SUSTAINABLE FOREST MANAGEMENT NETWORK
RÉSEAU DE GESTION DURABLE DES FORÊTS
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Natural Capital: Using Ecosystem Service Valuation and Market-Based Instruments as Tools for Sustainable Forest Management

Jay Anderson | Carla Gomez W. | Geoff McCarney | Vic Adamowicz | Nathalie Chalifour
Marian Weber | Stewart Elgie | Michael Howlett

A STATE OF KNOWLEDGE REPORT

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Foreword

The State of Knowledge program was launched by the Sustainable Forest Management Network (SFMN) to capture the knowledge and wisdom that had accumulated in publications and people over a decade of research. The goal was to create a foundation of current knowledge on which to build policy, practice and future research. The program supported groups of researchers, working with experts from SFMN partner organizations, to review literature and collect expert opinion about issues of importance to Canadian forest management. The priority topics for the program were suggested by the Network's partners in consultation with the research theme leaders. Each State of Knowledge team chose an approach appropriate to the topic. The projects involved a diversity of workshops, consultations, reviews of published and unpublished materials, synthesis and writing activities. The result is a suite of reports that we hope will inform new policy and practice and help direct future research.

The State of Knowledge program has been a clear demonstration of the challenges involved in producing a review that does justice to the published literature and captures the wisdom of experts to point to the future. We take this opportunity to acknowledge with gratitude the investment of time and talent by many researchers, authors, editors, reviewers and the publication production team in bringing the program to a successful conclusion.

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Executive Summary

Natural capital is the stock of ecological assets which provide a flow of goods and services that people value. For example, wetlands are considered natural capital as they provide a number of ecosystem services, such as water filtration and carbon sequestration. Many ecosystem services arise from functioning ecosystems whose productivity is determined by the amount and quality of the stock of natural capital, and by corollary the extent to which it is depreciated.

A particular challenge in managing natural capital is that while many services from ecosystems may be highly valued, these values are not captured by prices or reflected in the incentives facing land managers or decision-makers. This report explores the question of whether valuing ecosystem services and creating new markets for them can help guide sustainable forest management.

As more people rely on Canada's forests for a variety of uses there is concern that the cumulative environmental effects of increased forest activity could be substantial. Although Canada's forestland is abundant, the sum of impacts from individual development projects could significantly diminish the flow of ecosystem services. This is particularly true in areas that are hotspots for development, such as the Western Canadian Sedimentary Basin.

Valuation has emerged as a tool to address cumulative environmental effects. By assigning monetary values to ecosystem services, it allows the value of these services to be compared to market values arising from other uses, such as timber harvest. Valuation is thus a powerful tool for making a "business case" for conservation. In this report we highlight a number of methods for estimating the economic value of ecosystem services that flow from forests.

Valuation of ecosystem services can be challenging, but is useful in many contexts. However, deliberate and explicit *monetary* valuation is not always required for conservation policy. For example, valuation may not be necessary if it is clear that we are near a tipping point after which irreversible effects on ecosystem services will occur. Values may also emerge implicitly through the development of artificial markets for ecosystem services. The role of valuation can be to make a case for conservation policies or to evaluate whether specific policies are generating net benefits to society. As such, valuation is a component in a continuous improvement model of forest management policy.

This report also examines market-based approaches to conservation. Market-based approaches are generating substantial interest in policy arenas as they are more flexible than command-and-control regulatory approaches, such as performance-based standards. This flexibility reduces the costs of meeting ecological or environmental objectives. It also encourages experimentation and innovation in new environmental technologies. In addition, market-based approaches can help reveal the implicit economic value for the ecosystem service.

This report provides a detailed examination of two market-based instruments that could be particularly powerful for promoting sustainable forest management in Canada: tradable disturbance permits and forest carbon tendering. Tradable disturbance permits set a limit on the amount of land that can be disturbed annually, in order to maintain a desired stock of intact forest. Companies or other agents that wish to cut or otherwise disturb the forest in a given time period (e.g., one year) are required to have a permit. The permits can be auctioned to firms or they can be grandfathered based on historic use, similarly to how rights to emissions allowances are allocated in air pollution trading systems. Generally speaking, tradable disturbance permits ration access to the land so that it goes to the highest value. This minimizes the cost of conservation while at the same time revealing the economic value of land for non-conservation purposes.

Forest carbon sequestration is an important forest ecosystem service for which both regulated and non-regulated markets are emerging. For forest carbon management, an important issue is who owns and/or has a right to sell public land forest carbon. For example, should it be the province or a tenure-holding forestry firm? One solution is a carbon tendering system where the province requests bids from forestry firms to sequester carbon. The tender system allows the province to retain the ownership of carbon while paying firms for carbon management. The tender system creates competition between forest companies for the right to supply carbon, resulting in lower carbon management costs to taxpayers.

There are many challenges to introducing market-based instruments. This report explores challenges related to ecological complexity, economic valuation techniques, institutional challenges (such as the lack of information and/or policy-making capacity required to develop market-based approaches), challenges related to fairness and equity, and jurisdictional and legal challenges (such as existing property and constitutional rights).

The value of ecosystem services is increasingly being recognized. But without methods for land mangers to capture these values, the natural capital which provides these services will continue to be depreciated by the cumulative effects of development, jeopardizing the sustainability of these values over time. Valuation is a useful tool for designing policies that allow land managers to internalize these values in their forest management decisions.

This report focuses on potential opportunities for market-based policies for sustainable forest management. Market-based approaches are not appropriate for all forest management problems. However, they are a useful approach for coordinating the activities of multiple economic agents (forest companies, mining companies, etc.) to meet an overall conservation objective. The challenge lies in matching instruments to specific problems. Market-based policy approaches have not yet been seriously considered. However, as this report hopes to show, they have the potential to be valuable components of sustainable forest management.

1.0 Introduction

1.1 Issues and objectives

A principle of sustainable forest management (SFM) is to incorporate within forest management practices a broad set of objectives related to the overall ecological integrity of a forested landscape. Accordingly, SFM attempts to include non-timber forest values – such as carbon storage, biodiversity, wildlife habitat and recreational opportunities – alongside more traditional forest management goals, such as sustained yield. Failure to measure the non-timber values provided by ecosystems often means they are assigned a default value of zero in forest management decisions. While economic analysis is not, and should not be, the only input into forest management decisions (other factors might include ethical, cultural or historical considerations), economic valuation is nonetheless helpful in enabling us to compare the costs and benefits of alternative forest management decisions across the full suite of market and non-market benefits (Pagiola et al. 2004).

Economic valuation forces us to be explicit about assumptions regarding the impact of ecosystem management decisions on stocks of natural capital, on flows of ecosystem services (ES)[1], and, accordingly, on human well-being. It allows decision-makers to identify and evaluate trade-offs, and if appropriate, to consider the trade-offs in policy design (Heal et al. 2005). One means of evaluating trade-offs is benefit-cost analysis (BCA). Through the use of valuation methods and discounting, it is possible to quantify the costs and benefits of a proposed policy in present-day dollars. BCA recognizes that development decisions come at a cost to both current and future generations, since forest resources are no longer available for providing ES.

A particular challenge in the adoption and implementation of SFM is that many non-timber forest values are not captured or reflected in the incentives facing land managers or decision-makers. Governments in Canada have traditionally relied on command-and-control policies for managing forests, and the goals of forest policy have largely been focused on managing the sustainability of timber yields rather than forest ES. As a result, forest managers receive few rewards for incorporating non-market ecological values into their management plans, and instead often incur costs and resistance. Incentives for both timber and non-timber forest values need to be incorporated within a SFM framework.

There is a global trend towards developing markets for ES to complement traditional forest policy in order to enhance the provision of ES from forest landscapes. In practice effective market-based approaches present several challenges. These include getting the prices "right", setting appropriate targets, and providing sufficient incentives. Although economic valuation plays an important role in addressing these challenges, in Canada the relevance and potential benefits of ecosystem service valuation as a tool for SFM are not well understood.

[1] The term "ecosystem services" (ES) as used in this report refers to the full range of benefits that people obtain from a natural ecosystem. This includes both tangible products (goods) resulting from ecosystem processes, and ecosystem services such as the regulation of climate and pollination services. See Section 2.1 for additional discussion.

A recent environmental performance report by the Organization for Economic Co-operation and Development (OECD 2004) criticizes Canadian policy-makers for failing to conduct rigorous economic analysis of policy alternatives, and for not using policies that are market-based. Addressing such criticism requires educating policy entrepreneurs who can then play a role in reforming Canada's environmental and resource policy (Adamowicz 2007). This report is intended to describe the role of valuation and market-based policies in natural resource management, including sustainable forest management, and thus inform the next generation of forest policy in Canada.

This report synthesizes current approaches to defining, measuring and implementing incentives for managing the non-timber values associated with forest ecosystems. It also summarizes lessons learned from other jurisdictions and contexts that are relevant to sustainable forest management in Canada. In particular, the report follows the recommendation of the National Round Table on the Environment and the Economy (NRTEE 2005) and explores market-based approaches for the provision of ES from forests.

1.2 Report outline

There is increasing discussion in popular and scientific literature on the merits of assigning economic value to ES. It is believed that such valuation is helpful in improving natural resource and environmental management. The report synthesizes the available literature on ES valuation, on MBIs, and on specific applications to SFM. Where gaps in the literature remain, expert interviews are used to shed light on the application of ES valuation and MBIs to SFM, and to assess their benefits and limitations based on experience in several countries.

Section 2 explores the methods and challenges of economic valuation. After discussing the current state of knowledge, as well as the barriers to valuation, this section concludes by describing the relationships between market-based instruments, valuation, and the provision of ES.

Section 3 delves into specific policy mechanisms that can be used for ES provision, with a focus on market-based instruments. This section compares traditional command-and-control policies with more modern market-based policies, and outlines some challenges related to the Canadian context.

Section 4 discusses a number of legal and constitutional challenges involved in moving towards more market-based policies for SFM. While the list of issues discussed is by no means exhaustive, the section aims to illustrate how legal issues must be considered in the selection and design of market-based instruments.

Similarly, Section 5 focuses on the political challenges involved in changing the traditional command-and-control policy environment, emphasizing the impact of policy inertia.

Section 6 looks at how other jurisdictions have made inroads towards market-based environmental policies. It highlights some lessons learned when moving from theory to practice, and identifies some possible pitfalls that might be unique to Canada. The section concludes by giving more details about tradable disturbance permits and forest carbon offsets. Section 7 concludes the report with a brief overview of the lessons learned.

2.0 Economic valuation of natural capital

2.1 Natural capital and ecosystem goods and services

Ecosystem services (ES) are the full range of benefits that people obtain from a natural ecosystem, including "the conditions and processes through which natural ecosystems, and the species which make them up, sustain and fulfill life" (Daily 1997a: 3).

Ecosystem services (ES) are the full range of benefits that people obtain from a natural ecosystem.

The key economic concept is that ES generate ecological benefits either directly valued for human use, or are used as inputs into production processes from which things of value to humans are derived (Brown et al. 2006). Essential to any economic definition of ES is their fundamental contribution to human well-being.

Many authors separate the concept of **ecosystem goods**, which are the generally tangible products resulting from ecosystem processes, from that of **ecosystem services**, which, in most cases, provide improvements in the condition or location of things of value (Daily 1997a).

Examples of ecosystem goods include natural products such as food, water and timber. Examples of ecosystem services include the regulation of climate, pollination services, erosion control and watershed management. There are cases in which the conceptual separation of ecosystem goods and ecosystem services can be more difficult, however, such as the provision of recreational or cultural benefits (Brown et al. 2006).

In this report, we generally use the term ES to refer to both ecosystem goods and ecosystem services as described above. A number of substitute terms representing the same concept also appear in the literature, including "ecosystem goods and services" and "environmental goods and services". In this document we adopt the term ecosystem services based on the standard set by the Millennium Ecosystem Assessment. While some ES (e.g. timber) are bought and sold on markets, many are not (e.g., enhanced recreational experiences arising from improved water quality).

Economic valuation of ES is the process of assigning monetary value to ecosystem goods and services. It usually refers to valuation of ES that are not normally marketed.

Economic valuation of ES is the process of assigning monetary value to such goods and services, whether they are marketed or not. In practice, the term is usually used with reference to ES that are not normally marketed. ES valuation can be described as the process of

> "(a)ssigning monetary value to environmental factors (such as the quality of air and water and damage caused by pollution) that are normally not taken into account in financial valuation." (www.BusinessDictionary.com, accessed July 10, 2009)

Natural capital is the stock of ecological assets which provide a flow of ecosystem goods and services. For example, wetlands are considered natural capital as they provide a number of ecosystem services, such as water filtration and carbon sequestration.

To fully assess sustainable forest management (SFM) we must account for the effect of decisions on the depreciation or appreciation of natural capital, including its capacity to sustain non-market benefits (Adamowicz 2003). An example of such rigorous accounting of natural capital in forests is provided by Kriström and Skanberg (2001), who not only consider the value of timber and non-timber ES, but also the depreciation in the stock of forest capital and its impacts on recreational experiences and productivity of the forest landbase.

Several challenges arise in measuring ES from natural forest capital, and in setting objectives for managing them. **Substitutes for natural capital**, made by humans, can often replace lost ES flows. For example, if removing the forest surrounding a river results in diminished drinking water quality, humans may build a water treatment plant as a substitute.

In other instances there may not be good substitutes for natural capital (e.g. coral reefs). There also may be cases where human-made capital is a good susbstitute for natural capital but the cost of producing human-made substitutes cost is higher to society than the cost to protect the original ES in question (Brown et al. 2006). For providing specific services, protecting natural capital is sometimes a cheaper solution than building human capital. For an example, see Box 1.

BOX 1

The Catskill watershed (Heal 2000)

In the 1990s, water entering New York City from the Catskill watershed had fallen in quality to the point where a new filtration plant was required. Capital costs for the plant, not including ongoing operating costs, were estimated at $6 to $8 billion. Repairing the watershed was estimated to cost only $1 to $1.5 billion. The decision was clear.

The watershed agreement is also believed to have boosted the upstate economy at a rate of $100-million a year, with much of this economic stimulus coming from the following (Kenny 2006):

- *Increased employment*. New York City pays upstate locals to work for the city and state Department of Environmental Conservation. Local contractors are paid to install septic systems, upgrade wastewater treatment plants and set up storm-water-protection measures.
- *Increased subsides for environmental improvement.* Farmers receive reimbursements for building fences and bridges that keep their livestock away from waterways. Landowners are paid to keep forests undeveloped.
- *Increased ecotourism.*

2.2 Ecosystem goods and services and economic valuation

> Analysis of "the increasingly vexing trade-offs between natural ecosystem preservation and conversion to other uses ... clearly requires, above all, the explicit establishment of a basis for value." (Daily 1997b: 365)

Any decision involving natural capital requires the analysis of a host of trade-offs. These include trade-offs between current and future provision of both market and non-market goods and services.

From a forestry perspective, assessing ecosystem trade-offs includes addressing those that arise from the multitude of values facing forest managers: values for timber, water, biodiversity, and countless others. As a means of dealing with this complexity, economists assume that individuals hold values for the multiple services that ecosystems provide (Box 2).

BOX 2

Some key concepts of economic value

- In economic terms, "value" is the amount that an individual would give up (in money or other resources) in exchange for another good or service.
- Value can also be measured as the amount that an individual would require in compensation to give up a good or service and be as well off as they were before the exchange.
- In principle, value can be measured using any units, but money is a useful measure as it provides a common unit of analysis.
- Value is usually not the same as price. Indeed, many goods and services, including ES, may not have prices, but they have value in that individuals would be willing to give up something in exchange for these goods or services.
- Economic values are relative and therefore often measured in terms of a "change", e.g., what would individuals be willing to exchange (pay) for an increase in water quality, or an improvement in scenery at a recreational site?

One way of explicitly establishing a basis for valuing ES is to consider their total economic value. Broadly defined, the **total economic value** of forest-based ES includes both **use** and **non-use values** (Heal et al. 2005):

- **Direct-use values** include **consumptive uses** (e.g., harvesting of timber, mushrooms, wildlife, etc.) and **non-consumptive uses** (e.g., hiking, bird watching).
- **Indirect-use values** include **ecological services** that maintain and protect natural and human systems (e.g., maintenance of water quality and flow, flood control and storm protection, nutrient retention and micro-climate stabilization, and the production and consumption activities they support).
- **Non-use (existence and bequest) values** include the value of forest-related ecosystems and their components, regardless of their current or future use possibilities. They include, for instance, cultural and aesthetic values, heritage values, and significance to future generations.

Use values stem from direct human interaction with an ES, either now or in the future. Such values may be derived from direct use (in either a consumptive or non-consumptive manner) or indirect use (e.g., benefits from forest contributions to water regulation). Non-use values refer to values that arise from knowledge of the continued existence of a resource, but are unrelated to its use. The terms "non-use", "passive use", and "existence" value are generally used synonymously in the literature (Heal et al. 2005).

Despite the lack of a market price for many of these ES, there are methods for estimating their economic value, as outlined below (Section 2.3).

Economic valuation of non-market ES is important for several reasons. It can help to:

- Establish which ES individuals assign greater value to;
- Provide assistance to policy-makers in setting standards and objectives, in evaluating competing policy options, and in designing mechanisms for ES provision;
- Measure the benefits and costs of different policy options that alter ES conditions (Pagiola et al. 2004).

The objective of economic valuation is to inform decision-makers on the benefits and costs of a course of action.

The objective of economic valuation is to reliably and objectively inform decision-makers on the benefits and costs of a particular course of action. It is frequently not enough to know merely that ecosystems are valuable in a general sense; it is important to know their value in economic terms, and to determine how that value may be affected by alternative management actions (Pagiola et al. 2004).

One means of evaluating trade-offs is benefit-cost analysis (BCA; see Box 3). In BCA, decision-makers must consider not only the direct costs of particular ES management decisions or objectives, but also the opportunity costs (i.e., the value of the next best alternative foregone as the result of making a decision).

