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Global Ecosystem Markets

Overview of global ecosystem markets and identification of potential opportunities for Alberta's agriculture and forestry sectors

Final Project Report
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Notice

Deloitte was engaged by the Institute for Agriculture, Forestry and the Environment (IAFE) to conduct an assessment of global environmental markets in order to identify leading practices and opportunities for Alberta's agriculture and forestry sectors. The scope of this assessment was defined by IAFE and is described in detail below. Deloitte coordinated the research for this initiative, and the results of this assessment are presented in this report.

This report was prepared for IAFE and is for IAFE's use.

Executive summary

The purpose of this report is to provide an overview of emerging market- and price-based approaches to environmental protection, in order to identify potential opportunities for Alberta's agriculture and forestry sectors.

The primary focus of the report is on markets and price-based mechanisms operating at the national and international levels, rather than state or provincial level initiatives. However, several innovative environmental markets (or markets for ecological/ecosystem services) operate at regional levels, therefore the assessment included selected coverage of these initiatives where they represent leading practices that could help inform market development in Alberta. The scope of the review was also limited to environmental markets that are relevant to the agriculture and forestry sectors. Thus, the assessment focused on markets that involve carbon, water, and biodiversity. Bioenergy was not included in this assessment.

The approach used for this study included four steps:

1. A global scan of environmental markets. This resulted in an initial list of 40 markets at varying levels of maturity.
2. Identification of markets for more detailed review. To narrow the list, the markets were assessed against eight criteria of interest to Alberta's agriculture and forestry sectors.
3. A more detailed assessment of relevant markets. This was completed to gather available information on drivers leading to the creation of the markets, market mechanisms, ecosystem services included, key participants, and an assessment of potential market size.
4. An assessment of potential market opportunities for Alberta's agriculture and forestry sectors.

The study concluded that Alberta is well-positioned to explore new market- and priced-based approaches to environmental protection in the agriculture and forestry sectors. Experience gained with the creation of a carbon market (offsets and emission performance credits) under the Alberta Specified Gas Emitters Regulation, supplemented by policy drivers and commitments in the province's Land-use Framework and Water for Life Strategy, set the stage for developing environmental markets, where appropriate. The study identified immediate opportunities, as well as medium-term and potentially longer-term opportunities for the agriculture and forestry sectors. Immediate opportunities included certification and ecolabelling schemes, as well as the voluntary carbon market. Medium-term opportunities included participation in national and global regulated carbon markets that are expected to be in place in the next few years. In the longer term, global biodiversity markets may be an opportunity as they are of increasing international interest; however, it is not clear how they will operate and whether developed countries will be able to participate in them.

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1. Introduction

Context

Over the last several decades, awareness of the impacts of human activity on the natural environment has resulted in the development of complex frameworks of policies and regulations. These instruments have been designed to minimize environmental impacts while sustaining ongoing development and economic growth. Traditionally, the value derived from the environment (in the form of raw materials and various services) and the costs of environmental degradation have not been effectively quantified or accounted for. As a result, defining the benefits of environmental protection in the face of rapid growth has proven difficult.

However, in recent years there has been a growing recognition of the value associated with the raw materials and services (water filtration, climate regulation, crop pollination, etc.) that ecosystems provide. Attempts have been made to quantify these contributions with respect to human health, economic growth, and prosperity. The ability to quantify the benefits derived from ecosystems results in two important outcomes. Firstly, it supports a more robust assessment of the trade-offs between economic development and impacts to functioning ecosystems. Secondly, it supports an alternative, market-based approach to environmental protection by generating economic value for activities that maintain and promote healthy, functioning ecosystems.

Such market-based approaches represent significant opportunities to both individual businesses and entire sectors of the economy. In fact, the valuation of ecosystem services may present the greatest opportunities to those industries that rely most heavily on the natural environment. By providing an alternative means of generating economic value from such resources, it is possible to encourage a renewed focus on environmental protection while also supporting continued economic growth.

Report objectives

The purpose of this report is to provide an overview of emerging, market- and price-based approaches to environmental protection in order to identify potential opportunities for Alberta's agriculture and forestry sectors. Specifically, this report has two objectives, as listed below:

1. Provide an overview of existing and emerging environmental markets and identify potential opportunities for Alberta's agriculture and forestry sectors.
2. Describe leading practices of those organizations that have successfully engaged in environmental markets in order to identify opportunities for Alberta's agriculture and forestry sectors.

Section two of this report outlines the approach that was used to identify existing environmental markets and the selection criteria used to identify and present a select number of case studies relevant for the agriculture and forestry sectors. Section three explores the concepts of ecosystem services and the ecosystem marketplace in greater detail; this is complemented with an overview of the key drivers for market-based conservation as well as definitions for different categories of markets. Section four presents an initial market analysis, including international examples; and section five outlines the immediate and longer term market opportunities available for Alberta's forestry and agriculture sectors.

This report provides a high-level overview of the ecosystem marketplace, which utilizes market-based transactions to serve the dual purpose of ecosystem conservation and the provision of financial incentives to engage in environmentally sustainable behaviours. It identifies developed and emerging environmental markets as well as potential participation opportunities for further analysis for Alberta's natural resource sectors.

2. Scope and approach

The valuation of ecosystem services is a rapidly evolving field and policy frameworks supporting environmental markets are emerging in numerous jurisdictions globally. It was therefore important to clearly define the scope and objectives of this review to ensure its relevance to Alberta's forestry and agriculture sectors. The purpose of this section is to describe the scope of this document as agreed upon with IAFE, as well as the approach used to identify, review, and collate information on these markets for this report.

