenue expectations should be calibrated in tens of millions of dollars per year and, even then, some time away in the future.
- Nevertheless, there are opportunities which warrant further exploration. These include geological sequestration and certain specific forestry opportunities related to eco-based forestry.

## **V.2. Policy Issues**

- Opportunities for geological sequestration raise a number of technically challenging issues for provincial resource managers and regulators. To some extent these are of a similar nature as the issues already being faced with acid gas injection, enhanced oil recovery and other issues. With effort they are resolvable. Long term storage—on a geological time scale—raises some particularly challenging technical and liability issues. Notwithstanding that the potential for large scale geological sequestration is some time off, the costs of getting out in front of these opportunities is quite low. The Ministry of Energy, Mines and Petroleum Resources has a good handle on the issues. It belongs to several different Canadian and U.S. organizations carrying out work in the area. It should be possible for the province to move forward to address the institutional constraints.
- Forestry-based carbon sequestration projects raise very complex issues. The provincial tenure system conveys rights to harvest timber along with certain obligations to manage the associated forest land. However, there are no rights to future timber crops or other non-timber forest values and few tools to manage the land for the highest and best use. These limitations effectively preclude carbon sequestration over most of the forest land base. The problems with the forest tenure system are well known—carbon sequestration is just another example. The difficulty is that the solutions are very difficult—converting from volume to area based tenures is very complex; and creating new area-based tenures without further progress on First Nations treaties is highly problematic.
- The Ministry of Forestry has been working towards at least a partial solution for some of these issues—Defined Forest Area Management (DFAM). It may have medium-term potential as a vehicle for facilitating some carbon sequestration projects.
- In the meantime, it may be possible to make progress in situations that are amenable to ad hoc solutions. Afforestation projects on marginal agriculture or range land, reforestation projects in protected areas, and credit for eco-based forestry may meet this criterion. While there are still barriers to overcome, they appear to be more manageable.

## **V.3. Recommendations**

1. British Columbia should follow a three-pronged approach in pursuing its potential for carbon sequestration:
  - (a) continue to work with the federal government and other provinces on the design of Canada's offset system and issues for the second commitment period;

- (b) pursue specific achievable objectives and opportunities, including geological sequestration, beetle reforestation, and eco-based forest management; and
- (c) work toward a longer term forest tenure reform package that would better facilitate enhanced forest management, including carbon sequestration.

In addition, British Columbia should continue to pursue federal recognition of the province's potentially significant "business as usual" forest sink—albeit not through the offset credit system.

2. British Columbia's priorities in dealing with the federal government on climate change should include:
  - developing an agreed position on carbon stored in long-lived forest products in carbon accounting systems in the second commitment period—there are pros and cons to this concept that need to be further examined (see section II.3.2)
  - ensuring that the federal procedures for approving sequestration projects and awarding offset credits reflect an appropriate balance between workability and environmental effectiveness
  - consideration whether it is in British Columbia's interest to advocate that sequestration proponents have more direct access to the international market for credits.
3. The ministries of Forests and Range, Economic Development and Intergovernmental Relations should develop a strategy for gaining recognition of the provinces "business as usual" forest sink. This could be focused on obtaining a stronger federal commitment to address economic and socio-economic impacts arising from the mountain pine beetle infestation. However, other forms of recognition could also be considered.
4. The Ministry of Energy, Mines and Petroleum Resources should develop an action plan to resolve outstanding tenure and regulatory issues pertaining to geological sequestration and to ensure that British Columbia remains "in step" with other Canadian and U.S. jurisdictions. The plan could include a public involvement process.
5. The Integrated Land Management Agency should explore the potential for obtaining offset credits for the incremental carbon sequestration expected to be arise from eco-based forest management in the North Coast and Central Coast regions. This should include:
  - incorporating estimates of incremental carbon sequestration and associated revenues in EBM modeling;

- design of land use and EBM systems to maximize prospects for federal approval of offset eligibility by ensuring EBM is not positioned as “business as usual” for eligibility purposes.
6. The ministries of Agriculture and Lands and of Forests and Range should commission a “screening” level analysis to identify marginal agricultural and range lands that may be suitable for conversion to forestry.
  7. The Ministry of Forests should consider moving forward with its Defined Forest Area Management system following implementation of a new Interior timber pricing system in 2005/06; and explore the possibility for a second phase of DFAM that incorporates carbon sequestration activities.
  8. British Columbia should carry out preliminary consultations with First Nations at a high level forum, perhaps under a general climate change or a general resource management theme. The key messages should be:
    - there is some potential for carbon sequestration and government is planning to explore options for facilitating investment in this type of project
    - carbon sequestration will generate revenue, will create business and employment opportunities but may also require tenure and regulatory modifications
    - government is committed to sharing revenues on the same basis as other resource revenues; will consult with First Nations on any legislation or regulations—none expected for some time; and will consult with First Nations on specific projects as they come forward.

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## Appendix

### Project Terms of Reference

#### Estimating Benefits of Using Provincial Crown Resources to Create and Trade Greenhouse Gas Emission Reductions Credits (ERC)

##### **Background:**

BC's climate change plan, *Weather, Climate and the Future*, indicates that the Government will continue to assert ownership of all forest sinks and associated benefits (Action 17), develop a policy framework to support the creation of incremental forestry sinks (Action 18) and continue research into the protection of forest carbon sinks.(Action 19).

The Deputy Ministers' Committee on Climate Change asked both that a strategy be developed around the handling of business-as-usual sinks in the face of federal government claims of ownership and that policy be developed on access to Crown resources to be use in the creation of incremental sinks. The latter policy would extend to all resources connected with Crown land.

As a first step to developing both the strategy and tenure policy, an assessment is needed that scopes out the potential net benefits associated with both business-as-usual forestry sinks and incremental forestry and other sinks and other emission reduction projects utilizing Crown resources.

##### **Deliverables:**

Working with a steering committee consisting of representatives of the ministries of Water, Land and Air Protection, Forests, Agriculture and Lands and Energy, Mines and Petroleum Resources the contractor will research and deliver a final report by September 16, 2005 that addresses the points below. An interim report should be presented to the steering committee by July 29 and a draft final report by August 31.

1. Scope the range of potential revenues, and the factors influencing this range, and other benefits available to British Columbia over the period 2008 – 2012 and beyond from:
  - a) Business-as-usual forest management practices, assuming Article 3.4 (forest management) is included in Canada's greenhouse gas accounting, including a high-level consideration of;
    - a. Forest tenure-holder expectations, and
    - b. Aboriginal interests/obligations upon government, and
  - b) The sale of project-based, incremental greenhouse gas emission reduction credits utilizing Crown land resources (ERCs), including increased sequestration on forest lands, geological sequestration, landfill emission reductions and other types of projects.
2. Scope the range of potential complications involved in 1 a) and b) with a specific focus on existing forest tenure arrangements and the legislative/policy options for incorporating GHG management.
3. Discuss the effect on Crown ERCs if the Province were to implement its own forest management carbon credits through forest management policies of general application. These would include consideration of carbon credits in allowable annual cut determinations, interaction with tenure-holder expectations, and aboriginal and community interest groups.