Such analysis requires a common unit of measurement for comparing different provision possibilities. Economic valuation attempts to provide a common unit, by measuring changes in ES provision on human welfare and then expressing these changes in dollars.

KEY POINTS

- Economic valuation can provide indicators of how ecosystems, both individually and collectively, contribute to the economic welfare of society (Brown et al. 2006).
- Without proper valuation, the benefits attributed to ES are often incomplete, misattributed and misleading (Pagiola et al. 2004).
- For example, improved water management using forests has value because it may improve recreational fishing, increase property values for cottage owners, and provide an alternative to water treatment by a municipality. Without valuation the significance of these linkages may not be apparent.
- By identifying the social costs and benefits of a change in the stock of natural capital, economic valuation explicitly quantifies the economic trade-offs associated with competing alternatives (Montgomery et al. 1994).

BOX 3

Valuation and benefit-cost analysis

Through the use of valuation methods and discounting, it is possible to quantify the costs and benefits of a proposed policy in present-day dollars. Benefit-cost analysis (BCA) recognizes that decisions come at a cost both to current and future generations, for instance if they diminish forest resources available for providing ecological goods and services.

A particularly powerful aspect of BCA is that it provides a means of combining heterogeneous views of what is desirable, as well as accounting for the loss of benefits in the future (Heal et al. 2005). Valuation provides a common metric for aggregating these various preferences. Individuals can be all given the same weight, or groups of individuals can be given greater or lesser weight. By assigning values to the preferences of all individuals, the benefit-cost approach provides a mechanism for informing decisions that incorporates multiple perspectives (Heal et al. 2005).

2.3 Valuation approaches

A number of approaches and techniques have been developed to quantify ES values in monetary terms. Some methods are better at estimating particular components of total economic value than others. All the approaches assess how individuals or groups make trade-offs between various goods and services.

As shown in Table 1, these approaches can be classified according to whether the valuation method is based on observed economic behaviour (revealed preference approaches) or is based on hypothetical responses to scenarios elicited by surveys (stated preference approaches). Some valuation approaches tend to be more applicable to certain ES, as shown in Table 2. Another approach to valuation, the benefits transfer approach, uses values collected in other regions and/or policy contexts to approximate values required for another region or context of interest.

The upcoming subsections describe the valuation approaches listed in Table 1, and give examples of empirical valuation studies. Some results are summarized in Table 3. All values shown have been adjusted for inflation using the Bank of Canada (2009) inflation calculator. In cases where the valuation study was not conducted in Canada, the value estimates have been converted to 2009 Canadian dollars.

Table 1 Valuation approaches

REVEALED PREFERENCE APPROACHES
• Market prices • Production function methods • Travel cost methods • Hedonic methods • Replacement cost methods
STATED PREFERENCE APPROACHES (SURVEYS)
• Contingent valuation (contingent analysis) • Choice experiments (conjoint analysis)

Adapted from Freeman (2003) and Heal et al. (2005).

Table 2 Applicability of valuation approaches to different ecosystem goods and services

Valuation method	Ecosystem goods and services – potential application for method
REVEALED PREFERENCE APPROACHES	
• Market prices	• Carbon sequestration
• Production function methods	• Habitat-wildlife interactions
• Travel cost methods	• Recreation
• Hedonic methods	• Aesthetics
• Replacement cost	• Water filtration, erosion control, etc.
STATED PREFERENCE APPROACHES (SURVEYS)	• Wildlife conservation; existence value

Adapted from Heal et al. (2005).

Table 3 **Examples of of valuation studies designed to estimate economic value of ecosystem services (ES)**

ES of interest	Valuation approach[1]	Study	Study area	Valuation estimate[2]
Drought mitigation through forest conservation	Production function	Pattanayak and Butry 2005	Indonesia	Increase in agricultural profits of $10-$26/farm
Moose hunting	Travel cost (traditional model)	Sarker and Surry 1998	Northern Ontario	$237-$285/trip
Impact of forest fire on backcountry canoeing	Travel cost (random utility model)	Boxall et al. 1996	Manitoba	Welfare loss is between $3.72 and $27.88/trip.
Impact of different forest management plans (FMPs) on traditional use by Aboriginal people	Travel cost (random utility model)	Adamowicz et al. 2004	Two communities in northern Saskatchewan	Depending on the FMP, Community 1 gained either $27 or $165/year; Community 2 lost either $207 or $3,054/year
Impact of different forest fire intensities on hiking and biking	Travel cost (random utility model)	Hesseln et al. 2003	New Mexico	Depending on burn intensity, the impact of fire on value per trip is $117-$170 (hiking) and $13-$196 (biking)
Impact of logging on fishing	Hedonic	Hunt et al. 2005	Northern Ontario	Reduced the price of fishing package by $32
Increasing caribou herd from 400 to 600	Contingent valuation and choice experiment (conjoint analysis)	Adamowicz et al. 1998	Alberta	$118-$178 per household per year
Conserving natural capital in forests including carbon sequestration and other ES	Benefits transfer	Olewiler 2004	Fraser Valley, BC	$164-$6,650/ha in carbon sequestration, $147/ha in other ES

[1] See references cited for more details.

[2] All estimates have been adjusted for inflation using the Bank of Canada (2009) inflation calculator and are in 2009 Canadian dollars.

2.3.1 Valuation using market prices

Market prices are available for some ecosystem goods, such as timber. In such cases, market price appraisal is the easiest method for quantifying consumer valuation, assuming the absence of any market failure or distortion (Heal et al. 2005). Market price analyses simply require data on the quantity of the ES in question, as well as the market price (e.g., see Emerton and Bos 2004).

The usefulness of market prices in assessing values is often limited, however. Market prices may not adequately reflect a product's full social value, constituting a form of **market failure** (Box 4). This is the case for many ES. Prices may not reflect social values if the markets are not competitive or are affected by subsidies. It can also occur if the creation of the marketed product generates **externalities** (uncompensated effects on other users or resources). Market failure can occur not only with traditional products such as timber, but also with previously non-market goods for which markets are now emerging, such as carbon.

BOX 4

Externalities and market failure

Externalities occur when a market price does not reflect the full costs or benefits of a good or service, or when the value of the product is ignored altogether (as is the case with many non-market ES). For instance, production of a marketed good may lead to pollution and associated costs that are borne by the public or other "downstream" users rather than by the producer.

Market failure refers to a situation where the market price for a product does not include the full value of the product's true costs or benefits. An extreme case is when products are not marketed at all. Market failure is common for many ES, whether marketed or not.

The absence of markets for many ES means that those who supply them are not rewarded for all of the benefits that they provide to society. Conversely, those who adversely affect ES do not bear the full social costs of their actions.

2.3.2 Production function methods

Some ES do not have a market price, but are used as inputs for the creation of other marketed products. The production function method calculates the impact of a change in ES on productivity of the marketed product for which it is an input. For example, timber growth rates are dependent on climate, a non-marketed ES. One value for climate change could be determined through its effect on timber productivity.

Valuation using production function methods generally involves the following two-step approach (Barbier 1994): First, the linkage is established between the non-marketed ES and the marketed ES. Second, the impact of an environmental change is valued by noting the corresponding change in the value of the marketed ES. This method is suitable for ES which are direct inputs into a marketed commodity.

For example, a production function valuation was used by Pattanayak and Butry (2005) to estimate the economic value of drought-mitigation services provided to downstream farmers by the protective functions of a forested park in Indonesia.

A major challenge of using the production function technique is that it requires biophysical models that can predict how changes in non-marketed ES will affect marketed ES (e.g., see Heal et al. 2005).

2.3.3 Travel cost methods

Even when there is no direct charge to visit an ecosystem, a recreation visit costs people time and money. Travel costs can be used to estimate the value of recreation, and to assess relationships between recreation values and ES (Bockstael 1995). There are two main types of travel cost methods: traditional models and multiple site models (commonly called random utility models).

Traditional travel cost models sample a group of visitors, and use their travel costs and number of visits to estimate the demand for and value of a particular site. The value of the recreation site is estimated based on the assessment of how much recreationists would be willing to pay over and above their current expenditures to visit a given site. For an example involving valuation of moose hunting by means of a traditional travel cost study, see Sarker and Surry (1998).

Multiple-site travel cost models are useful for valuing changes in ecological characteristics that make a particular site attractive for recreation (Heal et al. 2005). Multiple site models evaluate peoples' site choices given a range of possible available sites.

The advantage of multiple-site models, compared to traditional models, is that they can estimate the value of ecological characteristics or attributes of a particular site, as well as the overall value of the site. Since different sites have different associated travel costs and ecological attributes, it is possible to estimate how a particular ecological attribute affects recreation demand.

The main weakness of travel cost methods is their dependence on large and detailed datasets and relatively complex analytical techniques. Data are collected using surveys, which are usually expensive and time consuming. Another criticism is that travelers are often motivated by more than just the destination. In other words, some of the value in visiting a particular site comes from the act of traveling itself; the traveling can actually be an end itself (e.g., see Emerton and Bos 2004).

2.3.4 Hedonic methods

Hedonic methods analyze how various characteristics of a marketed good, including ecological characteristics, might affect the price people pay for a market good (Heal et al. 2005). In an environmental context, such analyses estimate the implicit price paid for each ecological characteristic included in the analysis.

The most common application of hedonic methods in environmental economics is to property sales (Palmquist 1991 and 2003, Taylor 2003). Hedonic methods acknowledge that the selling price for a particular property depends on characteristics not only of the house itself, but also of its surroundings.

For instance, it is conceivable that people buying houses adjacent to Crown land would be willing to pay more if the Crown land was forested with mature trees. A hedonic model can isolate the values for all the characteristics of houses adjacent to public land, including house size, number of bathrooms and whether or not the adjacent public forest is mature. The analysis yields the marginal price people are willing to pay, all other things being equal, for having a mature forest next to their property.

Hedonic methods can also be used to assess how changes in environmental conditions affect the prices of other goods and services. For instance Hunt et al. (2005) analyzed the impacts of forestry operations on the prices of recreational fishing packages in northern Ontario. They estimated that logging around a previously unlogged site reduced the price of the fishing package by about $32 (everything else held constant).

A drawback of hedonic methods is the very large and detailed datasets required. For instance in our example of property value estimates, we need not only the property sales records but also information about the adjacent land, e.g., the nature of its forest cover, and the complexity of the analysis requires a large number of observations.

Also, such analyses yield meaningful results only if buyers and sellers are in fact aware of the ES thought to be affecting their property value. Finally, these analyses work best when transactions costs associated with buying and selling property are relatively low.

2.3.5 Replacement cost methods

Sometimes ES value is estimated from the cost that would be incurred to replace the ES that would be lost after an action of some type (e.g., forest harvesting). Recall the previous example about the Catskill watershed (Box 1). Capital costs for the plant, not including ongoing operating costs, were estimated at $6 to $8 billion (Heal 2000). These are replacement costs, since they are required to replace the ecosystem services provided by the watershed.

There are some reasons that replacement cost methods are often reported. First of all, the data requirements are not terribly onerous. Data are usually compiled from interviews, surveys, direct observation and expert consultation. Hence, in cases where human-created substitutes are possible, replacement cost methods may be a useful valuation tool.

An important issue, however, is that replacement cost is often not a valid measure of the value of ES. Replacement costs may not in fact be related to the demand for the ES, and can generate substantial overestimates of value. For example, if no one was willing to pay for the ES, then replacement cost would significantly overstate the value.

Using replacement costs as a measure of value should be done with caution, as these measures are not necessarily a measure of willingness to pay (or of willingness to accept compensation) for the change in the ES in question.

2.3.6 Stated preference methods (valuation surveys)

For the purposes of this report, both general forms of stated preference methods – contingent valuation (e.g., Bateman et al. 2002), and choice experiments (e.g., Holmes and Adamowicz 2003) – are similar enough to be discussed together. These methods all involve the use of surveys, and all instruct participants to imagine a hypothetical market for ES.

Surveys usually begin by describing a change in ES. Respondents are then asked how much they would be willing to pay for the change, if the change is an improvement in ES.

Contingent valuation surveys elicit respondents' willingness to pay (or willingness to accept compensation) by using either open-ended or discrete-choice questions. (Open-ended surveys let respondents determine their own bids, whereas discrete-choice surveys present a "bid" which respondents must either accept or reject.)

Choice experiments (also known as **conjoint analysis**) typically ask respondents to choose between the status quo and a hypothetical scenario. The scenario is defined by attributes that will include one or several ES (Holmes and Adamowicz 2003).

For example, Adamowicz et al. (1998) use choice experiments to measure the non-use values of preserving woodland caribou, a threatened species, in west central Alberta. The value of increasing the caribou population from 400 animals to 600 was estimated to be between $118 and $178 per household per year, depending on the exact model specification used (see Table 3).

An advantage of stated preference methods is that they can, in theory, be applied to any ES, whether a market exists or not. They are also effective at capturing non-use values, such as existence and bequest values. A disadvantage is that large and costly surveys are required. There are also often problems with bias arising from the survey process (Box 5). Nonetheless, contingent valuation methods remain among the most widely used tools for valuing ES (Emerton and Bos 2004).

2.3.7 Benefits transfer

In the benefits transfer approach, values collected in other regions and/or policy contexts are used to approximate values required for the region or context of interest. This reduces the cost of data collection and analysis. (See Box 6.)

The degree of error associated with benefit transfers is often unknown. It is likely that benefits transfers will be more accurate for similar goods in regions with similar populations – e.g., the value of a day of fishing from studies in the northeastern U.S. may be a good approximation for the value of a day of fishing in eastern Canada.

BOX 5

Types of bias – stated preference surveys

Surveys can be subject to various types of bias:

- **Hypothetical bias** (e.g., a respondent usually overstates the value of the ES because they do not have to actually pay for it);
- **Strategic bias** (e.g., a respondent doesn't reveal their true willingness pay but uses their response to try to achieve an outcome that would be beneficial, like lowering taxes or providing ES at low cost);
- **Design bias** (e.g., the survey leads respondents towards a particular answer);
- **Nonresponse bias** (e.g., respondents are not representative of the population, leading to a biased measure of social willingness to pay).

BOX 6

Use of a benefits transfer study to justify policy adoption in the Fraser Valley, British Columbia

Olewiler (2004) carried out a benefits transfer study estimating the value of natural capital conservation in the Lower Fraser Valley of British Columbia. Olewiler's estimates of ES values were in turn used to justify the adoption of policies for conserving areas of natural forest in the Lower Fraser Valley.

By aggregating the results of several studies, Olewiler estimated that the existing forest areas provided carbon sequestration services worth an estimated $164 - $6,650 per ha, as well as $147/ha/year in other forest ecosystem goods and service values such as forage, fishing and hunting terrain, wildlife viewing and other forms of recreation.

A useful resource for benefits transfer is the **Environmental Valuation Reference Inventory (EVRI)**, available online at www.evri.ca. It is a searchable database of empirical studies on the economic value of environmental benefits and human health effects. Users can search by valuation approach, by geographic characteristics, and by environmental issue. This database can serve as a tool for compiling value estimates for benefits transfer studies. It can also serve as a starting point for other forms of analysis of ES value. Many of the examples cited in this report were accessed via the EVRI.

The Environmental Valuation Resource Inventory is a searchable database of empirical studies (www.evri.ca). It can serve as a starting point for analysis of the value of ecosystem services.

Benefit transfer should be used with caution, however. The validity of the benefit transfer depends on the availability of suitable studies in other regions, and on the similarity in environmental and social/economic conditions in the regions where the data originated. In addition, care must be taken in transferring values in appropriate units. Values arise from human preferences, and thus value should relate to the number of people affected by a change in ES. Transfering values in per hectare or per land unit area can be very misleading as the units of land themselves are not generating the value, it is the combination of the land and the people being affected by the ES.

2.4 Challenges in ecosystem service valuation

Daily (1997b) identifies a number of technical challenges for ES valuation. Five major issues are discussed below:

- Identifying the relevant components – which ES to value?
- Social preferences are continuously changing – how will values change?
- Market prices can be poor estimates of value;
- Ecosystem stability is complicated; and
- Double counting issues.

Which ES to value?

There are many ES (too many to value them all), and they are often interconnected. The first challenge is to identify the most important set of ES to value; this is a daunting task. The next challenge is to determine how best to assess their value.

Canada's forests are remarkably complex. There is still much that we do not understand regarding their importance to the planet. Consider, for example, endangered species. We have little information about the presence of irreversible thresholds (tipping points) after which the species spirals towards extinction. Yet we must choose what to value.

A major challenge is deciding which ES to value. There are too many to value them all, yet they should be accounted for in some way.

Excluding a particular ES from our analysis effectively gives it an economic value of zero. Thus, it is preferable to estimate values for as many types of ES as possible. However, since we are likely unaware of the importance of many ES, valuation studies often provide conservative estimates of the actual ES value.

Even if relevant components of ES can be identified, collecting data on these components will be challenging.

Society's preferences change; how to assess future ES value?

Another challenge relates to society's continuously changing preferences. As society continues becoming wealthier and more urbanized, we are seeing more emphasis on non-use values, such as existence value. Also, as people worry about approaching irreversible thresholds, there tends to be more value placed on future generations.

Comparing costs and benefits that occur in the future is usually done by discounting them to the present. A zero discount rate means that future generations are treated the same as the present generation; a positive discount rate means that the welfare of future generation is reduced relative to the present generation. Discounting practices can be controversial. For instance, critics attacked the *Stern Review of the Economics of Climate Change* (Stern 2007) for using too low a discount rate (Nordhaus 2007). There is still much debate over the appropriate discount rate for ES.

Market prices can be poor estimates of value

The third challenge relates to problems using market values for some ecosystem goods. Prices are often distorted by externalities, subsidies and trade barriers.