Project scope—geographic location

As the purpose of this initiative was to identify opportunities for Alberta's agriculture and forestry sectors, the geographic scope of this review was initially limited to the primary export markets for these industries. However, based on an initial review of global environmental markets, it was observed that many of the best examples of functioning markets were found in other jurisdictions. For this reason, the geographic scope of the assessment was expanded in order to accommodate these examples. As a result, the countries included were:

- Primary export markets
  - South Korea
  - Europe (where environmental markets exist)
  - China
  - The United States
  - Japan
- Examples of functioning markets
  - France
  - Germany
  - Denmark
  - Sweden
  - Norway
  - United Kingdom
  - Costa Rica
  - Mexico
  - Australia

In order to maintain a manageable list of programs and markets for review, the primary focus of this assessment was on markets and price-based mechanisms operating at a national (rather than a state or provincial) level. It was recognized that some of the best examples of functioning environmental markets are currently not operating at this scale. In such instances, where provincial or state programs offered the most useful examples of a certain type of market, they were included in this report for illustrative purposes.

Project scope—types of ecosystem services and markets

Given the wide range in the type and maturity of environmental markets currently in operation, it was necessary to narrow the scope of the review to include only those markets that were relevant to the agriculture and forestry sectors. For this reason, the assessment focused on markets involving carbon, water, biodiversity, and "bundled services" (a grouped payment for services related to water, carbon, and/or biodiversity). At the request of IAFE, bioenergy (energy derived from biological sources) was not included in this report, as other individuals and organizations were reviewing this opportunity

Based on discussions with IAFE, it was decided that pilot projects operating at small scales would be excluded from this assessment. Further, as the focus of the report was on international market opportunities, domestic (Canadian) markets were not included in this assessment. Finally, as noted above, provincial and state level programs were generally out of scope for this assessment except in cases where they represented leading practice in the development, implementation, or operation of a certain type of environmental market.

Approach

The approach used for this assessment was designed to ensure a focused review of markets that are relevant to the agriculture and forestry sectors. The specific steps included in the approach are identified below.

Global scan of environmental markets

A high-level global scan of environmental markets was initially conducted to identify regions and types of markets for more detailed assessment. This resulted in an initial list of 40 markets at varying levels of maturity.

Identification of markets for more detailed review

In order to narrow the list of 40 markets to a list for more detailed review, this inventory was assessed against a number of criteria, listed below:

- The market is located within one of Alberta's agriculture or forestry export markets or in the identified geographic location (as noted above).
- The market is currently functioning, with a minimum of three years of transactions.
- The market's transactions are driven by one of the following: regulatory compliance, contractual agreement, and/or requirement for verification.
- The market has clearly defined buyers and sellers.
- The market has the potential to deliver financial and/or business benefits to various participants in the agriculture and forestry sectors.
- The market is designed to provide financial value for activities that deliver ecosystem services and environmental benefits.
- The market has future growth potential, as evidenced by increasing participation rates and transaction volumes (if information is available).
- The market is a national market (e.g., U.S. wetland mitigation offsets) or international (e.g., voluntary carbon offset markets).

Detailed assessment of relevant markets

Once a shortlist of relevant markets was identified, a more detailed assessment of each was conducted. This was based on Internet research to identify relevant reports, and supplemented by a review of the relevant academic literature and interviews with individuals in Alberta with specific expertise in the agriculture and forestry sectors. A description of each type of relevant market was then developed, including:

- Drivers leading to the creation of the market,
- An overview of how the market functions,
- A description of the ecosystem services included,
- An overview of key participants, and
- An assessment of current and projected market size.

For each market type identified, examples were also provided to illustrate the above.

Assessment of potential opportunities

Based on the information derived from the market scan, a list of potential opportunities for Alberta's forestry and agricultural sectors was then developed. As markets are in varying stages of maturity, this focused on both existing international market opportunities and potentially emerging opportunities.

3. Ecosystem services and markets

Overview

This section of the report addresses five aspects of ecosystem services and markets:

- What are ecosystem services?
- How are ecosystem services valued?
- What are ecosystem services markets?
- What are the drivers influencing the development of ecosystem markets?
- How are ecosystem services financed?

Examples are provided in this section for illustrative purpose. Additional detail for many of the examples is provided in the section *Environmental markets scan* (page 18).

What are ecosystem services?

Humans benefit from a multitude of resources and processes that are supplied by natural ecosystems. Collectively, these benefits are known as ecosystem services and include products, such as clean drinking water, and processes such as nutrient cycling.

The 2005 Millennium Ecosystem Assessment (MA), the largest and most comprehensive multi-stakeholder review to-date of ecosystems and their services, identified four ecosystem services categories, including:

- Provisioning services
  - Foods (including seafood and game) and spices
  - Precursors to pharmaceutical and industrial products
  - Energy (hydropower, biomass fuels)
- Regulating services
  - Carbon sequestration and climate regulation
  - Waste decomposition and detoxification
  - Nutrient dispersal and recycling
- Supporting services
  - Purification of water and air
  - Crop pollination and seed dispersal
  - Pest and disease control
- Cultural services
  - Cultural, intellectual, and spiritual inspiration
  - Recreational experiences (including ecotourism)
  - Scientific discovery

To demonstrate the relationships between humans and natural ecosystems through the services derived from them, two examples are illustrative.

1. In New York City, where the quality of drinking water had fallen below standards required by the U.S. Environmental Protection Agency (EPA), authorities opted to restore the polluted Catskill/ Delaware Watershed that had previously provided the city with the ecosystem service of water purification. After a reduction in the input of sewage and pesticides to the watershed, natural biotic processes improved, such as soil absorption and filtration of chemicals, together with abiotic recycling via root systems and soil microorganisms, resulting in water quality improvements to levels that met government standards. The cost of this investment in natural capital was estimated between US$1-1.5 billion, which contrasted dramatically with the estimated US$6-8 billion cost of constructing a water filtration plant plus the US$300 million annual maintenance costs.

2. In the U.S., pollination of crops by bees is required for 15-30% of U.S. food production. Most large-scale farmers import non-native honey bees to provide this service. One study[1] reported that in California's agricultural region, wild bees alone could provide partial or complete pollination services or enhance the services provided by honey bees through behavioural interactions. However, intensified agricultural practices can quickly erode pollination services through the loss of species, and those remaining are unable to compensate for the difference. The results of this study also indicated that the proportion of both chaparral and oak-woodland habitat available for wild bees within one to two kilometres of a farm can strongly stabilize and enhance the provision of pollination services, thereby providing a potential insurance policy for farmers of this region.