For example, it could be argued that the price currently charged for water simply accounts for water distribution, and does not reflect the actual value of the resource. Thus when looking at the impacts of forestry activities on water quality and quantity, using the "market" price for water will skew the analysis.

Ecosystem stability and unknown thresholds

The fourth challenge relates to ecosystem stability, and the value that is derived from such stability. Again, this relates to the idea of unknown thresholds, after which it is difficult, if not impossible, to repair the damages. Since a well functioning ecosystem tends to be more stable than the alternative, we place value on this stability. Calculating this value, however, is difficult.

Double counting

The final challenge is the issue of double counting ES. Natural capital can generate a number of different services, and ES are often interrelated in complex ways. Valuing each ES separately and simply adding up the total value could lead to double counting. Such problems often stem from inconsistent definitions of ES. It is important to identify the impact of the ES in terms of human wants and needs (products, experiences – recreation, production processes, non-use values) as focusing on the effect ES has on these "endpoints" will help avoid double counting.

2.5 Economic valuation of ecosystem services: further needs and opportunities

The above sections reveal a number of reasons why economic valuation of ES is important. They also reveal barriers to valuation. Great strides are being made, but additional steps are needed to fill the remaining gaps. These steps are generally agreed-upon in the valuation literature (e.g., see Daily 1997b, Heal et al. 2005). We present some below.

Human capital and interdisciplinary collaboration

The first need (and opportunity) relates to the **human capital required to conduct and analyze valuation studies**. The process of ES valuation overlaps disciplinary boundaries, requiring the use of interdisciplinary research teams. We should be promoting more collaboration between the various disciplines – especially between the natural and the social sciences.

Research on ecosystem service roles and productive functions

We currently lack **data on the relationships between the value of marketed ES and the underlying and/or nonmarket ES that support these ES**, i.e., their production functions. The role of certain critical ES is particularly important, yet not well understood or quantified.

We need to invest in research identifying production functions for critical ES. We are still learning about the potential for forest ecosystems to provide these critical ES. Increasing our understanding of the relationships between human activities and critical ES will greatly further our capacity to address the challenges involved to ES valuation.

Valuation and new markets for ecosystem services

The many examples of emerging markets for ES are increasing our understanding of the relationships between human activities and ES. For example, most would agree that calculating the social cost of carbon emissions, or the public's willingness to pay for reductions in carbon emissions, is complicated and contentious. Nevertheless, a range of policy instruments designed to reduce carbon emissions are being adopted in different jurisdictions. In some cases the policy options are implicitly generating values for ES.

Some countries have adopted cap-and-trade systems to impose a cost on carbon emissions. These countries felt it urgent for emitters to bear the cost of emitting carbon, and therefore used a market-based instrument as a proxy for valuation. Other jurisdictions (e.g., see *Alberta Climate Change and Emissions Management Act,* 2003) have implemented penalties or fees if carbon emitters exceed an efficiency target. They allow these firms to avoid these fees if they can find carbon sequestration opportunities elsewhere in the province (these so-called *offsets* are discussed below in section 3). Both of these policies result in the generation of an implicit value for carbon.

A word of caution is necessary on the relationship between markets and valuation. Indeed, while many markets for ES are established without valuation studies, it is important to note that these are "artificial" values, induced by the structure of the market, and not necessarily by the inherent benefit of the good being provided.

2.6 Economic valuation and sustainable forest management

The remainder of this report discusses policy responses for the conservation of ES, with a specific focus on the use of market-based instruments, and how such tools can be used in achieving sustainable forest management. Valuation studies are necessary to validate and continue public support for environmental policy, including newly created markets for ES. For example, such valuation exercises have been used to support the U.S. SO_2 market by indicating the benefits achieved by the reduction in pollution arising from the market-based instrument. Valuation is necessary to set appropriate targets for environmental policy, and to ensure sufficient incentives are provided.

Within the context of SFM, economic valuation provides important information that can help decision-makers address trade-offs from different forest practices and evaluate the effectiveness of current or proposed policies. Economic valuation is especially important in moving toward SFM, as many ES are not bought and sold on markets.

BOX 7

Valuation and sustainable forest management

In the context of sustainable forest management, valuation of ecosystem goods and services can help to:

- identify costs and benefits of different forest management options;
- evaluate impacts of particular management decisions on forest capital;
- identify benefits of sustainable forest management;
- develop policies that reward forest managers for sustainable practices;
- monitor and evaluate policy impacts and effectiveness;
- increase awareness (among government and forest-sector decision-makers, other forest-related stakeholders, and society as a whole), of the
  - contributions of non-market ecosystem services to total forest value,
  - potential impacts of human activities on forest capital, and
  - benefits to humans of forest capital and forest ecosystem services.

3.0 Policy options for conserving ecosystem services

The previous two sections have highlighted some of the challenges that arise in valuing and conserving ES within the context of SFM. Markets are one means by which individuals can express their respective values for, and willingness to trade-off, particular goods and services (Grafton et al. 2004). Unfortunately many ES lack markets, and even where markets exist, ES prices often do not accurately reflect their full social value due to market failures such as those described in Box 8. As a result many ES values are not accounted for in cost-benefit analyses and in calculations of total economic value.

The absence of markets for many ES means that those who supply them are not rewarded for all of the benefits that they provide to society. Conversely, those who reduce ES do not bear the full social costs of their actions. Market-based instruments and other policies have emerged to address these issues.

BOX 8

Why do many ecosystem services lack markets?

While some ES have markets (e.g., timber), most do not (e.g., climate regulation and habitat). In a few cases, such as carbon, markets for ES are emerging.

Markets for ES may not exist for various reasons. First, some outcomes, such as biodiversity conservation, are difficult to define and not widely understood by the publc. Second, it is often difficult to define the change in supply of ES resulting from specific management actions, due to scientific uncertainty or poor measurement of baselines.

For instance, biodiversity results from complex system interactions including species interdependencies, as well as various spatial and temporal dimensions. To complicate matters further, several ES may be jointly provided by one management action, or management actions may increase levels of one service while decreasing levels of another. For example, trees planted for carbon sequestration may reduce water availability. Scientific uncertainty in establishing the links between management actions and ES outcomes increases the risk and uncertainty associated with market transactions for ES.

Finally, the lack of property rights for ES makes it difficult to trade ES in a market. Assigning complete property rights to ES is particularly challenging given the public good characteristics of many ES. Even where it is possible to define and trade ES, thin markets due to few buyers and sellers and lack of information can discourage transactions (cf. Murtough et al. 2002).

3.1 An overview of policy instruments related to ecosystem services

There are a number of trade-offs to consider in selecting the appropriate policy instrument to address market failures in providing ES. Policy instruments differ in their characteristics, and some are more suited to some types of problems than others (Bennear and Stavins 2007).

Resource managers can consider four main broad categories of policy instruments to address ES (e.g. Collins and Scoccimarro 2008):

- **Command-and-control approaches** prescribe actions and technologies to meet desired outcome. Command-and-control approaches include standards, best available technology requirements, quotas, and mandatory management plans.
- **Market-based instruments** use market signals such as prices and penalties to encourage behavioural change and management action.
- **Suasive approaches** encourage a voluntary change in behaviour through education, codes of practice, training programs, extension services, and research and development.
- **Direct public provision** occurs in some cases where the government may decide to provide ES directly (e.g., provision of biodiversity through national parks).

Market-based instruments encourage behavioural change through market signals such as prices and penalties.

Command-and-control (CAC) approaches are prescriptive and usually involve stipulations of technologies, pollution releases, or activity levels that are uniform across a sector and that don't give firms flexibility in how to meet environmental objectives (UNEP 2006). CAC approaches may be highly desirable if hazards and risks are high and government wishes to maintain a high degree of control over activities and pollution sources. In Canada, most environmental policies are based on CAC. Most provinces regulate the forest industry through prescriptive ground rules (e.g. retention, cutblock size, adjacency restrictions) that must be followed in the field. While these rules have been suitable for managing activities at the stand level, they have not been successful at coordinating activities in order to meet ecological objectives at a landscape scale.

Market-based instruments (MBIs) use prices and other market signals to coordinate behavior in order to meet aggregate environmental objectives such as ambient air or water quality, management of fish stock levels, and in the case of forest landscapes, managing the total amount of disturbance. MBIs allow firms to substitute activities and inputs in order to meet aggregate environmental objectives at a lower cost. Like CAC, MBIs require laws and regulations to support implementation; however these are designed to encourage behavior through incentives rather than through explicit directives (e.g. Stavins 2003).[2]

Suasive approaches work if costs associated with the changes required are low and coordinated action is not required. Given the scope of most ES problems, suasive approaches are insufficient and we do not consider them further here, although suasive approaches can often be used in conjunction with MBIs to increase participation in ES markets and to reduce the costs of behavior change.

MBIs operate by realigning rights and responsibilities of firms, groups or individuals so that they have both the incentive and the power to act in a more environmentally responsible manner (UNEP 2006). Consequently, a major advantage of MBIs is that they tend to be more flexible, more dynamic, and more cost-effective than CAC in achieving joint outcomes (UNEP 2006). This cost-effectiveness is a result of the flexibility MBIs give firms in choosing the best strategy for reducing environmental damages, which allows reductions in impacts to be made from the lowest cost sources (UNEP 2006, Tietenberg and Johnstone 2004). With many MBIs (e.g. charges and permits) the use of environmental resources has an opportunity cost which creates incentives for firms to go beyond required reduction levels, and to invest in research and development in environmental technologies (Whitten et al. 2007, Chalifour 2007). Because of its prescriptive nature, CAC does not provide incentives for firms to go beyond the regulation.

[2] Although less popular than CACs and MBIs, other policies for the provision of ES range from the creation of insurance regimes to voluntary agreements for ES provision. Since these policies are uncommon in the context of sustainable forest management, we do not discuss them in this report.

3.2 Types of market-based policy instruments

Market-based instruments can be divided into "price-based" and "quantity-based" instruments. In addition, governments may wish to improve existing private market signals for ES by reducing market friction or transactions costs in these markets (cf. Whitten et al. 2007).

Price-based instruments

Charges and subsidies are common forms of price-based instruments. Price-based MBIs encourage specific natural resource management practices by creating a price to producers and/or consumers for the desired environmental outcome. For example, government could subsidize the supply of ES by paying for leaving standing dead trees which provide specialized habitat in a cutblock. An example of a payment for ES is Ontario's Managed Forest Tax Incentive Program which encourages the stewardship of Ontario's private forests by providing lower property taxes to forest landowners who agree to prepare and follow a Managed Forest Plan. Conversely, regulators could charge for impacts that reduce ES, such as charging for the percentage of a cutblock that is used for roads and landings beyond some baseline. Development charges on public forest lands in Canada have not been utilized.

Charges and subsidies differ with respect to whether the public or the developers have the implied right to use or enjoy the environment.

Charges and subsidies differ with respect to whether the public or the developers have the implied right to use or enjoy the environment. With charges, the "polluter pays" principle applies and the inferred property right for the ES is held by the public. With subsidies, the inferred property right to use scarce environmental resources is held by developers, who are compensated for the additional requirements imposed upon their tenures.

Charges and subsidies also differ in terms of their potential for innovation. Subsidies can distort incentives to innovate because they are often tied to specific actions rather than outcomes. This can crowd out new innovation that is not tied to the subsidized activity. However subsidies may be preferred in situations where a voluntary approach is required because of existing property rights or the perception that the public beneficiary should pay.

In the case of subsidizing the provision of ES, there are many ways in which the government may introduce market forces in the procurement of services. Conservation auctions, for example, create competition for conservation payments and can keep costs low while still encouraging some innovation. An alternative to auctions is to set a fixed payment level for anyone to provide conservation services; however, it is difficult to get the prices right. Setting the payment too high results in firms being paid more than their opportunity costs; setting the payment too low results in low participation rates and failure to meet environmental objectives (Connor et al. 2008). Box 9 provides an example of how conservation auctions have been used to allocate conservation contracts in Australia.

BOX 9

Australian example:
"BushTender" conservation auction

The BushTender program is an auction for biodiversity contracts developed by the Victoria Department of Sustainability and Environment (DSE). Under the program, landowners submitted bids to change land management practices. The lowest bids were selected to enter into three- or six-year fixed term management agreements, with further options of ten-year or permanent protection (DSE 2008).

The BushTender trial resulted in management agreements for conserving 1,785 hectares of rare and threatened ecosystems (DSE 2008). Based on the results of the BushTender trial, the state of Victoria expanded their auction system to tender forest carbon contracts under the CarbonTender program (DSE 2004). According to Stoneham et al. (2003), BushTender significantly reduced the costs of providing ES. Similarly one might envision a system for multiple forest conservation contracts in Canada which could include wetlands, old growth, carbon, and habitat for endangered species such as caribou.

Quantity-based instruments

Quantity-based instruments involve defining property rights to ES and then creating scarcity by capping the amount of the public good which can be used or damaged. The property rights are used to ration access to the public goods and can be allocated through auction or gratis according to agreed-upon rules.

If the rights are tradable, the prices for rights will send the correct signals to firms about the costs achieving the environmental outcome, and will encourage reduction in damaging activities and innovation. For example, tradable emission permits are rights to pollute. Firms that can reduce their emissions at low cost will do so and may be able to sell their pollution rights, while firms which cannot reduce their emissions at low cost can buy additional credits. Trading programs can be broken down into cap-and-trade and credit programs.

Cap-and-trade programs involve setting a cap on the total allowable environmental impact (e.g. total emissions or total land disturbance per year) with allowances for impacts either auctioned or grandfathered to existing sources. There are many examples of permit programs in air and water including the international GHGe market created under the Kyoto Protocol and the U.S. SO_2 trading program created under the 1990 *Clean Air Act Amendments* (e.g., see EPA 2008). The cost advantages from permit systems come from allowing firms to substitute low-value and high-value impacts between sources, and by development and substitution of new technologies.

Credit programs allow firms to earn credits for reducing impacts below an agreed-upon standard or baseline. The credits can be sold to other firms who wish to exceed their baseline. Several forest carbon credit markets, both inside and outside the Kyoto framework, have emerged in recent years in response to existing or anticipated climate policy.

Conservation (e.g. biodiversity or carbon) **offsets** are based on credits. Conservation offsets are conservation activities designed to compensate for the unavoidable harm to ecosystems and specific ecological services – such as provision of habitat for biodiversity – caused by development projects (Dyer et al. 2008). Many jurisdictions around the world already have legislation in place for conservation offsets. Offset credits are defined in terms of management and conservation actions above business as usual or existing regulatory requirements. One way to procure offsets is through conservation auctions.

BOX 10

Conservation offsets

In Canada, offsets are required under the *Fisheries Act*. In addition, some jurisdictions such as Alberta have developed enabling legislation for offsets on public forest land (*Alberta Land Stewardship Act*, 2009).

One challenge for conservation offsets is determining who would have a right to sell ES. In most provinces there are long-term area-based tenures where forestry firms manage large tracts of public lands, thus making it possible for forest companies to provide ES through conservation contracts for carbon or biodiversity. However since public land tenures are not permanent, the offset agreements would only be temporary in nature – a problem which requires further consideration.

In developing offset contracts it is important that payments for conservation activities go beyond what is required under existing tenure agreements which have some requirements for ecosystem management. Therefore the establishment of baselines will be critical for such systems to be effective.

Finally, offsets highlight the problem of overlapping tenures, since the offsets and ecosystem services provided by forest companies may not necessarily be protected from the infringement of other rights, such as those related to the development of mineral leases.

Offsets and tradable permit systems differ in terms of the initial allocation or rights and obligations, cost and distributional consequences, and who bears the economic and ecological risks associated with the program (the public versus industry). Cap-and-trade systems provide assurance about meeting the environmental target, while credit systems are not constrained by an overall cap or limit. In addition baselines require careful monitoring and can more easily be manipulated by firms since they often involve establishing a hypothetical “business as usual” scenario.

Drawbacks of trading programs include the potential for high transactions costs and thin markets if the trading rules are unclear or too rigid (for example if each impact has to be verified before authorizing a trade). In the case of cap-and-trade there may be large up-front negotiation costs in terms of setting the cap. Similarly, firms may negotiate over acceptable baselines for credit programs. In terms of compliance monitoring, credit programs can be costly to administer because they involve measuring individual firm actions against an often hypothetical baseline.

Reducing market friction

Reducing market friction consists of improving the market signal between buyers and sellers of ES. For example, in the context of SFM public demands for sustainable forest management are not adequately reflected in forest products markets. Forest certification attempts to make information about forest management practices embedded in products transparent and available to consumers, producers and investors, and provides a positive incentive for firms to change behaviour by helping to maintain or increase market share for certified firms.

3.3 Choosing between instruments

The decision about how to distribute risk between the environment and the economy is an important factor in determining whether to use price-based or quantity-based instruments. In developing policy, the economic costs of meeting an environmental target are often unknown both to government regulators and to industry. In addition, the environmental benefits (or damages) associated with behaviour change may also be uncertain.

BOX 11

Forest certification

Forest certification is the most widely used incentive for SFM in Canada. Forest certification is the process by which a forestry firm adequately demonstrates conformity to the specific standards of the certification scheme (Upton and Bass 1996). Canada has the largest area of third-party independently certified forest in the world, with almost 146 million hectares certified to at least one of the following certification schemes: Canadian Standards Association, Forest Stewardship Council, and Sustainable Forestry Initiative (Certification Canada 2008).

In most jurisdictions forest certification is voluntary, and depending on the level of performance required by the particular certification scheme, can be costly to implement. Forestry firms face a dilemma in choosing whether or not to pursue forest certification. They hope that by communicating to customers that their product is sustainably produced, they will have an advantage over non-certified competitors. An important consideration in making this decision is whether there is a price premium for certified forest products, or whether the certification will protect or increase market share. Previous valuation studies for various forest certification schemes have shown mixed results with respect to the existence of a price premium, suggesting that certification is a means of non-price competition for market share (e.g., Jensen et al. 2003, Gronroos and Bowyer 1999, Rametsteiner 1999, Ozanne and Vlosky 1997, Winterhalter and Cassens 1993).

Price-based instruments such as taxes and charges set the costs of using the ES constant and allow the environmental objective to fluctuate. If the government sets the charge too low, then environmental impacts will be higher than expected – i.e., the tax will not be high enough to reach the environmental target. Conversely, quantity-based instruments set the level of the environmental objective through the cap and allow the costs to firms of using ES to fluctuate. Often quantity-based instruments are designed with a "safety valve" such as a price ceiling on permits which fixes the maximum cost to firms.

In general, cap-and-trade programs are suitable when fixed targets are desirable and when environmental impacts are "uniform", i.e., they can be easily substituted or "traded" between each other. A large number of program participants is desirable to ensure a competitive permit market. Cap-and-trade systems require feasible and low-cost monitoring of impacts from individual sources. Compliance under the SO_2 trading program is very high because sources agreed to install continuous emissions monitoring systems. In the case of land, it is necessary to monitor the individual impacts of disturbances such as seismic lines or cutblocks.

Taxes and/or charges are suitable where there are many diffuse sources and/or heterogeneous impacts making it difficult to monitor impacts or activities of individual sources. For example a carbon tax can be applied to fuel for diffuse final emitters such as the transportation sector, which eliminates the need for monitoring the emissions of individual vehicles.

Credit and offset programs can be used to encourage firms to adopt better technologies or to mitigate impacts from individual projects. They may or may not be associated with fixed environmental objectives such as "no net loss". Offsets are desirable for managing heterogeneous impacts. Both offsets and credit systems are costly to verify because they require significant baseline information. Additional considerations to consider in choosing the MBI includes existing explicit and/or implicit property rights, particularly who has the rights to sell ES on public land – firms or governments, and who has the rights to create and administer the markets for ES (Whitten et al. 2007).

3.4 When to use market-based instruments?

Historically, command-and-control has been the dominant policy approach for achieving objectives related to the conservation of ES in Canada. Over the last twenty years there has been an increasing use of MBIs in environmental policy, particularly in other jurisdictions. However, MBIs are not appropriate for all environmental problems. The following criteria can be used for deciding when an MBI may or may not be appropriate (e.g. Whitten et al. 2007, Donahue and Nye 2002, NRTEE 2002).

MBIs may be appropriate when:

- the cost of environmental controls differs widely among firms such that there are gains from trading offset permits – i.e., high-cost firms buy permits from low-cost firms;
- there are large variations in the ability of potential participants to provide the desired environmental outcome – i.e., there are different technologies or processes for meeting environmental objectives, and it is costly for governments to obtain information about least-cost technologies and processes;
- there is large scope for incentives to help harness innovation in improving natural resource management;
- there is already a CAC structure in place but it is inefficient because it lacks flexibility;
- it is easy to monitor outcomes (e.g., emissions or disturbance) and/or to measure the impact of a change in practice on the desired environmental outcome.

MBIs may not be appropriate if:

- costs are easily identifiable and technologies are standardized (i.e., few "gains from trade");
- the substitution of impacts is not desirable, for example when there are very high hazards or hazards are site-specific. This can be seen in the hesitation to use markets to manage highly toxic substances, such as mercury, or in the regulation of hazards such as nuclear waste.

In general CAC policies are more appropriate when substitution opportunities are not desirable, when there are few technological substitutes, or when the impacts of concern are local or project-specific and hazardous. MBIs are more appropriate for meeting regional objectives, and where coordinated action with flexibility is desirable for minimizing costs and ensuring outcomes are achieved. There is little advantage to using MBIs when there are few opportunities for substitution or innovation.

MBIs and CAC are not mutually exclusive, and MBIs often complement existing CAC policies (e.g., UNEP 2006, Stavins 2003). For example, water markets can ensure that water is allocated to its most beneficial use, while regulations may dictate how water is used or returned to the system. In forest management, stand-level directives that protect the ecological integrity of the harvest sites can coexist with landscape level objectives such as amount of old-growth intact forest which may be managed through MBIs such as offsets or development charges on old growth.

In summary, both CAC and MBIs require a regulatory framework for implementation (with the exception of subsidies, which can be delivered without regulation) (UNEP 2006). Both are appropriate in certain contexts. CAC measures are appropriate, for instance, when an outright prohibition is required, such as in the case of banning toxic substances. MBIs are suitable for meeting objectives which require coordinated action between firms to meet a joint outcome. Thus MBIs have received significant attention in the management of ambient targets and cumulative effects in air, water, and land. Often CAC and MBI policies can be combined, for example, where CAC regulations are used to set the approval requirements under which MBIs can be implemented. It is important to note, however, that conflicts among policy instruments can lead to perverse effects, often destroying markets in the process. For example, the New Jersey Open Market Emissions Trading Program for NO_x and VOCs failed in part because it was combined with rigid CAC type standards which did not allow sources to exceed federal and state ambient emission targets, which thus limited trading.

3.5 Market-based instruments and forest policy in Canada

Until recently, MBIs have not been a part of forest policy in Canada. There are several reasons for this. First, forest policy in the past focused largely on financial considerations of the forest industry, with little consideration of other ecological, cultural and social values. Second, given some of the challenges in the valuation of ES (as discussed in Section 2), it has been difficult to evaluate the trade-offs and identify targets and goals for ES. Also, the degree to which there is a perception of a scarcity of ES is an important factor to consider in the adoption of more innovative policy instruments. One can argue that until recently there has likely been a perception that the ES provided on public forest lands were not generally scarce. In jurisdictions (e.g. Europe, Australia) and sectors where scarcity is more of an issue (e.g., water), policy has moved further towards using MBIs to allocate scarce resources. As the public perception of threats to the boreal forest evolves, moves by some provinces to manage for cumulative effects may create new opportunities to use market instruments.

A significant challenge to the design of MBIs for forest policy is related to the complexity of the ecosystem and economic interactions (Heal et al. 2005, Boyd 2007). Ideally economic indicators of ecosystem service value should reflect the interrelationships between management decisions and ecosystem outcomes at various scales. Yet there are unanswered questions regarding the scale at which market indicators of ecosystem services should be defined, and the degree of substitutability between ecosystem services at different scales (Sanchirico and Siikamaki 2007, Chave and Levin 2003).

A number of institutional challenges also create barriers to change. Governments and industry are often comfortable with the existing regulatory structures, and bureaucracies may lack the appropriate skill sets to design and implement new market based programs (Whitten et al. 2007). Legal questions may also create challenges for the implementation of MBIs, because law is the least developed component of ES markets creation, particularly in relation to property rights and governance (Ruhl et al. 2007). Legal issues, such as who is entitled to see ES provided by public forests, are discussed in Section 4.

4.0 Legal issues related to using market-based instruments for sustainable forest management

Designing MBIs for the provision of ecosystem services raises a number of legal issues, many of which are novel and unanswered. There is relatively little literature on the legal issues relating to MBIs (Ruhl et al. 2008), especially in Canada and as relevant to forest management in a public land context. This section reviews what literature is available, and identifies and discusses a range of legal questions that arise when using MBIs for SFM. These include the following:

- **Property rights** (e.g., who owns the carbon sequestered by trees on publicly owned forests licensed to a forest company?) (section 4.1);
- **Aboriginal rights** (for instance, how can and should MBIs be designed to respect Constitutionally protected aboriginal rights to ecosystem goods or services, and rights to be consulted in the design of market-based regulatory systems) (section 4.2);
- **Constitutional division of powers** (e.g. would the federal government have authority to implement a MBI relating to biodiversity conservation or GHG emissions reductions on provincial land?) (section 4.3);
- **Trade rules** (for instance, how can we ensure payments for ecosystem services are not considered countervailable subsidies?) (section 4.4);
- **Fairness and equity** in the design of MBIs (section 4.5).

4.1 Issues relating to property rights

As explained in section 3, MBIs come in many forms, ranging from payments for the provision of ecosystem services to the creation of tradable markets in carbon. While clearly defined rights to the ES relevant to the MBI are always important, they are especially critical in cases of market creation (Pearse 1988:308, Kennett 2005-2006, Malavasi and Kellenberg 2002).

The international experience gained from implementing MBI projects suggests that the absence of clarity about who owns the positive externalities emerging from forest management can be a legal barrier to implementing ES markets (J. Salzman, personal communication). This absence of clarity with respect to ownership adds an additional layer of complexity in the context of Canada's largely publicly-owned forests, particularly when those forests are subject to concessions. Some examples of the types of ownership questions that can arise include (Brand 2009):

i) what specifically is being traded?
ii) who is the owner of the ES provided by forests?
iii) can ownership of the land, trees and the ES be separated?
iv) who is entitled to transfer ES? (Elgie 2005, Kennett et al. 2005-2006).

Most current timber concessions do not stipulate whether ES rights accompany the timber rights or remain part of public ownership (Elgie 2005). Although these uncertainties can and should be resolved in future concessions, in the meantime, questions about whether ecosystem services should be considered part of the timber concession or remain with the Crown become important (Elgie 2005) when designing and using forest-related MBIs.

In the case of MBIs that create markets, establishing clear property rights for ES provides "access security, defensibility of ownership, and transferability" (van Bueren 2001:5) to the parties investing and participating in the market. Under these circumstances buyers have the certainty that they are acquiring valid titles from whomever is legally entitled to trade ES (Kennett et al. 2005-2006), and are less reluctant to become parties to the ES transactions. For instance, creating a tradable carbon market requires at least some recognition of the property rights associated with the market, and these markets will function best when the property rights are clearly defined and allocated (Elgie 2005).

In the case of MBIs that involve simple payments for provision of ES, the establishment of clear ownership rights is less critical. For example, a government may be quite willing to pay a private landowner for the provision of certain ES without resolving whether the landowner or the Crown ultimately owns the service.

In this section, we will consider questions relating to the creation, recognition and transfer of property rights in ES in a forest context, focusing especially on cases of market creation since this is where ownership rights are most important. We will show that although well-defined property rights systems are not easily or quickly established, especially in the context of private rights on public lands, experience has shown that MBI projects can succeed based on "sufficient certainty". Although not optimal, this "sufficient certainty" can be achieved without creating a complex set of regulations specifying ownership rights for ES, as long as there is a sufficient backdrop of provisions within the jurisdiction's legal framework to validate the transactions (Elgie 2005; R. O'Sullivan, personal communication; J. Salzman, personal communication).

4.1.1 Forest allocation and ecosystem services in Canada

Approximately 93% of forests within Canada are publicly owned, with 77% owned by the provinces and territories and 16% by the federal government (Natural Resources Canada 2007). Like private landowners, governments are free to grant to third parties (e.g., forestry companies, mining companies, tourism operators) rights to have access to and/or to manage some of the ES provided by their forests (Pearse 1988). The allocation of rights to forest resources in Canada is achieved "under a highly centralized resource management regime"(Passelac-Ross 2008:xi), through which provinces use different types of instruments (e.g., freehold titles, leases, licenses, permits, and land tenure or cooperative management agreements) as a means of granting rights to natural resources on public lands or forests (Passelac-Ross 2008:11).

The characteristics of these rights allocations or tenure arrangements are not homogenous. They differ in terms of duration, comprehensiveness, exclusivity, transferability and benefits conferred (Pearse 1988, Pearse 1990). While some forests tenures holders obtain interests closely resembling full ownership over the natural resources, with exclusivity for a long period of time, others receive only the use or access right for limited periods of time (Ross 1995, Pearse 1990).

Non-timber ES

While forest tenures vary considerably, none of them allocate rights to the land or to other resources beyond timber (Ross 1995: 116). For example Ontario forest management laws specifically establishes that forest tenure confers rights only to harvest timber within an assigned area, without conveying any ownership of the land (*Crown Forest Sustainability Act*, S.O. 1994 c. 25, s. 36). The Act allows rights to be conferred in "forest resources", and defines those resources as including trees and other plant life identified by regulation (*Crown Forest Sustainability Act*, S.O. 1994 c. 25, s. 3). By not including ecosystem services within the definition of forest resources, the legislation does not currently contemplate conferring rights to ecosystem services by means of forest licenses (though this could arguably be achieved by regulation).

Of course, governments may (and do) allocate rights to ES other than timber on public forest land. For example, provincial governments often grant hunting rights (Canada's Hunting Network, not dated). For instance, British Columbia issues certificates granting licensed guide-outfitters the exclusive privilege to guide hunters in an assigned area for a defined period (BC Ministry of Environment, not dated). The certificate does not confer any property rights on the holder, but grants a use right. The guiding rights in an area can be sold with prior approval of the provincial authority (BC Ministry of Environment). These existing allocation approaches offer models that could be followed in developing regimes for emerging types of ES, such as carbon or biodiversity.

Only one Canadian jurisdiction so far has begun to clarify ownership rights for forest carbon. Alberta's *Climate Change and Emissions Management Act* states that "a sink right is a property right" (s. 9). According to the Act, the carbon sink right is "the legal interest, and any commercial or other interest, in a sink" (s. 1f). (*Climate Change and Emissions Management Act*, 2003, Chapter 16.7, s. 1f). Although Alberta has not yet specified who owns the sink rights, it has granted power to the Lieutenant Governor in Council to "make regulations respecting emission offsets, credits and sink rights for the purpose of achieving reductions in specified gas emissions" (*Climate Change and Emissions Management Act*, 2007, s. 4a, 4b). These regulations may include provisions respecting the description and nature of the sink rights, and they can also address "the manner in which and the terms and conditions subject to which … sink rights may be created, obtained, distributed, exchanged, traded, sold, used, varied and cancelled" (*Climate Change and Emissions Management Act*, 2007, s. 4b).

4.1.2 The example of carbon sequestration

Carbon sequestration offers a good example with which to illustrate some of the ownership questions discussed in this section, in part because it is the topic most written about in the nascent literature on MBIs. Most authors agree that establishing clear ownership rules for carbon and describing the conditions for transferring carbon rights are key to providing security for carbon sequestration initiatives and to facilitate the correct functioning of carbon markets in general (Kennett et al. 2005, Elgie 2005, Miller 2008).

Ownership issues as relevant to carbon sequestration fall into two categories:
a) property rights needed to *develop carbon sequestration projects*, and
b) property rights needed to *transfer carbon rights* (Kennett et al. 2005-2006, Miller 2008). We will discuss each in turn.

(a) Development rights

What we call "development rights" here are the carbon property rights needed to develop a carbon sequestration project. This can be through different activities, such as planting trees, conserving forests and vegetation, and/or managing a forest in a sustainable way (Miller 2008). These carbon rights grant their holders legal titles to the carbon assets (sequestration potential, actual sequestered carbon, carbon sinks and sinks-based offsets) (Kennett et al. 2005-2006).

Kennett et al. have argued that, in the absence of legislation, carbon assets are most likely a real property right that runs with the land rather than a new property right (Kennett et al. 2005-2006). This means that owners of privately-held forests also own the carbon held in the trees and soil and the sequestration functions performed by the forest, unless the contrary is expressly stated in legislation or in specific agreements (Kennett et al. 2005-2006). This means that landowners own the carbon assets and are entitled to enter into carbon sequestration activities and grant these rights to third parties (Kennett et al. 2005-2006).

In the case of Crown (public) forest lands, this implies that the government is the owner of carbon sequestration rights, subject to any competing aboriginal claims. Whether the government has transferred some or all of those rights to third parties will depend on the wording of legislation and any relevant resource allocation instruments. In some cases, such as Alberta, legislation explicitly provides for allocation of carbon sink rights to third parties (although this has not yet occurred). In other cases, legislation and other instruments (leases, licences, etc.) allocate rights to forest management and/or timber harvest to third parties, but without reference to carbon. In the absence of clarity with respect to allocation, one might presume that the carbon rights remain with the Crown. However, there is a fair argument to be made that the licenses *implicitly* allocate such rights, by allocating the right to manage the forests and soils that store the carbon (Elgie 2005).

(b) Rights to transfer carbon rights (selling rights)

Once carbon sequestration projects have been implemented, the carbon actually sequestered is subject to being measured, verified, certified and even registered in order to later be transferred through an offset sale or other carbon transaction (CERs-UNFCCC). In this case, the question is "which person or entity has the property right needed to sell the sequestration carbon, particularly if that property right has not been clearly defined in law"?

To answer this question, Kennett et al. (2005-2006) argue that in order to make carbon sequestration rights transferable, the carbon rights should:

i) constitute a distinct legal interest – separate from ownership of the land on which sequestration activities are carried out (meaning that property rights to a tract of land and property rights to carbon absorbed in the same tract of land could be allocated to different persons),
ii) be defined as a legal interest in carbon assets (sequestration potential, actual sequestered carbon, carbon sinks and sinks-based offsets),
iii) entail flexibility (parties to a transaction can identify the nature and extent of their rights and land use obligations),
iv) be freely transferable, and the obligations and rights derived from the transaction should "run with the land", committing not only the current parties to the transaction but also future purchasers of the land,
v) be defined in such a way that it reduces the risk of conflicts of interest with different interests in land.

In the context of public land, some scholars have argued that it would be reasonable for the Crown to allocate ownership rights to sequestered carbon to whoever has the management power to take decisions (i.e. the owner or operator of a forest) to avoid conflicts on a given tract of land (Elgie 2005).

The failure to clarify ownership of carbon rights on public land with forest tenures is impeding the development of carbon transactions in Canada. For example, the Little Red River Cree in Alberta proposed to develop and sell sequestered carbon from Crown lands over which they held long-term timber licenses, as part of the PERRL program (a pilot program for carbon markets). However, this proposal was rejected (Krcmar and van Kooten 2005, van Kooten 2008). This rejection was in part due to uncertainty over their property rights in the forest carbon (Elgie 2005). Similarly, the Innu Nation in Labrador has been seeking to develop carbon projects in forest lands over which they have long term tenure, and sell to voluntary markets, but the lack of clarity over property rights has been a major impediment (Courtois and Innes, not dated). These experiences underline the importance of clarifying property rights over sequestered carbon.