These examples and many more that could be cited, give an indication of the important role that ecosystems services play in maintaining healthy environments and attributes that are valued by humans. The agriculture and forestry sectors, which are the main focus of this report, are responsible for managing the provision of many ecosystem services.

According to Forest Trends,[2] "Vital forest services include watershed protection, biodiversity conservation, and carbon storage. Forest degradation can lead to impacts on these services ranging from local scale flooding and degradation of water supplies, to global scale climate change, to loss of ecosystem resilience, scenic beauty, and accessible sources of sustainable timber and non-timber forest products, as well as all other services supported, directly or indirectly, by well-functioning forest ecosystems."

For forested ecosystems, four types of environmental services are of particular relevance: carbon sequestration, biodiversity protection, watershed protection (or hydrological services), and aesthetics.[3]

Vital forest services include watershed protection, biodiversity conservation, and carbon storage.

The Food and Agriculture Organization of the United Nations (FAO) has identified the same four types of services in which environmental markets (specifically "Payments for Ecosystem Services" schemes) could reduce the negative environmental impacts of agricultural production and improve the regulating and supporting functions of agricultural ecosystems.[4]

- Carbon sequestration—encouraging increased sequestration and long-term storage of carbon in plant biomass and soil organic matter.
- Watershed services—increasing water use efficiency and the protection or improvement of water quality through nutrient and chemical load management and erosion reduction, which will help to reduce sediment load in streams and thus reduce the risk of landslides and floods; increased groundwater recharge by better infiltration of rainwater.
- Biodiversity conservation—supporting the protection of remaining areas important for wild biodiversity or enhancing the quality of on-farm habitats and agro-biodiversity.
- Landscape aesthetics—protecting or enhancing landscape features, like tropical forests, rice paddy terraces or a hedgerow-lined agricultural mosaic that are valued for their aesthetic and cultural aspects.

As an illustration of the potential value of ecosystem services, the Ecosystem Services Project in Australia applied this concept to the family farm[5]. In an idealized "farm of the future", 50% of revenue comes from traditional commodity sources, such as wheat and wool. The other 50% comes from carbon credits, water quality credits, and biodiversity credits tradable in voluntary or government-mediated environmental markets (see Table 1).

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[1] Greenleaf, Sarah S. and Claire Kremen. Wild bees enhance honey bees' pollination of hybrid sunflower. PNAS September 12, 2006 vol. 103 no. 37 13890-13895
[2] Forest Trends. *Developing Markets and Payments for Forest Ecosystem Services*. Technical Forestry Briefs (last updated 10/2004).
[3] Robbins, Alicia. October 27, 2005. *Ecosystem Services Markets*. University of Washington, College of Forest Resources.
[4] FAO. 2007. *The State of Food and Agriculture 2007. Part I: Paying Farmers for environmental services.* Rome.
[5] Ecosystem Services Project website. Accessed January 14, 2009: www.ecosystemservicesproject.org

Table 1: Future farm income

Commodity	Percentage of farm income	Potential buyer
Wheat	10%	World market
Wool	15%	World market
Timber	25%	Specialty and world market
Carbon credits	15%	Steel company
Salinity credits	10%	Cost sharing for catchment management
Water filtration credits	20%	Urban water authority
Biodiversity credits	5%	Philanthropic trust

The literature on ecosystem services is already large and is increasing rapidly as the growing human population and the related consumption of goods and services threaten ecosystems around the world. In fact, 16 of the 24 ecosystem services examined in the MA were categorized as degraded. The MA research further revealed that the rate of decline in biodiversity and ecosystem health in the past 50 years was unprecedented.[6]

The MA report caught the attention of the public, as well as policy-makers around the world. It accelerated the search for new ways to halt and reverse the loss of ecosystem services, and it stimulated the active engagement of industry through the World Business Council for Sustainable Development (WBCSD), which stated that, "The [MA] report introduced new ways of looking at ecosystems and of quantifying the services they provide. In a departure from previous thinking on ecosystems, it added human beings into the equation. It offered new incentives and impetus for sustainable use and mooted the idea of ecosystems and other services as fungible assets. This report has encouraged all sectors of society, and particularly business, to view ecosystems with a greater sense of urgency and to seek out new mechanisms for their sustainable use."[7]

How are ecosystem services valued?

It is difficult to give objective monetary values to ecosystem services. Such values have limits typically due to significant variance, and often non-monetary valuation methods, and indicators must be used to help shape policy decisions. Monetary estimates have a key role to play however, and it is essential to understand the ways in which such valuations are derived. The advantage of monetary values is that they are amenable to market transactions, in which buyers and sellers come together to trade commodities based on a price.

A conservative estimate of the direct and indirect financial contribution of ecosystem services to the world economy is US$33 trillion per year.[8] This estimate from 1997 is considerably lower than more recent estimates. In 2007 a study estimated the value of ecosystem services from Canadian boreal forest for carbon storage, pest control, and water filtration at C$93.2 billion (2002 dollars), or 8.1% of Canada's GDP in 2002.[9]

As there are many ecosystem services valuation approaches and methodologies,[10] a complete description of each is beyond the scope of this report. It is important to note however, that monetary estimates are based on assumptions, approximations, and simplifications. They measure only certain kinds of value, and can be misapplied if used at an improper scale or over inappropriate timeframes. They do, however, integrate information about supply and demand and can be an effective policy tool when used appropriately or in combination with other policy tools.

What are ecosystem services markets?