There are still, however, many uncertainties related to property rights over carbon assets and sequestration transaction. To avoid future conflicts and uncertainty, governments need to clearly articulate in the concessions or legislation the allocation (or retention) of these ES rights, addressing clearly the legal nature of ownership of carbon assets and for establishing the legal basis for sequestration transactions (Kennett et al. 2005-2006).

4.1.3 International experience granting property rights for ecosystem goods and services

Different countries have used MBIs to encourage provision of ES in forests. Australia and Costa Rica, for instance, have become leading countries in the use of MBIs for provision of ES, mostly on private lands. They have done so through the elaboration of legal frameworks to promote the implementation of MBIs for forest conservation and the involvement of national authorities in the management of different programs (Malavasi and Kellenberger 2002). Approaches vary from Payments for Environmental Services (PES) to the creation of new markets for ES.

International experience has shown that parties treated ES as running with the landowner, and that transactions involving payments for provision of ES can proceed in the absence of a legal framework creating new forms of property rights. As these experiences move from pilot projects and payment programs to tradable markets, it will become more important to clarify ownership rights over ES and to describe the rights and responsibilities associated with trading these rights.

The bottom line is that having clear rules, or at least a clear understanding of who has the right to manage, sell and buy the ecosystem services provided by a forest, will facilitate the development of MBIs. As experience with various MBIs for provision of ES grows, and lessons can be learned from the different approaches in different jurisdictions, a list of best practices can be developed. We will briefly describe some international experiences in the boxes below.

A major difference between the Costa Rican and the Australian initiatives described in Boxes 12 and 13 is that Costa Rica created a public scheme, in which the government is the only buyer of ES provided by private forests, while the Australian Auction for Landscape Recovery initiative and the BushTender trial initiative created a market in which private parties could became buyers and sellers along with government, acting under the scope of a public program.

BOX 12

International experience: Costa Rica

A Costa Rican initiative aims to promote private landowners' involvement in the conservation of their privately-owned forests, which account for "approximately sixty percent of forest cover" in the country (Malavasi and Kellenberger 2002).

Under the program, "landowners receive direct payments for the ecological services their lands produce when they adopt land use and forest management techniques that do not have negative impacts on the environment" (Malavasi and Kellenberger 2002:1).

The Costa Rican national government implements the program by entering into a series of individual contracts with landowners, in essence "buying" the ES provided by private forests (FONAFIFO, not dated). Under this scheme, the government pays landowners for different services provided by their forests. Among them, we can cite: climate regulation, water regulation, biodiversity conservation, landscape beauty) (Ley Forestal 7575).

In carbon sequestration projects, after purchasing the services the government becomes the "owner" of those rights and therefore the party entitled to sell these rights on the international market (Malavasi and Kellenberger 2002:4).

BOX 13

International experience: Australia

Australia's Auction for Landscape Recovery (ALR) initiative constitutes "the first biodiversity/conservation auction trial to have been conducted [o]n Western Australia['s private lands]" (Gole et al. 2005). It is a multi-partner project which creates a market in which landholders submit proposals for providing biodiversity conservation services (for instance, addressing salinity problems) (Gole et al. 2005). A variety of public and private stakeholders, such as "landholders, government and non-government agencies … and research and tertiary institutions" provide the funding for the project (Gole et al. 2005:1). The mechanisms by which the ES are provided include nature conservation contracts and voluntary management agreements (Gole et al. 2005).

Similarly, in Austrialia's BushTender trial initiative, landowners become competitive suppliers of a variety of ES, while the Victoria state government is the major funder (or ES buyer) (Eco-certification 2002).

It is interesting to note that the Costa Rican and Victorian initiatives were developed without the establishment of legislation clarifying ownership rights to ES. In contrast, Western Australia and South Australia have enacted statutory provisions that articulate carbon as a new property interest in land, different from the fee simple ownership of the land. This new interest in land "is contingent upon registration of the underlying carbon agreement" (Hepburn, not dated, p.8-9), allowing third parties to participate in both what we called the "development rights" and after that in the transfer of carbon rights.

Boxes 14 to 17 describe examples where private companies are investing in rainforest conservation for ES in South America and southeast Asia (Butler 2008).

BOX 14

International experience: Bolivia

The Noel Kempff Mercado climate action project offers an example of using MBIs for bundled ecosystem services on public lands. This project tried to simultaneously address climate change and protect biodiversity on public lands in Bolivia (TNC, not dated). It "was the first forest emissions reduction project to be verified by a third party based on international standards used in the Kyoto Protocol", and is "the largest project of its kind in the world" (TNC, not dated).

The project was initially a private-public partnership between the Bolivian government, two NGOs and three multinational energy companies. It included the expansion of the boundaries of a national protected area to include some public lands which had previously been subject to logging under a forest tenure arrangement. The tenure holders were compensated for the land they lost to the expansion of the park (Noel Kempff Mercado Climate Action Project, not dated).

Regarding the ownership of the carbon credits, "the corporations want to be able to claim credits for the carbon dioxide which the rescued trees will absorb from the atmosphere, and use them to achieve part of their targets for reducing emissions …" (BBC News, Hirsh, T. Nov. 2000). Therefore, the government of Bolivia, which has the initial ownership of the sequestration potential and sequestered carbon, granted a percentage of these rights and the right to transfer carbon credits to the private investors (Noel Kempff Mercado Climate Action Project, not dated).

BOX 15

International experience: Indonesia

The Merrill Lynch bank invested $9 million over four years in a rainforest conservation project designed to sequester CO_2 in the Indonesian state of Aceh (Butler 2008). The bank's objective is to obtain sequestration credits to participate in the post Kyoto 2012 carbon credit market, based on the rights granted to the investor by the Indonesian government.

BOX 16

International experience: Malaysia

New Forests, an Australian-based investment firm, and Equator Environmental LLC implemented a wildlife conservation banking system (the Malua Bio-Bank) on the island of Borneo, Malaysia, an area rich in biodiversity. In this case, the Sabah state government, which is the owner of the forest, licensed the investor's conservation rights for a period of 50 years to establish a wildlife habitat conservation bank, with the goal of conserving 34,000 ha of the Malua Forest Reserve (Butler 2007, Malua Bio-Bank 2009). The banking system is designed to sell biodiversity credits.

The following actions have been taken (Malua Bio-Bank 2009):

i) cessation of all logging operations in the area,

ii) creation of a fund to rehabilitate and conserve the forest Reserve, and to market the biodiversity conservation credits,

iii) creation of the institutional structure to oversee and finance the conservation activities of the Reserve.

BOX 17

International experience: Guyana

Canopy Capital, a private equity firm, recently purchased the rights to ES generated by a 371,000-hectare rain-forest reserve, managed by the Iwokrama International Centre for Rainforest Conservation and Development. This agreement, which "has the support of the President of Guyana, and has the Commonwealth Secretariat and the Prince of Wales as patrons" (Canopy Capital, not dated; Butler 2008), did not include the purchase of lands but only of ES generated by the land, including carbon sequestration, rainfall generation, biodiversity maintenance and water storage.

The agreement grants the company the right to 16% of profits from selling ES, while 80% of the generated income goes to local communities, and 4% to the Global Canopy Programme (a research institution). Based on this deal, Canopy Capital has made a commitment to measure and value forest ES and to structure an instrument to market these services. The initial marketing of the ES will be done through an "Ecosystem Service Certificate" attached to a 10-year tradable bond (Canopy Capital, not dated). However, the terms of the contract have not been publicly released yet (Butler 2008; Canopy Capital, not dated).

4.2 Aboriginal rights

Aboriginal peoples are the main inhabitants of many forest regions in Canada, particularly in the north. They use the forests and their resources for many purposes, and possess a range of legal rights to those forest resources. The ability to develop and sell ES, such as carbon or biodiversity, presents a potential opportunity for Aboriginal people to integrate economic development with traditional values – to the extent that they can generate revenues from conserving lands that remain available for traditional uses.

The issue of Aboriginal peoples' right to ES is in many ways a novel one. Most ES markets are still emerging in Canada. As such, there has been little or no judicial consideration of aboriginal rights to most types of ES. However, the case law concerning aboriginal rights to lands and resources establishes various principles that can be extrapolated and applied to assess potential ES claims.

Aboriginal rights include:

- **ownership rights: reserve lands, aboriginal title;**
- **use or harvest rights;**
- **the duty to consult and accommodate.**

Aboriginal rights in Canada are protected by section 35 of the *Constitution Act*, 1982, which states that "(t)he existing aboriginal and treaty rights of the aboriginal peoples of Canada are hereby recognized and affirmed". Treaty rights emerge from a series of "numbered" treaties signed between 1871 and 1921, which typically provide fairly limited rights and land allocations, and modern treaties (called land claims agreements), which typically provide more extensive land allocations and rights. In addition, the federal *Indian Act* [R.S.C. 1985, c. I-5] governs most aspects of aboriginal land and resource use on reserve lands. Aboriginal rights to lands and resources not governed by Treaties in the form of aboriginal title and ancestral rights derive from prior historical use.

There are three main types of aboriginal rights to lands and resources: ownership, use (or harvest), and consultation and accommodation. The Supreme Court of Canada in *Delgamuukw v. British Columbia*, [1997] 3 S.C.R. 1010 (*"Delgamuukw"*) summarized this spectrum of rights:

> [T]he aboriginal rights which are recognized and affirmed by s. 35(1) fall along a spectrum with respect to their degree of connection with the land. At the one end, there are those aboriginal rights which are practices, customs and traditions that are integral to the distinctive aboriginal culture of the group claiming the right. However, the "occupation and use of the land" where the activity is taking place is not "sufficient to support a claim of title to the land" … In the middle, there are activities which, out of necessity, take place on land and indeed, might be intimately related to a particular piece of land. Although an aboriginal group may not be able to demonstrate title to the land, it may nevertheless have a *site-specific right* to engage in a particular activity [emphasis added]. …

At the other end of the spectrum, there is aboriginal title itself.

To understand how these three types of rights – title, use and consultation – can apply to ES, the first step is to consider what is involved in an ES transaction. To be able to sell an ES, an Aboriginal group would need to show, at a minimum, that it had the ability to control or limit the use of the forest in question, in order to provide a certain level of that ES. For example, to be able to sell a carbon offset, or a biodiversity offset, a seller will need to be able to ensure a forest is managed in a way that it will generate a certain amount of carbon storage or wildlife habitat. It would also need to show a property right in that offset, as discussed in Section 4.1 above. In what situations could an Aboriginal group demonstrate this kind of control?

4.2.1 Ownership rights: reserve lands and aboriginal title

While First Nations do not technically "own" reserve land – it is held in trust for them by the federal government – they can exercise significant control over its use. In particular, the *Indian Act*, R.S.C. 1985, c. I-5, requires a band council to approve the issuance of any timber cutting licences – giving them effective control over limiting harvest. The *First Nations Land Management Act*, S.C. 1999, c. 24, goes even further. It provides that a band may sign an agreement with government giving it the authority to manage the natural resources on reserve lands, including forests. Thus, the tools are in place for Aboriginal bands to exercise the control of on-reserve forest resources needed to sell ES (subject to clarifying their property rights in the ES).

> **Aboriginal title arises from occupation of traditional territory by Aboriginal peoples prior to Crown assertions of sovereignty.**

Aboriginal title arises from occupation of traditional territory by Aboriginal peoples prior to Crown assertions of sovereignty. This relationship of indigenous peoples with the land can be recognized as something called aboriginal title, recognized under the Canadian legal system. Aboriginal title can arise by a court order or through a treaty or land claims agreement. The *Delgamuukw* case explained that "aboriginal title encompasses the right to *exclusive use and occupation of the land* … for a variety of purposes, which need not be aspects of those aboriginal practices, customs and traditions which are integral to distinctive aboriginal cultures ..." [emphasis added].

Modern land claims agreements generally assign title to some portion of the land to the Aboriginal group, giving them owner-like control over those "settlement lands". In addition to assigning title, these agreements typically address the ownership and management of natural resources. For example the Teslin Tlingit Final Agreement (1993) provides that "Subject to its Settlement Agreement, each Yukon First Nation shall own, manage, allocate and protect the Forest Resources on its Settlement Land."

Thus, on lands where aboriginal title is established, the Aboriginal group would very likely possess the degree of control over forests needed to sell ES. However, such lands, like reserve lands, make up only a small fraction of the traditional territory used by any given Aboriginal group. Thus, a key question is to what extent Aboriginal groups could claim ES rights on those *other lands*.

4.2.2 Aboriginal use or harvest rights

Aboriginal people have rights to use and harvest various types of wildlife and other resources. Such rights can flow from treaties, or from traditional aboriginal rights (ancestral rights) protected by s. 35 of the Constitution. These rights could potentially serve as a basis for a claim to ES.

Many treaties with Aboriginal peoples in Canada make explicit reference to hunting and fishing rights. The language in Treaty 6 is typical of that used in many of the numbered treaties:

> [T]he said Indians, shall have right to pursue their avocations of hunting and fishing throughout the tract surrendered …, subject to such regulations as may from time to time be made by Her Government of Her Dominion of Canada, and saving and excepting such tracts as may from time to time be required or taken up for settlement, mining, lumbering or other purposes by Her said Government of the Dominion of Canada, or by any of the subjects thereof duly authorized therefore by the said Government (Treaty 6).

Even in the absence of a treaty, s. 35 of the Constitution protects traditional harvesting and resource use rights. As stated by the Supreme Court in Van der Peet: "in order to be an aboriginal right an activity must be an element of a practice, custom or tradition integral to the distinctive culture of the Aboriginal group claiming the right … that existed prior to contact [with European society]." (R. v. *Van der Peet* [1996] S.C.J. No. 77 (QL) ("*Van der Peet*")). Section 35 has been found to protect rights to hunting, fishing and gathering (*R. v. Sparrow*, [1990] 1 S.C.R. 1075 (QL) ("Sparrow")); it can also protect other traditional resources use activities, such as harvesting timber (*R. v. Sappier*; *R. v. Gray*, [2006] 2 S.C.R. 686. ("*Sappier and Gray*")).

These aboriginal rights allow harvest of the resource for personal use, and may also include the right to harvest for a *commercial purpose* (i.e. to sell), if it can be shown that such trading "was an integral part of the distinctive culture" of the group before contact (*R. v. Gladstone* [1996] S.C.J. No. 79 (QL) (*"Gladstone"*)). For example, in several cases courts have found that a right to fish for commercial purposes exists for particular First Nations (*Gladstone; R. v. Marshall*, [1999] 3 S.C.R. 456 (*"Marshall"*)). On the other hand, the Supreme Court has rejected a claim to commercial logging rights by two maritime First Nations, and limited them to cutting timber for personal use only (*"Sappier and Gray")*.

Aboriginal harvesting rights have been interpreted to also include activities which are *reasonably incidental* to the exercise of the right. So, for example, the right to hunt includes a right to build a hunting cabin (*R. v. Sundown* [1999] 1 S.C.R. 393 (QL) (*"Sundown"*)). Moreover, Aboriginal people are not limited to using only traditional means to exercise their rights. The courts allow for a *modern expression* of traditional activities. This includes, for example, the right to use modern hunting and fishing equipment, or to build a modern hunting cabin rather than "moss-covered lean-tos" (*Sundown; R. v. Simon* [1985] 2 S.C.R. 387 (QL) (*"Simon"*)).

Aboriginal hunting and fishing rights, in some circumstances, can also confer ancillary protection of the *habitat* needed to sustain fish and wildlife populations. In *Tsawout Indian Band v. Saanichton Marina Ltd.*, [1989] B.C.J. No. 563, (*"Tsawout"*), for example, the B.C Court of Appeal struck down a license to build a marina on the basis that it would cause habitat destruction that would impair aboriginal fishing rights.

The government may restrict aboriginal harvest rights, but only if it can satisfy the rigorous infringement justification test set out in *Sparrow,* e.g. by showing an important over-riding public objective (such as resource conservation), or by showing that such rights were previously extinguished.

With that brief overview, could aboriginal harvest rights form the basis for a claim to ES rights? The answer would depend on the particular ES being claimed and the evidence of historical use by the Aboriginal group. Since this is a novel legal issue, it is difficult to draw firm conclusions. However, some general observations can be made, using biodiversity rights and forest carbon rights as examples.

An Aboriginal group could claim a right to sell biodiversity credits. For example, it could offer to cease or reduce its harvest of particular species, in order to increase the population. One challenge it would face would be showing that its actions would lead to an increase in the species – that it could not only reduce its take but also exclude others from harvesting those same animals. An aboriginal right to harvest a species does not necessarily include a defined portion of the population. They have a right to take what they need, and even get first priority, but if they do not exercise that right they cannot restrict others from harvesting the portion they do not take. It is a "use it or lose it" right.

There may be ways around this obstacle in particular situations: for example, in a remote region where almost all the hunting is done by Aboriginal peoples, or if they can reach agreement with the regulator to not allow an increase in non-aboriginal harvest. They also could advance a novel argument, such as a claim that their right to hunt includes a right to conserve (in a situation where conservation is justified).

Even if they could establish their ability to reduce the overall harvest level, there would be a question of their right to sell the credit. Obviously selling biodiversity credits would not be a "custom or tradition integral to the distinctive culture of the aboriginal group". Perhaps they could argue that it is a modern expression of the traditional practice: that trading a credit has evolved from trading the animal itself (assuming they could establish a commercial use right, which is often difficult).

The other approach an Aboriginal group could take would be to seek to sell the credits for conserving wildlife *habitat*. To do this, they would need to show that their right to hunt or fish was being infringed by habitat destruction, as in the *Tsawout* case. Even where they could show this (which would not be easy), it would be hard for the group to show they could deliver a specific amount of habitat conservation, as would be required to sell a credit. Their habitat right would be indirect and ill-defined, and they likely would need to go to court to establish it. Such a situation would be unlikely to provide the certainty needed for a market sale of a biodiversity credit. On the other hand, it may be easier for an Aboriginal group to carry out habitat *restoration*, where they have the right to do so, and seek credit for that activity.

The end result is that an Aboriginal group would face many obstacles in seeking to establish a right to sell biodiversity credits based solely on resource use rights, although it may be possible in some circumstances.

An Aboriginal group seeking to sell forest *carbon* credits would face an even more uphill battle. It is difficult to imagine how it could argue that using carbon or storing it in trees was a custom or practice integral to its distinctive culture.[3] The group could try to argue that it has a right to harvest the trees, and therefore (indirectly) the carbon in them. However, as discussed above, the courts so far have only recognized a right to cut trees for personal use (*"Sappier and Gray"*). Even if this right could be established, the group would face the twin challenges of showing it could limit the timber harvest activity of others, and that selling carbon credits is a modern expression of the practice of cutting trees – both of which likely would be very difficult to show.

Alternatively, an Aboriginal group could seek to conserve forest carbon indirectly, on the basis that its hunting or gathering rights require the maintenance of particular forest habitat conditions. Even if such a claim could be established, which would be difficult, the group would have a very hard time establishing that its hunting rights somehow translate into a right to sell carbon credits. So, overall, establishing a right to sell forest carbon credits, other than on reserve or aboriginal title lands, is likely to be difficult.

However, even if aboriginal harvest rights do not, by themselves, confer a right to sell ES, they may trigger the legal duty to consult and accommodate, which can lead to negotiation over ES rights.

4.2.3 The duty to consult and accommodate

The duty to consult and accommodate was recently summarized by the Supreme Court of Canada in *Haida Nation v. British Columbia*, [2004] S.C.J. No. 70 (QL) (*"Haida"*). The duty arises when a "Crown actor has knowledge … of the potential existence of the Aboriginal right or title and contemplates conduct that might adversely affect it." The Court went on to explain that "[t]he content of the duty varies with the circumstances … A dubious or peripheral claim may attract a mere duty of notice, while a stronger claim may attract more stringent duties." Such "stringent duties" could include:

> the opportunity to make submissions for consideration, formal participation in the decision-making process, and provision of written reasons to show that Aboriginal concerns were considered and to reveal the impact they had on the decision. (*Haida*, para.37)

A government scheme to allocate ES rights might trigger the duty to consult and accommodate.

The duty to consult and accommodate, by itself, would not confer rights to ES on Aboriginal people. However, it could trigger negotiations about such rights. The triggering event could be any government action that threatens to infringe an aboriginal right or title claim. This could include the allocation of logging or mining rights in an area subject to land claim (*Haida; Platinex Inc. v. Kitchenuhmaykoosib Inninuwug First Nation* [2006] O.J. No. 3140 (QL) (*"Platinex"*)), or even the construction of a new road through important wildlife habitat (*Mikisew Cree First Nation v. Canada* [2005] S.C.J. No. 71 (*"Mikisew"*)).

More to the point, a government scheme to allocate ES rights might trigger the duty to consult and accommodate. For example, a proposal to create biodiversity offset rights might trigger the duty, if it could lead to more intensive development in areas subject to an aboriginal or treaty right or title claim. Similarly, a proposal to allocate forest carbon offset rights could trigger the duty, if it could be shown to lead to land use changes that would affect an aboriginal right or title claim (which may not be easy).[4]

In such a situation the government would not necessarily have an obligation to provide ES rights to the

[3] The group could argue that it depended on (i.e. used) atmospheric carbon levels to maintain a stable climate that supported its way of life. But even so, the amount of carbon it could store in a forest would make only a minute contribution to atmospheric carbon levels.

affected Aboriginal group. The duty is to consult about the actual right that would be infringed – either land title or resource harvest. But the negotiations over accommodation could encompass broader matters, such as the allocation of ES offset rights to the group.

This is exactly what happened in at least one case. A 2005 court order led to consultations with Hupacasath First Nation regarding its traditional territory on Vancouver Island. As part of this consultation, the Crown offered to "explor[e] HFN ownership of carbon credits when provincial policy has been developed" (*Hupacasath First Nation v. British Columbia (Minister of Forests)*, [2008] BCJ 2089 (QL) ("*Hupacasath*")).

This consultation and accommodation process may offer the most promising avenue for Aboriginal groups to pursue ES rights, given the cost and delay involved in litigating to establish aboriginal title or rights. In addition to the Hupacasath example above, there are (at least) several other Aboriginal groups involved in discussions with the Crown about the ownership of forest carbon rights in their traditional territories (Courtois and Innes, not dated; Lambert et al. 2006).

Where the lands involved are on a reserve or subject to aboriginal title, the claim over ES will generally be quite strong.

In sum, Aboriginal peoples' rights to ES will vary depending on the nature of the particular ES and the type of right being asserted. Where the lands involved are on a reserve or subject to aboriginal title, the claim over ES will generally be quite strong. Where the group is relying on resource use or harvest rights, under a treaty or the Constitution, the claim over ES will vary depending on the nature and strength of the right being asserted. Generally speaking, claims to biodiversity offset rights will normally be stronger than claims to forest carbon rights, although both will depend on showing a right to commercial use, which can be difficult. At the very least, a right to consultation and accommodation will arise if the allocation of ES is likely to affect any aboriginal right or claim. Such consultation could include negotiations about allocation of ES rights.

4.3 Constitutional issues

Both the provincial and federal governments have regulatory powers to enact MBIs aimed at encouraging the provision of ES in forests. The provincial power is broad, although it may not extend to inter-provincial trading. The federal power is more limited, including federal lands and waters, and specific ES issues with a national dimension (like carbon and endangered species).

Both levels of government have broad, but not unlimited, authority to provide direct *payments* for ES. Whether a particular government has the power to address particular ES, through trading or other MBIs, will depend on the design of the instrument and its parent legislation.

When creating new markets for ES, government action is required to define property rights in ES and to establish the regulatory requirements and framework for ES markets.

The government's role in the use of MBIs varies depending on a number of factors. In some cases, such as payment for ES programs, the government's role is primarily as a purchaser of ES. When creating new markets for ES (such as carbon markets), at a minimum government action is required to:

(i) define property rights in ES, and
(ii) establish the regulatory requirements and framework for ES markets.

Governments also often play a lead role in certifying ES projects and overseeing the market, although these roles can be delegated to third parties.

In Canada, with our federal-provincial division of powers, it is always necessary to determine which level of government has the authority to enact any legislation

[4] This may not be easy to show, since most research to date suggests that a forest carbon market is likely to lead to greater conservation of existing forested areas.

that may be required to underpin an MBI. The example of carbon trading in Canada, where both the federal and several provincial governments are proposing to develop their own rules for trading, including forest carbon, illustrates the kinds of complexities that can arise (Elgie 2008).

The question of which level of government has the authority to legislate over what matters is an ongoing, complex question that comes up regularly in our federalist state. While jurisdictional authority can overlap, allowing some choice as to which jurisdiction can implement a given measure, often there are important limitations arising from the language of the *Constitution Act* 1867 and its 1982 amendments, as well as the many court decisions that interpret the Constitution. This section offers a brief overview of the division of powers as it relates to the use of MBIs in forestry. We begin by summarizing how the division of powers over forestry (and ES in forests) is allocated. We then offer two short examples as illustrations – namely the creation of a property right and a payment program for provision of a biodiversity service.

It is important to note that we are not aiming to be comprehensive. It is very difficult to assess constitutional validity in the absence of a specific piece of legislation. While some generalities can be made, small design elements in legislation could be sufficient to render it within or outside the power of a given jurisdiction, so it is impossible to say with certainty that a certain MBI would be within federal or provincial authority to implement without actual legislation.

An important starting point is that Canadian governments only require constitutional authority to pass legislation and regulations. While most MBIs will require a legal and institutional framework that will involve legislation and thus must be constitutionally valid, it is possible for such markets to emerge without legislation or regulation, as in the case of voluntary carbon markets. In this case, jurisdictional authority is not relevant. Similarly, there is nothing precluding a province or the federal government from entering into a contract with a landowner or company to compensate for the provision of ES, for instance. Governments can spend funds without having to stay within their jurisdictional boundaries, as long as that spending is not a concealed attempt to regulate matters outside of their authority.

4.3.1 Division of powers

The authority to legislate in Canada is assigned in the Constitution to either the federal or provincial governments according to subject matter. Examples of powers that fall under federal jurisdiction include trade and commerce, navigation and shipping, fisheries, Indians and lands reserved for Indians, and criminal law. Provinces are responsible, among other things, for property and civil rights, municipalities, natural resources and matters of a local or private nature. It is the federal government which holds a residual power to "make laws for the peace, order and good government of Canada in relation to all matters not coming within the classes of subjects … assigned exclusively to the Legislatures of the Provinces" (Canada, *Constitution Act* 1867, ss. 91 and 92).

Determining who has legislative authority over particular environmental issues is a constant source of debate in Canada (Chalifour 2008). Within this context, it is not surprising that the Canadian Constitution does not assign the power to legislate with respect to ES to either the provinces or the federal government. As such, to determine who has the authority to legislate over particular ES in forests it is necessary to look by analogy to the existing heads of power in the Constitution and their judicial interpretation.

4.3.2 Constitutional authority to manage forests and to create market-based policies in Canada

In general terms, Canadian provinces "have the primary responsibilities for managing forests" located within their geographic boundaries by virtue of a number of constitutional provisions (Chalifour 2005: 116).

Although Canadian provinces have primary jurisdiction over forest management within their borders, the federal government has jurisdiction over some aspects relating to forests. This authority, for instance, allows the federal government to enact environmental laws that could affect the management of provincial forests, as it has done in the case of laws such as the *Fisheries Act*, *Species at Risk Act*, or *Migratory Birds Convention Act.*

In other words, while the provinces own almost all public forests within their borders, and have the authority to regulate for purposes of forest management, the federal government has the authority to regulate in ways that affect forests when addressing matters within its areas of jurisdiction, such as inland fisheries and Aboriginal lands. Not surprisingly, there is a fair amount of federal-provincial overlap.

In addition, the federal government owns 16% of all forest land in Canada, which includes most of the forest land in the three northern territories (Environment Canada 2007). To an increasing extent, the federal government has delegated legislative authority over these northern forests to territorial governments, but still retains its status as owner.

There are a number of MBIs for which the provinces and federal governments have overlapping jurisdiction, though the design of the instruments would likely be different reflecting the different source of authority. For instance, both levels of government would likely have constitutional authority to implement tax provisions to discourage activities that detract from ES provision and tax incentives that encourage provision of ES by forest companies, though this authority would derive from different powers (i.e. provincially, the licensing, natural resources and provincial taxation powers; federally, the criminal, POGG and taxation powers) (Chalifour 2008, Chalifour 2004).

The creation of ES markets is surrounded by different questions, some of which might cause potential constitutional concerns. Among these questions, the most significant one is who has authority (1) to create property rights in ES, regardless of any trading regime, and (2) to create institutional frameworks for ES. For the latter, ES markets are very rarely created on their own. They are almost always an adjunct to a regulatory regime. So a carbon market is part of carbon regulation, a biodiversity market part of biodiversity regulation, etc.

Given the division of powers briefly summarized above, what authority would each level of government have to pass legislation to implement MBIs for ES in a forest context? Given their broad authority over property and civil rights as well as natural resources, provinces have a large scope of authority to *create property rights* in ES within the province, except perhaps in limited areas such as federal or Aboriginal lands. In terms of regulatory power, they also would likely be empowered to create regulatory frameworks for most types of ES in forests within the province. Provinces have constitutional authority to regulate forest management, water and wildlife (biodiversity), for example, which covers a broad swath of ES. But provincial authority is not unlimited. For example, it is questionable whether provincial regulatory regimes (including ES markets) could extend to resources that are specifically within federal authority, such as fisheries (and aquatic organisms) and migratory birds.

In areas where the province has authority to regulate forest ES, this likely includes the authority to regulate the *trade* of ES within the province. Whether provinces could regulate inter-provincial trade in ES (including carbon) is far more questionable, since inter-provincial trade is an area of federal jurisdiction (Elgie 2008). Provinces have broad authority to implement direct *payments* for ES concerning lands and resources within the province.

Although the federal government does not have direct authority over forest management within provinces, outside of federally owned lands, there are a number of heads of powers that could justify federal legislation that creates markets for ES or establishes MBIs relating to ES provision in forests. The federal government's ability to establish ES markets depends to some extent on the *source* of its constitutional authority over a particular issue. Most heads of federal constitutional power confer broad authority to use a range of different legislative tools. For example, the power over Fisheries (s. 92(12)) would likely enable the creation of an ES market involving aquatic ecosystems (for waters that have or support fish) (*R. v. Northwest Falling Contractors* [1980] 2 S.C.R. 292).

It is difficult to precisely delineate the scope of federal power to enact ES markets, since so much depends on the specific legislation. However, a few general observations can be made. In aquatic areas or federal lands (e.g. parks and the north), the federal power is fairly broad. For most other types of ES within its authority, such as carbon or endangered species, the federal government would need to rely on its "Peace, Order and Good Government" (POGG) and/or Criminal powers. The Criminal power is probably the safest constitutional basis for federal legislation on these issues, based on current case law. However, it is questionable whether ES markets or MBIs would be allowed under the

Criminal power (Elgie 2008). Some other authors such as Hogg however believe they would be likely would allowed (Hogg 2008). To be safe, the federal government may need to rely on its POGG power as the basis for establishing ES markets on issues such as carbon or endangered species habitat. However, the scope of this power is more uncertain than the Criminal power, based on recent court cases, making it harder to predict the outcome. Alternatively, the federal government could rely on a combination of its Criminal and Trade & Commerce powers (combining powers is allowed) to support such ES schemes. But this is also very untested constitutional ground, so the chances of success are uncertain (Elgie 2008, Hogg 2008).

On the whole, most authors are of the view that federal legislation creating markets for carbon reduction – and by extension probably endangered species habitat conservation too – would likely be upheld by the courts (Elgie 2008, Hogg 2008), provided it is not seen as an indirect way of legislating in areas of provincial jurisdiction. However not all share this view (Hogg 2008, Rolfe 1998, DeMarco 2004, Barton 2002, Castrilli 1999).

In summary, the existing legal framework applicable to Canada's publicly owned forests generally prescribes rights to "traditional" ES, such as timber, hunting and fishing, or tourism, but not to other emerging forest ES (such as carbon or biodiversity).

4.4 Implications for trade rules

International trade rules, such as those of the North American Free Trade Agreement (NAFTA) and World Trade Organization (WTO), are not generally a major legal challenge to using market-based instruments for sustainable forest management. However, they can become relevant in two contexts.

BOX 18

Prohibited and actionable subsidies (WTO rules)

According to the WTO Agreement on Subsidies and Countervailing Measures (SCM), a subsidy is "a financial contribution by a government or any public body within the territory of a Member" that "confers a benefit" on its recipient (s. 1.1 of the SCM). The WTO either prohibits or makes "actionable" subsidies that are "specific" to a company, industry or region.

The subsidies that are prohibited outright by the WTO are those that are tied to export targets or require the use of domestic versus imported goods (SCM). Subsidies are actionable if the complaining country can show that the subsidy had an adverse effect on its interests.

Adverse effects could be demonstrated if, for instance, one country's subsidies hurt a domestic industry in the importing country, or if they hurt competing exporters from another country when the two compete in a third market (SCM). The country alleging the use of actionable subsidies by another country has the onus of proving the harm as well as meeting other criteria before proceeding with the application of countervailing duties (WTO, website).

The application of the subsidy rules is enormously complex – from determining what is a subsidy and whether it is "specific" to an industry, to whether it caused an adverse effect. Anyone familiar with the softwood lumber dispute will know that many years were spent arguing over what constitutes a subsidy (the provincial tenure regimes were claimed to have created a subsidy to the industry) and whether the U.S. forest industry was harmed by the alleged subsidization.

What is important for readers of this report is to keep in mind the possibility that trade rules (notably those relating to subsidies) could be relevant to the selection and design of MBIs for SFM. As such, it would be wise to consult someone familiar with subsidy rules in the policy-making process, ideally at the conceptual stage. Policies can thus be designed to minimize the risk of inflaming trade sensitivities.

First, if MBIs entail a charge on resource users (such as an energy or carbon tax), global trade rules permit jurisdictions imposing the tax to use border tax adjustments to offset any negative competitive impacts that might result from such measures. Since most of the MBIs used to promote SFM discussed in this report involve the use of incentives rather than disincentives, we will not discuss border tax adjustments further.

Second, if MBIs create financial incentives or payments, trade rules relating to subsidies can be relevant (Box 18). We will offer a few comments about subsidy rules since Canadian stakeholders will be more comfortable using MBIs for SFM knowing that they can do so in a way that complies with subsidy rules. Because subsidy rules are enormously complex, we will only here offer a brief summary of how they work, using the WTO subsidy rules as an example. We strongly recommend that policy-makers designing MBIs that involve incentives work with trade lawyers to ensure the policy instruments are designed to be in compliance with subsidy rules.

The good news is that it is possible to design incentive measures to minimize the risk of triggering countervail, for instance by "ensuring that the measures are not specific in design (de jure specificity) or in application (de facto specificity) to any particular industry or sector", but apply across multiple sectors (Chalifour 2004:286-287). Of course, one of the safest techniques to reduce risk is to seek sanction from trade partners ahead of time (i.e. through Memoranda of Understanding or other negotiated settlement).

In conclusion, subsidy rules need not pose a problem for the use of MBIs to encourage provision of ES in forest management. However, designers of these instruments need to be aware of the rules and ensure that the measures are designed appropriately.

4.5 Fairness, equity and distributional impacts

The implementation or modification of any policy, including MBIs designed to promote ES, will have different impacts on different stakeholders and sectors of society. When evaluating the fairness of any policy instrument, the fundamental question is to understand its impacts on the distribution of benefits and burdens within society, and to determine whether these differential impacts are acceptable to society (OECD/Elgar 2006).