According to the WBCSD, a number of market-based approaches to promoting or enhancing the provision of ecosystem services exist, and they can be voluntary or mandatory. Direct payments can be made for the delivery of specific ecosystem services or for adopting land uses that are thought to provide such services. For example, paying for watershed protection can result in reducing pollutant

[6] Millennium Ecosystem Assessment. 2005. *Ecosystems and Human Well-being: General Synthesis*, Island Press, Washington D.C.
[7] World Business Council for Sustainable Development. March 28, 2008. *Making Markets for Ecosystem Services.*
[8] Costanza, Robert, Ralph D'Arge, Rudolf de Groot, Stephen Farber, Monica Grasso, Bruce Hannon, Karin Limburg, Shahid Naeem, Robert V. O'Neill, Jose Paruelo, Robert G. Raskin, Paul Sutton and Marjan van den Belt. *The Value of the World's Ecosystem Services and Natural Capital*. Nature 387 (1997): 253-260.
[9] Anielski, Mark and Sara Wilson. 2005. *Counting Canada's Natural Capital: Assessing the Real Value of Canada's Boreal Ecosystems*. Canadian Boreal Initiative and the Pembina Institute.
[10] See, for example, The National Academies Press. 2004. *Valuing Ecosystem Services: Toward Better Environmental Decision-Making*. Water Science and Technology Board.

loads in runoff from upland areas and providing clean water for irrigation. Governments in a number of countries provide payments and tax incentives to encourage resource conservation.

Another market-based mechanism rests in creating new rights and liabilities for the use of natural resources, and then opening them up to trade. Examples include the growing market for wetland banking[11] in the United States and the increasing trade in biodiversity offsets[12]. The burgeoning trade in carbon credits based on government-allocated emissions allowances is another illustration. The global carbon market was worth approximately US$118 billion in 2008, rising 84% from the previous year due to higher trading volumes and prices.[13]

The use of certification and ecolabelling offers another business opportunity. Certification schemes for wood and non-timber forest products, fisheries, and agricultural produce are already well-established, and signs indicate that they too are set to grow.[14]

The WBCSD concluded that, "Market mechanisms clearly offer opportunities to use ecosystems sustainably and deliver environmental dividends, provided they are carefully and equitably implemented. Ensuring this will require partnerships between governments (to provide the regulatory frameworks), civil society (for the knowledge surrounding ecosystems and their services), and business (for their capital and technology). Partnerships for sustainable use will enable all stakeholders to better understand ecosystems and their services, assess their dependence and impacts, reduce their negative impacts and scale-up solutions, and to explore and pursue new business opportunities."[15]

Market mechanisms clearly offer opportunities to use ecosystems sustainably and deliver environmental dividends, provided they are carefully and equitably implemented.

The Willamette Partnership in Oregon is an example of an effort to bring together diverse stakeholders to develop a common vision for economic health and vitality in the Willamette River Basin. The Partnership has taken steps towards establishing an integrated ecosystem marketplace that promises to deliver broad conservation benefits at lower costs and with less conflict than traditional approaches. In 2005, the U.S. Environmental Protection Agency (EPA) selected the Partnership to receive one of 12 Targeted Watershed Grants to develop an innovative water quality trading program. A Conservation Innovation Grant was allocated in 2007 to help the Partnership build the tools needed to evaluate and participate in emerging markets for water quality improvements, wetland restoration, habitat conservation, and carbon sequestration. More specifically, the grant provided additional capacity to link multiple ecosystem-service markets together into an integrated marketplace for the entire Willamette Basin.

Three ecosystem services markets are already in place in Oregon, including:

- Wetland mitigation banks, which sell compensatory mitigation credits to offset unavoidable impacts to a natural wetland impaired by a development project.
- In the Tualatin River Basin, a water resources agency avoided investing more than US$60 million in technological upgrades by restoring 35 miles of 150-foot-wide stream buffers and paying farmers competitive rates for using their land for restoration.
- The Oregon Department of Transportation is developing two "conservation banks" to conserve Oregon chub, an endangered fish. The banks are being developed under the U.S. Fish and Wildlife Service conservation banking program that allows developers who cannot avoid causing adverse impacts on endangered species to invest in banks elsewhere that restore or protect equivalent habitat.

[11] A mitigation bank is a wetland, stream, or other aquatic resource area that has been restored, established, enhanced, or (in certain circumstances) preserved for the purpose of providing compensation for unavoidable impacts to aquatic resources.
[12] Biodiversity offsets are measurable conservation outcomes resulting from actions designed to compensate for significant residual adverse biodiversity impacts arising from project development and persisting after appropriate prevention and mitigation measures have been implemented.
[13] New Carbon Finance. 2009. *Carbon market up 84% in 2008 at $118bn.* Press release: January 8, 2009.
[14] See, for example, The National Academies Press. 2004. *Valuing Ecosystem Services: Toward Better Environmental Decision-Making*. Water Science and Technology Board.
[15] Ibid.

The Willamette Partnership, which is positioning itself to be a leader and innovator in the green economy, could be used as a model for Alberta. One component of leadership could be the development of an integrated ecosystem marketplace similar to the one that is being created in Oregon.

In December 2008, the U.S. Department of Agriculture (USDA) announced plans to establish a new "Office of Ecosystem Services and Markets, and to create a federal government-wide Conservation and Land Management Environmental Services Board to assist the Secretary of agriculture in the development of new technical guidelines and science-based methods to assess environmental service benefits, which will in turn promote markets for ecosystem services, including carbon trading to mitigate climate change."[16] As noted in the media release, "Agriculture producers provide many ecosystem services which have historically been viewed as free benefits to society—clean water and air, wildlife habitat, carbon storage, and scenic landscapes. Lacking a formal structure to market these services, farmers, ranchers and forest landowners are not generally compensated for providing these critical public benefits. Market-based approaches to conservation are cost-effective methods to achieve environmental goals and sustain working and natural landscapes. Without financial incentives, these ecosystem services may be lost as privately-owned lands are sold or converted to development."

It is clear from the few examples provided above that an enormous shift in policy thinking is taking place in the realm of ecosystem services and markets. The following five important "Building Blocks for Ecosystem Services Payments and Markets" have been identified:[17]

1. Identify ecosystem services, buyers, and sellers—includes assessment of both buyers' and sellers' goals/motivations to ensure that they are complementary.
2. Create supportive legal/regulatory context—includes establishing tenure/rights.
3. Develop the rules for the market or trading—includes determining what is being sold, who is paying for what, etc.
4. Establish supporting organizations and services—includes verifications services, etc.
5. Launch markets and payments for ecosystem services.

The development of mechanisms to pay for ecosystem services often faces several obstacles, including:

- Lack of technical and market information,
- Potential buyers are not organized,
- High cost of finding, negotiating and monitoring deals,
- Lack of experience and capacity,
- Inadequate legal and regulatory framework,
- Political conflicts over resource rights and responsibilities, and
- Mistrust of markets for public goods.

What are the drivers influencing the development of ecosystem markets?

This section describes the key drivers and influences on the development of environmental markets.

- **Population growth and environmental degradation**—Between 1970 and 2000, the global population doubled to 6 billion. This increase in population has been coupled with an increase in resources consumed per capita, resulting in more stress on natural systems. Increased and potentially unsustainable demand for commercial food production, timber products (including bioenergy sources), and fresh water for both consumption and energy generation will further impact the assimilative and productive capacity of ecosystems.
- **The exclusion of the environment from the traditional market**—The public nature of ecosystem services has limited their inclusion in the market. Public goods like clean air and water are perceived as free and in the commons for all to use. These characteristics limit the public's willingness to pay for them and the ability for suppliers of these services such as

[16] United States Department of Agriculture. December 2008. *USDA Announces New Office of Ecosystem Services and Markets*.
[17] Adapted by Forest Trends from Brand, David. 2002. *Investing in the Environmental Services of Australian Forests*, in S. Pagiola, J. Bishop, and N. Landell-Mills (editors). *Selling Forest Environmental Services: Market-Based Mechanisms for Conservation and Development.* London, U.K.: Earthscan Publications.

agricultural producers (e.g., carbon sequestration from no-till farming) to benefit financially from delivering them. What is lacking is a true price signal in the market to ensure that those entities or individuals that contribute to the degradation of resources pay an adequate price, and those actors that maintain, enhance, or restore the system receive adequate financial dividends.

- **Governments, regulation, and public policy**—Legal requirements and policy frameworks are often the main driver for the development of environmental markets. At the international level, agreements on a variety of issues, including biodiversity conservation (Convention on Biological Diversity), trade in endangered species (Convention on the International Trade of Endangered Species), and most notably, greenhouse gas emission reductions to mitigate climate change (United Nations Framework Convention on Climate Change), compel the implementation of regulatory frameworks. Local and national environmental issues, such as salinity impacts on terrestrial and aquatic habitats, biodiversity loss, and wetland degradation, also compel policy-makers to implement regulations to control activities that contribute to these problems. It is often a local environmental crisis that prompts policy action.
- **Private sector investment in sustainability**—The private sector is motivated to participate in environmental markets for several reasons, including accessing new markets, demonstrating corporate social responsibility, enhancing brand recognition, anticipating government regulation and seeking early-adopter status, attracting skilled workers and retaining staff, and securing access to capital by reducing exposure to environmental risks. Another key driver, particularly for resource-based industries, is obtaining a 'social license' to operate. Securing a 'social license' can be equated to earning the trust and confidence of local residents and stakeholders so that they are confident that the operations of a business will not negatively impact local resources beyond an acceptable level. Participation in environmental markets, such as voluntary offsets, can demonstrate corporate commitment to local and global conservation issues. A number of industries have engaged in various multi-stakeholder initiatives to address conservation and biodiversity in development. The mining industry, for example, through the International Council on Mining and Metals, worked with the International Union for Conservation of Nature to develop a guidance document for the industry to adopt best practices for biodiversity offsets.[18]
- **Climate change**—As nations grapple with climate change mitigation and adaptation, the resulting policies will fundamentally alter the market dynamics for the forestry and agriculture sectors. Activities on working landscapes influence the dynamics of the climate regulation system; the manufacturing, transportation, and consumption of forest and agriculture products also influence the concentration of greenhouse gases in the atmosphere. Increasing carbon storage capabilities in soils, vegetation, and forests could serve the multiple purposes of reducing greenhouse gas emissions, supporting the resilience of ecosystems to buffer against impacts as an adaptation strategy, and generating financial rewards through new opportunities, such as the voluntary and regulated carbon markets. The development of carbon markets has, in many ways, provided a platform for other environmental markets to develop. Climate change has also been responsible for garnering significant public attention on environmental issues and concerns. Expectations for businesses to demonstrate corporate social responsibility is a continuing trend that is being driven by the public and shareholders alike.

How are ecosystem services financed?

Ecosystem services are usually bought by direct beneficiaries. The following describes some of the key buyers for a range of ecosystem services:[19]

- Watershed protection
  - Industrial and agricultural water users—to secure stable supply and flow
  - Municipal water utilities and consumers—to reduce costs and ensure water quality
  - Agencies managing environmental risks by funding erosion control measures
- Carbon emission offsets or avoided deforestation
  - Industries seeking to comply with carbon rules (offsets for emissions)
  - Companies and groups strengthening their reputation for environmental stewardship

[18] See ICM.website/library. Integrating Mining and Biodiversity Conservation: Case studies from around the world. www.icmm.com

[19] Waage, Sissel. *Investing in the Future: An Assessment of Private Sector Demand for Engaging in Markets and Payments for Ecosystem Services*. FAO and Forest Trends. 2007

    - Agencies and municipalities seeking to improve air quality
- Biodiversity conservation
    - Conservation agencies and organizations working on private lands
    - Tourist industry, for landscape beautification or protection of key species
    - Land developers (i.e., offsets for damage or for amenity values)
    - Farmers—to protect pollinators and sources of wild products

For the purposes of this report, the terms "payments for ecosystem services" (PES), "environmental markets", and "markets for ecosystem services" will be used interchangeably. These markets can be either regulated or voluntary, and involve transactions where a well-defined ecosystem service is purchased by a buyer from a specific provider or consumer. The terms refer to a broad suite of market-based mechanisms. This includes private contracts between buyers and sellers, certification schemes where the cost of sustainable resource management is included in the price of the good or service, and direct payments to landowners from governments, non-profit organizations, or private enterprises to maintain, restore, or enhance ecosystems. Ecosystem services suppliers must be able to verify the existence of the service and must have established a baseline against which additional units "produced" can be measured.