The most commonly evaluated form of distributional impact is economic, where studies examine the extent to which policies may be regressive and show that "poorer households pay disproportionately more of the financial costs associated with the introduction of environmental policies; and richer households receive disproportionately more of the benefits associated with improved environmental quality" (OECD/Elgar 2006:1-2). Policies can also raise distributional concerns from the perspective of gender, race, region or time (i.e. with intergenerational concerns) (OECD/Elgar 2006:1).

There are obvious ethical reasons why it is important for policy-makers to aim to create policies that are fair and equitable. In addition, and from a pragmatic point of view, it is critical to take fairness and equity considerations into account to reduce the risk of developing a policy that ends up being rejected by the public due to its social justice concerns. It is outside the scope of this paper to offer a comprehensive discussion of distributional concerns. However, we wish to underscore the importance of bringing these issues into the instrument selection and design process.

5.0 Political challenges to using market-based instruments for sustainable forest management

The decisions involved in the development of MBIs are inherently political as they can involve change in regulatory approaches, property rights, and the setting of targets, standards or tax levels. This section examines some of the essential political issues associated with MBIs and the movement towards providing incentives for the provision of ecosystem services.

5.1 Multi-actor policy decision-making

Policy-makers typically face situations in which decisions are made in complex administrative and legislative settings involving multiple actors. These settings often involve multiple levels of institutions, including intra- and/or inter-governmental.

In these situations, multiple actors interact in different *arenas* and decision-making typically takes place in multiple stages or *rounds*. Individual decisions taken in each round build upon each other to generate a final result (Weiss 1980).

These complex settings and procedures add a great deal of uncertainty to the nature and type of decision outcomes which result from such processes. Understanding how decision-making in such complex structures occurs, and not mistaking them for simpler processes, is a prerequisite for understanding policy-making in modern societies.

While decision-making membership is expected to vary across policy issues and sectors and over time, it is possible to outline a basic inventory of policy actors from whose ranks members will be chosen.

5.1.1 Elected officials

The elected officials participating in the policy process may be divided into two categories – members of the executive (i.e., cabinet members) and legislators. The executive is one of the key players in the policy subsystem. Its central role derives from its constitutional authority to govern the country. While other actors are also involved in the process, the authority to make and implement policies rests ultimately with the executive. Indeed, there are few checks on the executive in parliamentary systems, such as Canada's, as long as the government enjoys majority support in the legislature.

Members of the legislature play a very different role. In parliamentary systems the task of the legislature is to hold governments accountable to the public rather than to make or implement policies. But the performance of this function provides opportunities to influence policies. Legislatures are crucial forums where social problems are highlighted and policies to address them are demanded. Legislators also get to have their say during the process of approving government bills, policies and budgets. In return for their consent, they are sometimes able to demand changes to the policies in question.

In many contemporary legislatures, most of the important policy functions are performed not on the floor of the legislature, but in the committees established to review proposed legislation. Committees often build considerable expertise in the area with which they deal, and the extent to which this happens enables the legislature to exercise influence over making and implementing policies (Olson and Mezey 1991).

As a result of these limitations, legislatures generally play only a small role in the policy process in Parliamentary systems such as Canada's. While individual legislators, on the basis of their expertise or special interest in the problem, can be included in a policy sub-system, legislatures as a whole are not very significant actors in the making or implementing of public policies.

5.1.2 Appointed officials

The appointed officials dealing with public policy and administration are often collectively referred to as the *bureaucracy*. Their function is to assist the executive in the performance of its tasks, as is suggested by the terms *civil servants* or *public servants* used to describe them. However, the reality of modern government is such that their role goes well beyond what one would expect of a servant. Indeed bureaucrats are very often the keystone in the policy process and the central figures in many policy subsystems (Kaufman 2001).

However, we must avoid exaggerating the role of the bureaucracy. The political executive is ultimately responsible for all policies, an authority it does assert at times. High-profile political issues are also more likely to involve higher levels of executive control. Executive control is also likely to be higher if the bureaucracy consistently opposes a policy option preferred by the politicians. Moreover, the bureaucracy itself is not a homogeneous organization but rather a collection of organizations, each with its own interests, perspectives, and standard operating procedures which make arriving at a unified position difficult. Even within the same department, there are often divisions along functional, personal, political, and technical lines. Thus it is not uncommon for the executive to have to intervene to resolve intra- and inter-bureaucratic conflicts, and bureaucrats in democratic countries require the support of elected officials if they are to exercise their influence in any meaningful way (Sutherland 1993).

5.1.3 Business actors

Among societal groups, it is the organization of business and labour that is often most significant in determining a state's policy capabilities. This is because of the vital role each plays in the production process, which is, in every society, a fundamental activity that has effects far beyond the economy.

Among interest groups, business is generally the most powerful, with an unmatched capacity to affect public policy. As a result of the increasing globalization of production and financial activities, corporations which own the means of production and therefore control capital, have unparalleled power. It is possible for investors and managers to respond, if they so wish, to any unwanted government action by moving capital to another location. Although this theoretical mobility is limited by a variety of factors – including the availability of suitable investment opportunities in other countries – the potential loss of employment and revenues is a threat with which the state must contend in making decisions. Because of the negative consequences this entails for state revenues, capitalists have the ability to punish the state for any action it might take of which they disapprove (Hayes 1978).

The financial contributions that businesses make to political parties, as well as their ability to fund researchers of their choice, also influence policy-makers. This can lead political parties and candidates running for office to accommodate business interests more than they would those of other groups. Similarly, the financial contributions that businesses often make to research institutions serves to further entrench their power. The organizations and individuals receiving funds tend to be sympathetic towards business interests and can provide business with the intellectual wherewithal often required to prevail in policy debates (McGann and Weaver 1999, Abelson 1999).

5.1.4 Labour

Labour also occupies a powerful position among social groups, though not as powerful as business. Unlike business, which enjoys considerable weight with policy-makers even at the individual level of the firm, labour needs a collective organization, a trade union, to have its voice heard in the policy subsystem. In addition to bargaining with employers on behalf of their members wages and working conditions, which is their primary function, trade unions engage in political activities to shape government policies affecting them.

5.1.5 The public

Surprising as it may appear, the public plays a rather small direct role in the public policy process. This is not to say that its role is inconsequential, as it provides the backdrop of norms, attitudes and values against which the policy process is displayed. In most liberal democratic states, however, policy decisions are taken by representative institutions, which empower specialized actors to determine the scope and content of public policies, rather than the public, per se.

One important role played by members of the public in democratic polities, of course, is as voters. On the one hand, in democratic states voting is the most basic means of participating in the policy processes. It not only affords voters the opportunity to express their choice of government, it also empowers them to pressure political parties and candidates seeking their votes to offer them attractive policy packages. But, on the other hand, the voters' policy capacity usually cannot be actualized, at least not directly, for various reasons. One reason is that in modern democracies policies are made by representatives of voters who, once elected, are not required to heed the preferences of their voters in their day-to-day functioning. More significantly, candidates and political parties often do not run in elections on the basis of their policy platforms; and even when they do, voters usually do not vote on the basis of proposed policies alone.

5.1.6 Political parties

Political parties comprise another vehicle that shapes public opinion. But they are also vehicles for the election of leaders and governments, and often they play only a minor role in the development of specific policy issues. They are a means through which opposing views can compete to attain political power through the electoral system. Parties articulate political platforms, and candidates for political office are elected largely on the basis of their party affiliation.

5.1.7 First Nations

The role played by First Nations in environmental and resource policy has evolved considerably in countries like Canada. In areas of the country covered by modern treaties, First Nations have negotiated a variety of proprietary and usufructory rights which can impinge on land and resource use decision-making. This represents a significant change from an earlier era of treaties in which only very limited powers over reserve lands were held by First Nations. This situation developed slowly over a 50- to 60-year period as Aboriginal organizations pursued a multi-faceted attack on the image and venue of the existing Aboriginal rights regime (Howlett 1994).

The role of provincial governments towards First Nations is quite different than that of the federal government. Although provincial governments actually deliver a wide range of federal services to First Nations through a complex set of intergovernmental agreements, their relationship with First Nations is quite distinct from that of the federal relationship (e.g., see Scott and McCabe 1988). In many cases the relationship between the provinces and First Nations are inherently conflictual as, for example, any expansion of First Nation's territorial control reduces the extent of provincial jurisdiction over lands and resources, directly conflicting with provincial land management and ownership rights set out in Sections 109 and 92(5) of the *Constitution Act,* 1867.

5.1.8 Mass media

The print media, especially daily newspapers, offer environmental coverage through reportage, editorial commentary, as well as documentation of environmental events and issues. The media serves an educational and political role in directing the popular discussion about environmental issues. Media coverage of environmental issues informs the public and provides the basis for political mobilization (Hackett and Zhao 1998).

Environmental coverage has increased in the past four decades, in conjunction with developments in scientific knowledge, increased adverse "events" (such as oil spills and nuclear accidents) and a burgeoning environmental movement (Lowe and Morrison 1984). Reportage of environmental matters is considered to be a preliminary stage in the mobilization of the public and the agenda-setting process. Newspapers notify the public about problems and provide information; they alert political actors to the character of emergent issues and the tides of public opinion. The media influence the kind and amount of environmental information accessible to the public, and in turn, generate public response to these issues.

Environmental issues have not been easily incorporated in the print media. The lack of environmental news networks, the incongruence between daily newspaper deadlines and the long-term time-scale of environmental issues explain, to some extent, the under-representation of environmental news. Moreover, environmental issues are difficult to articulate (Hansen 1991). The scientific character of many environmental issues does not translate easily into news coverage. The news media focus on direct, visible and obvious environmental crises rather than open-ended, continental issues which extend over long periods of time (Hackett et al. 2000).

5.1.9 Interest groups

Another significant intermediating actor is the organized interest group or non-governmental organizations (NGOs). While policy-making is a preserve of the government, and particularly of the executive and bureaucracy, the realities of modern politics enable interest groups to play a significant role in the process.

In the resource and environmental policy sector, environmental groups can mobilize and organize support outside the political arena and then pressure existing political forces to work toward enhanced environmental protection. Such groups have been especially successful in their educational activities. Many groups form links with other groups to address issues with large-scale impacts. For example, the Pulp Pollution Campaign in Vancouver was mobilized in the late 1980s by the West Coast Environmental Law Foundation and other groups, including a wide range of over fifty environmental and other public interest groups. Its public education and lobbying efforts have been effective in pressuring government to tighten pulp pollution regulations in British Columbia.

Environmental non-government organizations (ENGOs) have several advantages in resource and environmental policy-making that are not enjoyed by other indirect means of representing the public interest. The use of the media in expanding a base of public support is one example. The strategic use of the media by Greenpeace in efforts to stop the sealing industry and to remove nuclear submarines from Canadian waters, for instance, has been especially effective in mobilizing public support.

Yet environmental organizations, while representing a means by which the public can initiate and influence the policy process, are also limited by a number of factors. While pressure groups have increasingly gained access to policy networks in Canada in recent years, the uncertainty of their funding, their temporary and issue-specific nature, and their organizational instability restrict their success in dealing with other network actors. Struggles between and within ENGOs have also dissipated activists' morale and energy, while public support may ebb and flow in response to a variety of socioeconomic factors.

5.2 Policy inertia and barriers to policy change

Using MBIs for the provision of ES is a relatively new policy approach globally, and it is very new in the Canadian context. As such, there may be barriers to implementing MBIs even in those cases where they are clearly the best policy framework.

The question of policy stability and resistance to change has been studied extensively over the course of the past 30 years and is relevant to adoption of MBIs designed to conserve ES. Research on policy stability highlights the manner in which ideological and institutional factors insulate policy issues from change processes. These factors can be classified as (i) non-decisions, (ii) hard issues, (iii) path dependence, and (iv) closed networks (Box 19).

Moving from CAC mechanisms to MBIs may be limited because of all four of the issues identified above. MBIs can be viewed as relatively complex and technical, and they may be viewed by some as inappropriate for addressing environmental problems – invoking the hard choices issue. As there is a long history of CAC in environmental policy, path dependence and closed networks are likely to be present as well. However, identification of these as potential challenges can help in re-framing the issue to move towards adoption of MBIs where appropriate.

BOX 19

Factors that contribute to policy inertia

Non-Decisions was a term used in the 1960s to describe situations in which policy debates remained mired in the *status quo* because alternatives were simply not considered or debated (Bachrach and Baratz 1962, Frey 1971). Examples of such instances range from the failure to deal with issues important to the urban poor to similar inaction on a wide-range of women's issues.

Hard Issues is a term coined more recently to describe the oft-noted phenomenon in which the nature of a particular policy issue can insulate it from external change processes (Rittel and Webber 1973, Martin 1998). Issues follow different routes onto government agendas, with a significant difference in policy processes being related to whether the issue involved significant elite or public mobilization (Cobb et al. 1976). Certain issues either fail to ignite popular interest, or if they do, fail to deliver a popular consensus on what kinds of change are required (Pollock et al. 1989). For example, some issues like toxic regulation or utility rate-setting are "hard" in that they are technical, legalistic, means-oriented, or simply unfamiliar to most members of the public. Hard issues, therefore, are more likely to involve only a very limited number of specialized policy actors and serve as a barrier to entry of new actors into existing subsystems (Keller 1999).

Path Dependence refers to the manner in which current policy decisions are influenced by the institutional and behavioural legacies of past decisions (Rose 1990). Policy legacies affect current policy-making due to factors such as sunk costs, or institutional routines and procedures which can force decision-making in particular directions – by either eliminating or distorting the range of options available to governments (Rona-Tas 1998). Hence, for example, a decision to alter an existing nuclear energy program in which billions may already have been invested is a much more difficult decision to make than if a program had not yet been started.

Closed Networks refer to a more recently identified source of policy stability, which is based simply on the ability of existing key policy actors to prevent new members from entering into policy debates and discourses. This can occur, for example, when governments refuse to place prominent environmentalists on environmental advisory boards or regulatory tribunals, when funding is not provided for intervenors at environmental assessments, when the creation of such boards and procedures is resisted, or because of interest groups pursuing specialized issue niches (Browne 1990, 1991). All subsystems tend to construct *policy monopolies* in which the interpretation and general approach to a subject is more or less fixed (Rhodes 1997, Schaap and van Twist 1997).

5.3 Enhancing policy capacity

Contemporary governance takes place within a very different context than that of past decades. Government capacity in terms of human and organizational resources has increased, but its autonomy or ability to independently effect change has been eroded. This is due, at the international level, to the growth of powerful international and trans-national actors and systems of exchange (Cerny 1996, Reinicke 1998). At the domestic level, however, modern governments have also been affected by the re-structuring of societies into complex networks of interorganizational actors (Mayntz 1993).

As a result of both movements, states have undergone a kind of hollowing out, as various functions and activities traditionally undertaken by governments now involve a variety of significant non-governmental actors. This change is true of:

(i) the services previously provided directly by government employees – ranging from highway maintenance to psychiatric care – which have been contracted out to non-governmental organizations,

(ii) the replacement or augmentation of legal and regulatory enforcement – in areas such as energy conservation and drinking and driving – by information-based quasi-private public relations campaigns,

(iii) the general shift in regulatory activities from *enforcement* to *compliance* regimes, and

(iv) the shift in the use of financial instruments away from taxes and subsidies towards the increased use of tax expenditures (Hawkins and Thomas 1989, Woodside 1983, Weiss and Tschirhart 1994, Howlett and Ramesh 1993, Hood 1991, Doern and Wilks 1998).

Intentionally or not, these changes have all had the effect of further deepening the network structure and complex character of contemporary life by fostering the creation and interaction of non-governmental and governmental organizations (Peters and Pierre 1998).

A significant factor affecting policy failures and their management issues pertains to governmental and non-governmental policy analytical capacity. Taken together, they require a government with the ability to develop medium- and long-term projections, proposals for, and evaluations of, future government activities (Fellegi 1996, Singleton 2001, Anderson 1996, Bakvis 2000) and not simply react to short-term political, economic or ecological challenges.

While *policy capacity* can be thought of as extending to day-to-day administrative activities involved in policy implementation, *policy analytical capacity* is a more focused concept. It refers to:

(i) the amount of basic policy research a government can conduct or access,

(ii) a government's ability to apply statistical methods, applied research methods, and advanced modelling techniques to the data,

(iii) a government's ability to communicate policy related messages to interested parties and stake-holders, and

(iv) a government's ability to employ analytical techniques such as environmental scanning, trends analysis, and forecasting methods in order to gauge opinion and attitudes of the broad public, of interest groups and of other major policy players, and to anticipate future policy impacts (Anderson 1996).

BOX 20

Factors shaping policy capacity

Additional factors important to policy analytical capacity include the relevance of the work conducted, the quality of employees, and the opportunity for employees to strengthen their skills and expertise (Anderson 1996). A government department should also be able to clearly articulate its medium- and long-term priorities (Fellegi 1996). There should also be sufficient horizontal coordination between government branches, along with adequate management of relations with external policy actors.

Of the external policy actors, the policy-research community is especially important. By researching policy issues and communicating them to the public, it serves as a complement to government policy capacity (Anderson 1996). Enhancing policy analytical capacity requires:

(i) government to recognize the importance of, and thereby demand, policy research,
(ii) a supply of qualified researchers,
(iii) quality data,
(iv) productive interactions with other researchers, and
(v) a culture that encourages openness and risk taking (Riddell 2007).

5.4 Overcoming policy inertia

Policy analytical capacity is important for identifying policy opportunities, but simply training more analysts and conducting more policy research is not always enough to overcome policy inertia. Indeed, policy change is often enhanced by particular processes, such as (i) systemic perturbations, (ii) venue change, (iii) policy learning, and (iv) subsystem spill-overs (Box 21).