Based on work by the WBCSD, Business for Social Responsibility, Forest Trends, and the Ecosystem Marketplace, Deloitte identified seven key types of markets.

The following categories provide an approach for classifying the markets for ecosystem services:

- **Government direct payments**—The government collects taxes and redistributes funds by direct payments to land owners who provide ecosystem services through improved conservation practices. Government and policy considerations may play stronger roles in the collection and disbursement of funds, in establishing levels of payments and compensation, and indentifying priority areas towards which payments will be directed. Examples include the U.S. Conservation Reserve Program that pays farmers for conservation practices and the Chinese Government's Sloping Land Conversion Program, which was established for restoring forests.
- **Private sector direct payments**—The private sector voluntarily invests in conservation for the delivery of one or more ecosystem services and/or to enhance business value. Clear property rights and enforceable contracts are key elements. For example, in Costa Rica, hydropower producer La Esperanza formed an agreement to pay the Monteverde Conservation League, an NGO that holds most of the upper catchment, for maintenance of existing forest cover to maintain stable stream flows and reduce sedimentation.
- **Tax incentives**—Landowners are remunerated with indirect financial incentives provided by the government for stewardship and delivery of ecosystem services. Evidence of the use of tax-based incentives exists in the European Union, the United States, Argentina, Brazil, France, and Australia. For example, in Australia, a tax provision allows a deduction for planting trees. This type of ecosystem services market is enabled by directing tax revenue towards resource management practices that deliver ecosystem services (e.g., tax credits for planting trees to prevent sedimentation in a local watershed).
- **Cap and trade**—Trading schemes create demand by establishing regulatory caps or targets for pollutants. This provides a basis for allocating individual emission quotas that can be traded. In New South Wales, Australia, the government is piloting proposals for salinity trading. Based on pre-determined targets, the government has allocated licenses to dischargers of salinity. Those wishing to exceed a salinity quota can purchase salinity credits from those who have taken action to reduce salinity (e.g., by protecting and managing native vegetation). Other examples include tradable development rights pioneered in urban areas in the U.S., including wetland mitigation credits, and emerging nutrient trading schemes in some states. Under international emissions trading, developed countries can reduce carbon emissions at a lower cost and trade credits for emission reductions with other developed countries.
- **Compliance offsets**—Governments regulate development and require compensation for activities that cause residual environmental impact. In the United States, real estate developers must convince the Army Corp of Engineers that no reasonable alternative to damage to a wetland exists, and if determined so, are required to "protect, enhance, or restore" a wetland of comparable ecological value.

- **Voluntary offsets**—Universities, private individuals, companies, and other organizations purchase voluntary offset credits for a variety of reasons, including license to operate, hedging future risks, and brand enhancement. As with compliance offsets, to qualify as an offset, concrete actions are taken to mitigate environmental impacts. Through the Chicago Climate Exchange (which also has legally binding emissions reduction targets and therefore is also considered a cap and trade market), companies are able to purchase or trade carbon credits that are supplied by project-based carbon offsets through an intermediary that sources from privately-owned providers, such as forest and agriculture landowners.
- **Certification/ecolabelling**—Information on the restoration and stewardship of ecosystem services can also be included in the price a product or service. Credibility and communication with consumers is enhanced by certifying the product or services and/or providing an ecolabel. This type of ecosystem market is diverse, having both local and international certification schemes for a variety of products and services.

4. Ecosystem markets scan

This section of the report provides an overview of the different types of ecosystem markets, including case studies for illustrative purposes. It is indicative of the considerable diversity in the development and maturity of ecosystem markets. As these markets are nascent and constantly evolving, the information provided is drawn from the best available sources at the time of the report development.

Each market type overview below provides the following information:

- Description of the market, including:
  - A high level overview of the market,
  - The jurisdictions it operates in,
  - The drivers that precipitated it,
  - How it works,
  - The market participants.
- Market size and forecast, including:
  - Description of current market size, where information is available,
  - Anticipated developments and future projections,
- Examples of existing markets.

Government direct payments

Description

Government direct payments are a form of market-based instruments that send a price signal to landowners to alter their behaviour by providing a financial payment, rather than strictly regulating practices on the landscape. This form of environmental market is very common primarily because the public sector is perceived to be responsible for ensuring that public goods, such as clean air and water, are maintained.

The majority of jurisdictions included in this review have some form of government direct incentive. Programs exist in both industrialized and non-industrialized nations, including the United States, the United Kingdom, Costa Rica, and Mexico. Government direct payments appeal to landowners' self-interest, rather than relying on regulation for environmental protection.

Publicly-funded payments are given to landowners who adopt established guidelines for land and resource management. Landowners are compensated for the costs associated with contractual obligations to adopt new practices, such as reduced or no-till farming, removal of invasive species, planting trees, and protecting habitat. These practices can increase habitat for endangered and pollinating species, reduce the flow of sediment in rivers, secure carbon sinks, and provide buffers against floods. The type and extent of ecosystem services provided by this market depend on the conservation focus of the instrument.

As this type of market suggests, local, state, and national governments are the buyers. Landowners will enter into an agreement with a government agency to adopt certain practices in return for compensation. As previously discussed, under the New York Catskill-Delaware watershed management program, the City of New York receives purified water without the costs associated with building and maintaining a water filtration plant (in 1989, that cost was estimated to be US$6-8 billion plus annual maintenance costs). Instead, farmers and foresters who adopt approved management practices to maintain the watershed's filtration services receive a portion of a US$40 million fund. In this example, the sellers or suppliers of the service are landowners in the watershed and the buyer is the City of New York.

A number of factors influence the price paid in government-mediated programs for ensuring that ecosystem services are maintained, enhanced, or developed. A high ecological value (e.g. unique flora and fauna or important representation of a unique ecozone) or cultural and historical significance are

examples. Another factor is the political and budgetary considerations that can influence direct payment levels.[20] As a number of case studies demonstrate, the government sets the price for certain activities and has control over the market. Given that there is considerable supply available, the price is often determined by estimating the minimum amount required to incent conservation practices that do not impact the financial viability of other land uses (e.g., agriculture). Government restrictions on financial contributions and public expenditure constraints are the key limiting factors in government-mediated ecosystem payments.

Market size and forecast

Research conducted by the Katoomba Group's Ecosystem Marketplace indicates that the global market for government-mediated watershed and biodiversity protection incentives could total more than US$8 billion per year.[21] [22] Supported by the non-governmental group, Forest Trends, and three major banks—ABN Amro, Citigroup, and HSBC—policy-makers, investors, and companies utilize the Ecosystem Marketplace website as a key source for information on the science, prices, regulatory developments, and other market essentials.[23]

Examples

- In the United States, the Environmental Quality Incentives Programs (EQIP) was extended by the recent adoption of the Food, Conservation and Energy Security Act of 2008 (the "Farm Bill"). Administered by the Natural Resources Conservation Service, the program provides eligible farmers with cost-sharing funding up to US$450,000 per individual or entity for activities such as nutrient and waste management, and wildlife habitat enhancement, as outlined in their conservation plan, as a condition of fund approval. In 2007, EQIP had 41,700 contracts with farmers, allocating US$1,004,926,249 towards conservation[24] practices.
- In 2003, the National Forest Commission of Mexico established the Forestry Fund to provide payments for communities for the forest ecosystem services produced on their land. The annual allocation of US$30 million (2004 dollars) pays farmers and landowners to keep land forested, rather than cleared for marginal agricultural production. Farmers enter into five-year agreements with the government and allow monitoring access to program coordinators. Prices for farmers vary—landowners with indigenous forest species in critical mountain areas receive US$40 per hectare; for other species types in less critical areas, the payment is US$30 per hectare per year.[25]
- By 2020, China alone will spend more than US$43 billion in payments to landowners for conservation activities, such as planting trees and reducing nutrient run-off from agricultural activities for watershed protection.[26] Included in the calculation is the Grain for Green program (also known as the Sloping Land Conversion Program) initiated in 1999. Farmers are paid to plant forests on sloping or degraded landscapes in order to limit and prevent soil erosion, flooding, and water quality decline.[27]

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[20] Powell, Ian, Andy White, and Natasha Landell-Mills. 2002. *Developing Markets for the Ecosystem Services of Forests*. Forest Trends. Accessed online December 5, 2008: www.forest-trends.org
[21] Miller, Rachel, Lauren de la Loye, and Carin Bracer. 2008. Government-mediated Biodiversity PES. In, *Payments for Ecosystem Services: Market Profiles*. Forest Trends and the Ecosystem Marketplace. Accessed online November 18, 2008: www.ecosystemmarketplace.com
[22] Stanton, Tracy. 2008. Government Meditated Watershed PES. In, *Payments for Ecosystem Services: Market Profiles*. Forest Trends and the Ecosystem Marketplace. Accessed online November 18, 2008: www.ecosystemmarketplace.com
[23] Guardian Unlimited. Ecosystem Market Launched. Friday April 1, 2005. Accessed January2, 2009.
[24] United States Department of Agriculture. Natural Resources Conservation Service, Environmental Quality Initiatives Program. Accessed December 5, 2009: www.nrcs.usda.gov
[25] Stanton, Tracy. 2008. Government Meditated Watershed PES. In, *Payments for Ecosystem Services: Market Profiles*. Forest Trends and the Ecosystem Marketplace. Accessed online November 18, 2008: www.ecosystemmarketplace.com
[26] Ibid
[27] Bennett, Michael and Jintao Xu. 2005. *China's Sloping Land Conversion Program: institutional innovation or business as usual?* Paper presented at the ZEF/CIFOR Workshop on Payments for Environmental Services: Methods and Design in Developing and Developed Countries, June 2005, Germany.

Private sector direct payments

Description

Private sector direct payments are voluntary transactions, typically bilateral in nature, from an entity interested in the protection or enhancement of defined ecosystem services to an entity with the ability to influence the management of an ecosystem or range of ecosystems. A key characteristic of these payments is that they involve voluntary transactions in which the drivers are not mandated by policy, regulation, or any third-party requirements.

The motivations underlying the payments are varied, but ultimately depend on the maintenance of a natural resource that a company or individual depends on as part of its value-chain, such as water quality in the case of a water bottling company or landscape aesthetics for an eco-tourism operator. The interests may be direct, as described above, or indirect. Examples of indirect motivations for ecosystem payments include enterprise risk management, corporate image and brand, obtaining the "social licence to operate" in a local area, for market access or for philanthropic purposes.

Geographically, private sector payments are not restricted to any particular country or region, and can be classified as a global market. Research conducted for the United Nations Development Program's Global Environmental Facility (UNDP-GEF) identified numerous examples in which private companies conducted an ecosystem market transaction, with the majority occurring in South America. There are examples for both local (primarily water-related ecosystem services) and global (primarily carbon) markets; however, the majority of the transactions occurred at a local scale.[28]

As this market mechanism is a generic conservation market, a diversity of ecosystem services can be monetized and marketed. Possibilities include salinity and sedimentation control by paying forest companies to plant more native species, and watershed protection by beverage companies through paying farmers to adopt organic agriculture practices to reduce chemical effluents. Private sector conservation markets for ecosystem services can be a valuable alternative to secure quality natural resources and address environmental risks. For example, the costs associated with building and maintaining technological water filtration services might far outweigh the costs associated with conserving and maintaining a functioning watershed.

Private sector ecosystem markets are primarily enabled through contractual agreements between the buyers and sellers. Contracts vary in structure from formalized legal agreements to memorandums of understanding to 'handshake' deals[29]. Despite the structure, elements of a direct payment deal should include the terms and conditions (e.g., details on the quantity or quality of ecosystem services), timing and type of payment, details on specific requirements regarding monitoring, verification and reporting, and a description of risks and mitigation strategies to ensure that the contractual obligations are fulfilled.[30]

In many cases, the lack of a formalized process or structure for the development of these agreements involves considerable up-front costs in terms of time and finances. Depending on the deal, significant time and effort may be invested to define the details of the contract. As the concentration and number of private sector contracts increase in a given area, the development of expertise and more formalized processes will decrease transaction costs. The FONAFIFO case study exemplifies private sector deals occurring within a more formalized structure, as compared to bilateral arrangements (see insert below).