Aspects of each of these mechanisms for overcoming policy inertia are evident in the current discussion of using MBIs for ES. Climate change is viewed by many as a crisis that is changing policy regimes. Environmental groups are increasingly describing the benefits of MBIs as an approach to achieve environmental goals. Policy learning, particularly from other jurisdictions, is occurring and it appears that spillovers between various governmental and nongovernmental agencies are occurring regarding the use of MBIs.

BOX 21

Factors influencing policy change

Systemic perturbations are policy change-enhancing processes that originate in external crises, and which upset established policy routines (Meyer 1982). These can include idiosyncratic phenomena such as wars or disasters, or repeating events such as critical elections and leadership rotations. The principal mechanism by which policy change occurs is via the introduction of new actors into policy processes, very often in the form of enhanced public attention being paid to a policy issue as a result of a perceived crisis situation (Sabatier 1988, 1987; Sabatier and Jenkins-Smith 1993).

Venue change refers to a second process of facilitating policy change – one related not so much to changes in external conditions as to changes in the strategies policy actors follow in order to pursue their interests (Schattschneider 1960). This process includes strategies employed by actors presently excluded from policy systems or subsystems, such that they are able to gain access to policy deliberations and affect policy outcomes (Baumgartner and Jones 1993). This often involves members of policy communities attempting to “break into” more restricted networks of central policy actors, but also can involve jockeying for advantage among network actors (Wilks and Wright 1987, Howlett and Ramesh 1995, Howlett and Rayner 1995).

Policy learning refers to the third change-enhancing process, whereby a relatively enduring alteration in policy results from policy-makers and participants learning from their own and others’ experience with similar policies (Heclo 1974). What is learned is often the experiences of other jurisdictions, but can also involve reflection on experiences originating within the confines of the subsystems’ existing boundaries (Rose 1993 and 1991, Olsen and Peters 1996).

Finally, **subsystem spill-overs** refer to the change process whereby activities in otherwise distinct subsystems transcend old policy boundaries and affect the structure or behaviour of other subsystems (Dery 1999, Keohane and Hoffman 1991). An example of this process is when long-established natural resource policy actors found it necessary to deal with Aboriginal land claims issues. This general process, like systemic perturbations, affects policy processes largely through the introduction of new actors into otherwise stable subsystems.

6.0 From theory to practice: using market-based instruments for sustainable forest management

Creating markets for ecosystem services is not easy. As the previous sections have shown, the theoretical underpinnings of MBIs are complex. We now move beyond theory and focus on the practical application of MBIs. The discussion focuses specifically around the implementation of MBIs. This section begins with a discussion of some of the key lessons learned, particularly from international experience, and their implications on the use of MBI systems in Canada. Following this, we present two examples of MBIs that could contribute toward SFM in Canada, including key issues in their implementation. The report concludes with a discussion of the management implications and recommendations for policy (Section 7).

6.1 International experience with market-based instruments: lessons learned

As we have seen, international experiences with MBIs have been varied. In an attempt to summarize some of the key lessons learned from using MBIs around the world, we conducted interviews to identify major challenges surrounding the design and implementation of MBIs, and to describe how these challenges have been overcome.

Telephone interviews with leading experts were conducted to compile practical experience with valuation and MBIs in the hope of improving current policy approaches in Canada, and to gain knowledge on emerging issues and practical approaches. The experts came from academic and policy-making backgrounds in Canada, the U.S., and Australia. To protect their privacy, no personal information is revealed about any of the sources.

The interviews with experts provided advice on three particularly important issues in the design and implementation of MBIs:

- the issue of the role of valuation of ES in relation to MBIs,
- MBI design: diagnosis and action, and
- challenges in MBI implementation.

Valuation and MBIs

Ecosystem services valuation has emerged as a tool to address cumulative environmental effects by assigning values to ES. Valuation is a powerful tool, and earlier in this report we highlighted a number of methods for estimating the total economic value of ES. Yet, when it came down to the practicalities of ES valuation studies, many of the experts raised the same concern: Valuation studies are not always necessary for valuing ES. Some experts stated that valuation studies are more theoretically applicable than practically applicable. Part of the reason for this sentiment may be due to some of the factors that contribute to difficulties with valuation, including:

- lack of consistency of valuation estimates,
- lack of acceptability and credibility in valuation studies,
- lack of consistent definition of ES,
- limited economic resources, and
- lack of familiarity with the valuation process.

Valuation can be an important tool to establish the appropriate goal or target to be used within the MBI. However, in cases where we know that the benefits of a policy will outweigh the costs, it is possible to bypass valuation and choose an ad hoc target for use in a MBI. This shortcut might be favourable in cases where we are believed to be running out of time before a tipping-point occurs. In theses cases, the ad hoc targets used in MBIs should be verified wherever possible using valuation studies.

MBI design: diagnosis and action

Regarding MBI design, some experts suggest a two-stage process when designing MBIs: an initial diagnosis stage and a subsequent action stage.

- During the **diagnosis stage** analysts identify the market failure impacting a particular ES, and then list the barriers to MBI implementation. In determining the ES that have the best fit for MBIs, the diagnosis stage should begin with an analysis of the potential buyers. In other words, look for an ES (or a bundle) that people are generally familiar with, and that is easy to measure, and then design the MBI accordingly. However, before implementing the MBI across the economy, policy-makers should be sure to employ the action stage.
- The **action stage** uses pilot projects and experiments as a means of identifying and addressing unforeseen problems with the MBI. Here analysts should look closely for any unintended consequences of the proposed MBI, since these become more difficult to fix after implementation.

Challenges in MBI implementation

Many of the challenges identified in previous sections of this report were also identified by experts as practical problems. The following challenges were commonly cited as likely problems faced when implementing MBIs:

- lack of clear science regarding ES,
- lack of institutional capacity for designing and implementing MBIs,
- lack of political will,
- lack of perceived scarcity,
- transaction costs within a market, and
- legal barriers.

Given the critical importance of each of these challenges in designing successful MBI systems, each of these challenges is now discussed in turn.

First, it is important to have clear **scientific knowledge** regarding the ES in question. For instance, if an MBI is intended to promote land use management for clean water, it is important to know what management steps lead to clean water. Without this basic ecological understanding, it is difficult to design an effective MBI.

Second, experts point to the lack of **policy expertise** as another barrier to implementing MBIs. The diagnosis and action stages of MBI development require significant analytical capacity. Without an increase in capacity, government agencies likely do not have the ability to educate decision-makers. A major step in this educational process entails retiring the traditional concept of forests as simply a timber supply, and instead conceptualizing forests as sources of ES.

The third challenge facing MBIs is the lack of **political will**. Political inertia is likely attributable to the public's failure to recognize the importance of ES, as well as the familiarity of policy-makers with command-and-control approaches over the relatively new MBIs. It is also believed that this inertia is partially a result of the previously mentioned lack of analytical capacity, and hence the lack of knowledge among decision-makers. It is possible that as analytical capacity increases, political inertia should decrease.

The fourth challenge facing MBIs is related to the public's notion of **perceived scarcity**. For MBIs to function, the public should recognize that a particular ES is becoming scarcer. This *scarcity concept* justifies paying for ES, since otherwise they will continue being underprovided to the point where they may eventually reach an irreversible threshold – i.e., extinction. Furthermore, there are times when the government is the main purchaser of ES. Since these purchases involve taxpayers' dollars, there could be anger among members of the public who do not perceive the ES scarcity. Solving this problem is difficult, and will likely require education and communication.

The fifth challenge facing MBIs is the **transaction costs** of bringing buyers and sellers together. This problem arises from the need to develop new markets for these ES transactions, and the transactions costs tend to be larger in the early stages. Solving this problem often involves using communication technology, such as the internet, to increase trading efficiency.

Finally, the **legal challenge** facing MBIs is related to property rights over the ES. Defining property rights is important, since there is a minimum set of rights required before people will begin producing and marketing ES. In other words, the MBI must legally define ownership of the ES, as well as clearly specify what rights the owner has. In the case of Canadian SFM, this property rights problem is further complicated by the fact that most of the forest is publicly owned.

To summarize, MBIs can be developed without explicit information on the value of ES, and MBIs provide a number of advantages relative to CAC; however, this does not mean MBIs will necessarily optimize SFM. They still face a number of economic, political and legal barriers.

Hence, some scholars suggest there are circumstances where MBIs should be combined with the more traditional CAC policies. For example, consider a CAC policy that is effective at preventing a number of market failures, but has one unintended consequence that leads to an environmentally damaging practice. In this case it might be unwise to remove the CAC policy, since it is doing more good than bad. Instead, a MBI could be designed to counterbalance the CAC policy by discouraging the unintended environmentally damaging practice.

6.2 Potential instruments for improving sustainable forest management in Canada

In this section we outline two MBIs that could be relatively easy to implement in Canada, and which would correct for market failures not currently addressed in forest policy. These MBIs are tradable disturbance permits and forest carbon tendering. For each of the instruments we outline the nature of the problem being addressed by the MBI, details about the design of the MBI, and implementation issues and how they might be addressed.

6.2.1 Tradable disturbance permits with conservation offsets

a) Description of the problem

- Within Canada's public forest, there are many different land users and uses, such as forestry, mining, oil and gas, etc. Since land often contains more than one resource, more than one user will operate on a given area. Hence, provincial governments have allocated a system of overlapping tenures that allow multiple users access to the same area of land. The fact that one particular user does not have complete property rights often leads to more land disturbance than what would otherwise be socially optimal, resulting in a negative impact on biodiversity (e.g., see Weber and Adamowicz 2002). This particular market failure is referred to as an *open access problem*. The classic open access problem is the unregulated commercial fishery, where many different fishers have access to the ocean, and the inability to restrict access to fish stocks leads to overfishing. Multiple users on the forest landscape result in a similar inability to restrict resource access in order to manage for specific ecological objectives.

b) Proposed solution

- Tradable rights are a common approach for addressing open access problems in the fisheries, and for managing aggregate air emission problems (e.g., see Grafton et al. 2004). In the case of tradable disturbance permits (TDPs), the government allocates the right to disturb a certain amount (e.g., one hectare per permit) of a particular habitat type in a given year (Weber and Adamowicz 2002). The number of TDPs is capped, creating scarcity; and since TDPs can be traded, a market price for each habitat type will emerge. By considering TDP prices in development decisions, the opportunity cost (i.e., the value of the next best alternative foregone as the result of making a decision) is minimized. These cost savings can then be applied towards habitat preservation (Weber 2004). Furthermore, conservation offsets can be incorporated in this program and applied as credits against permit requirements.

c) Implementation barriers

- Since there are often few industrial firms operating in each forest area, market power could pose an economic challenge (Weber and Adamowicz 2002). In this case, the lack of competitiveness in the market for TDPs could lead to strategic behaviour by firms.
- There is also a legal issue with respect to TDP duration. For example, consider a system where banking is allowed. In this case there would be additional cost savings due to increased flexibility to manage impacts over time; but banking could also result in periodic concentrations of disturbance (Weber and Adamowicz 2002).
- Politically speaking, there is the challenge of policy inertia to overcome. TDPs are meant to be allocated according to the premise of adaptive management, which entails changing disturbance levels in light of new habitat information. Industrial players will likely oppose any such uncertainty in the amount of disturbance they are allowed, since insecurity to future resource rights increases investment risk (Weber and Adamowicz 2002). Industry opposition to a TDP system would make it politically problematic.
- A major ecological challenge is determining the appropriate number of TDPs. Caps on development could be set using results from natural disturbance models, or using habitat thresholds believed necessary for maintaining viable populations of threatened wildlife species (Lande 1987).

d) Comments

- Among the interviewed experts, there is a general convergence of opinion regarding the advantages of using more market-based policies, such as a TDP system.
- The TDP system could be a cost-effective means of addressing the open-access market failure currently facing many Canadian forests. Indeed, Weber (2004) models the Boreal Forest Natural Region of Alberta, and finds that a TDP system significantly increases preservation areas and species representation. Generally speaking, the TDP system rations access to the land so that:
  - i) land goes to the highest value use,
  - ii) the amount of land disturbance is capped (the ES or non-market values are protected),
  - iii) the cost of achieving the cap is minimized,
  - iv) information on values and uses of land is revealed, and
  - v) there is some flexibility in the system.

6.2.2 Forest carbon tendering

a) Market failure

- Burning fossil fuels is a leading cause of greenhouse gas emissions, contributing to climate change. A market failure occurs when the external costs of the emissions are not paid by the polluters, and instead are paid by society.

b) Proposed solution

- A solution to the greenhouse gas emissions market failure would be to have a tendering system for carbon offsets. Based on the results of its BushTender trial (mentioned in Sections 3.2 and 4.1.3), the Australian state of Victoria is expanding its auction system to tender forest carbon contracts.
- Forests can act a significant carbon sinks, and increases in carbon sequestration above baseline levels can be used to offset increases in carbon emissions from other parts of the economy.
- Since an important means of increasing carbon sequestration is by increasing rotation ages, it could be assumed that more old forest will be present on the landscape. Assuming old growth is a proxy for biodiversity, a carbon offset system has the potential to increase the amount of old forest, and hence increase the amount of biodiversity (McCarney et al. 2008).
- An advantage of tendering forest carbon contracts is that the carbon offsets can be sold – either in provincial, federal or international markets – therefore generating revenues for the carbon payments to forestry firms. In this case, provincial regulators ask for sealed bids from forestry firms, in which the firm provides the price at which it would sequester carbon. The province then purchases these temporary carbon offsets from the lowest price suppliers, and sells them on the carbon market.
- This system allows the province to regulate carbon sequestration while minimizing the financial burden on taxpayers. Depending on the costs of carbon sequestration relative to carbon prices, some provinces might even profit.

c) Implementation barriers

- An important debate in Canada is deciding whether the province or the firm should possess the property right for public land forest carbon. In a carbon tendering system, the province retains the property right to the carbon offset, but pays the firm for sequestration. Hence, the firm has an incentive to sequester carbon, and the province can generate revenue by selling the offsets.
- Another issue is determining the baseline carbon stock. In this case, for the province to be able to sell the offset on the international markets, it will likely have to use its historical *business-as-usual* (BAU) forest management statistics in setting the baseline. For provinces that have allocated all of their public forestland to private firms, setting a provincial BAU baseline is not overly problematic. Problems arise, however, for provinces that still have forest to be allocated, since future forest industry entrants could be forced into purchasing carbon offsets if their timber harvesting lowers carbon stocks below the baseline level.
- Another issue is determining who is liable if a contract area were to burn. If the offset provider were liable and had to replace the destroyed offsets by purchasing more, it would greatly increase the risk of these decisions.

d) Comments

- Although most Canadian forestry firms operate on public land, the long duration of forest tenures make a carbon auctioning system feasible. Indeed, such a system will likely be cost-effective, given that forestry firms and governments have different information. Forestry firms have a better private understanding of the costs of sequestering forest carbon through changes in forest management practices on their forest management areas.
- By collecting bids for forest carbon sequestration, public funds can be allocated to the lowest cost provider.
- For provinces that still have unallocated annual allowable cut (AAC), carbon baselines could be set by assuming that the AAC will eventually be harvested using average forest management statistics. Calculating the baseline this way would not penalize firms that might harvest this AAC sometime in the future. Of course, international markets for carbon might not approve of this baseline calculation, since it could allow provinces to sell carbon offsets while their aggregate carbon stock was actually falling. Such a system, however, might be acceptable for smaller emissions markets, such as the one currently operating in Alberta.
- The fire issue is complicated. It is possible that private firms would require prohibitively high prices if they were to be held liable for carbon emissions from fire, as well as from massive outbreaks of insects or disease. The liability may have to reside with government.

7.0 Conclusions: where do we go from here?

Can valuing ecosystem services (ES) help guide the development of market-based policy instruments? Can valuation and market-based instruments enhance sustainable forest management? The answer appears to be "yes".

The value of forest ES is increasingly being recognized, although public policy is often required to address market failures (i.e., undervaluing of ES). Valuation of ES is useful in guiding government investments and providing targets for policy change. Valuation can also help other decision-makers consider the total economic value of market and non-market resources.

In some cases, the government can move directly to policy tools while a detailed valuation study is being conducted.

There are, however, a number of challenges surrounding valuation. Capacity, cost and time constraints are especially important.

In some cases, the government can move directly to policy tools while a detailed valuation study is being conducted. Policy-makers can for instance pick a standard or target for a particular ES, and then let the values emerge from the policy instrument. When the valuation study is completed, it can be used to calibrate the market-based instrument such that an appropriate market price emerges. For instance, the social value for old-growth habitat calculated by a valuation study might be higher than the market price for tradable disturbance permits for this habitat. In such a case, policy-makers could simply reduce the number of old growth permits in the market until the market price was equal to the results from the valuation study.

There has been some progress in Canada towards using market-based instruments, especially with respect to carbon sequestration.

There has been some progress in Canada towards using market-based instruments, especially with respect to carbon sequestration. There is a market for carbon sequestration offsets in Alberta. The Alberta Greenhouse Gas Emissions Trading System requires large industrial emitters to reduce intensity reductions by 12%; otherwise they must purchase carbon offsets or pay a tax of $15 per tonne CO_2 equivalents (Boyd et al. 2008). Alberta has an offset protocol for afforestation, but the forest management offset protocol has yet to be finalized. Ontario is looking into tradable carbon offsets that can be earned by tree planting, forest management and forest conservation. Quebec, Ontario, Manitoba and British Columbia are partners in the Western Climate Initiative, which is in the process of designing forest offset mechanisms

The value of ES is increasingly being recognized. Unfortunately, many ES are the victim of various market failures, which require public policy to be corrected. ***Compared to traditional command-and-control policies, market-based instruments are often the lowest cost means of achieving, and perhaps exceeding, environmental performance standards.*** The challenge lies in matching MBIs to specific problems. Although barriers exist, market-based instruments show great promise in helping Canadians achieve sustainable forest management.

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