The opportunity for these markets lies in injecting market forces into ecosystem management. They help establish building blocks that could lead to the development of more robust environmental markets.

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[28] Powell, Ian, Andy White, and Natasha Landell-Mills. 2002. *Developing Markets for the Ecosystem Services of Forests*. Forest Trends. Accessed online December 5, 2008: www.forest-trends.org
[29] Katoomba Group. 2008. *Payments for Ecosystem Services: Getting Started*. Accessed online December 20, 2009: www.katoombagroup.org
[30] Ibid.

Market size and forecast

As these transactions typically occur outside of a formal structure or framework, the value of global transactions is difficult to assess. However, a number of significant transactions have been recorded.

Continued growth in this type of market is expected as investment from the private sector in conservation-oriented markets is increasing[31]. Stakeholder concerns about corporate responsibility and sustainability, in particular climate change, will continue to be at the forefront of business risks and will continue to drive the global sustainability trend. As a result, voluntary private sector direct payments can be expected to grow as more and more organizations are interested in not only understanding, but also taking responsibility for, their environmental footprint.

Examples

- Vittel, the water bottling company owned by Nestlé, recognized it would be more cost-effective to pay local farmers in Europe to actively manage the 600 acres of land surrounding their aquifers for clean water than it would be to invest in a water filtration plant.[32] Realizing that intensive farming could threaten the quality of their mineral water, Vittel took a proactive approach, by investing US$24.5 million over a seven year period to support the transition from intensive to extensive farming practices. Vittel entered into long-term contracts with farmers in the watershed that were committed to the continuation of farming. These contracts provided farmers with subsidies and land use rights for up to 30 years (average 150 ha) in return for adhering to specified management practices.
- La Esperanza Hydropower in Costa Rica formed an agreement with an NGO (Monteverde Conservation League) whereby it would pay for conservation of existing forest cover in order to maintain stable stream flows and reduce sedimentation, thereby increasing plant efficiency[33]. Payments are used to help protect the cloud forests in Monteverde that are host to a large variety of flora and fauna. Because the area is located on high slopes with high propensity to landslides, the company perceives that protection of the forest results in sediment control and stable water supply. Negotiated payments are made directly to the Monteverde Conservation League. The value of the contract is approximately US$30,000 per year (US$10/ha times 3000 ha) and is for a 99 year term.

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[31] Waage, Sissel. *Investing in the Future: An Assessment of Private Sector Demand for Engaging in Markets and Payments for Ecosystem Services*. FAO and Forest Trends. 2007
[32] Ibid.
[33] Watershed Markets website. Accessed Janunary 11, 2009. See casestudies/Costa_Rica_La_Esperanza.

Case Study 1: FONAFIFO—Environmental Services Payment Program (Costa Rica)

FONAFIFO is Costa Rica's National Forestry Financing Fund. The fund redirects private sector investments to small- and medium-sized forestry producers in the form of loans or other mechanisms, with the aim of promoting the conservation and recovery of the country's forest cover.

The Environmental Services Payment Program (ESPP) aims to reduce deforestation, support the recovery of degraded land, create an effective mechanism to counter illegal logging, promote Costa Rica's forestry industry, improve environmental outcomes, and contribute to rural development.

The Environmental Services Certificate (ESC) is the enabling instrument. It has the following characteristics that increase attractiveness to investors:

- Timeliness—concentrates contributions, avoiding slow and cumbersome negotiations
- Convenience—allows investors to place their money in the region where they receive the environmental services, or to invest in the conservation of forests in general
- Versatility—allows for specific bond issues, according to the conservation priorities set forth
- Transparency—monitors the use and application of resources

Buyers

Both individuals and companies may invest in an Environmental Services Certificate for the protection of one or more regions, determined according to their interests. The amount to be invested will depend on the number of hectares the organization is willing to protect. The minimum area for an ESC to invest in is one hectare. The average value of an ESC per hectare is US$57 per year, and contracts are made for five-year terms. Several companies have invested in this system, including Tuis Hydro SA, Holcim Costa Rica, Agricultural Tayutic SA, Asofifo, Nature Air, Tribe Nasca, Travel Horizons, and the Football Federation of Costa Rica. The benefits to investors are either direct, in terms of the rendering of environmental services required for a proponents business, or indirect, in terms of the marketing and branding benefits of being a conservation provider. In addition, investments in the program are tax-deductible.

Sellers/suppliers

FONAFIFO's operation is carried out by an Executing Unit, which is constituted by an executive director and five operating departments: Environmental Services Department, Credit Department, Administrative Department, Legal Department, and the Resource Management Department. Credits offered under appropriate conditions play a very important role in promoting the well-being of small and medium-sized producers of forestry goods and services. Hundreds of small and medium-sized producers have benefited from different types of credits within the forestry sector.

Future projections

Continued growth is expected, as the proportion of funds from the private sector has increased significantly. This model has proven its effectiveness in creating innovative mechanisms for the payment of environmental services (PSA) and attracting financial resources from the private sector, thereby enabling the protection and regeneration of the forests that produce so many benefits to society and the country.

FONAFIFO is exploring the possibility of international institutions participating; discussions have taken place with The World Bank and the World Environmental Fund. FONAFIFO has designed a monitoring and evaluation system supported by modern technology and trained personnel. There may be an opportunity to export the system outside of Costa Rica.

Source: FONANFIFO website. Accessed December 27, 2008. www.fonafifo.com/english

Tax incentives

Description

Governments provide tax-based incentives for landowners to implement conservation activities, such as planting trees for soil protection and water quality improvement, or by placing a conservation easement on the land.[34] Individual landowners, organizations, and companies that undertake the requisite activities are eligible to "sell" their conservation initiative to the government in exchange for a tax credit; hence the buyer is the public sector. The tax incentive can take many forms, including tax credits, deductions, and preferential rates on income.

A tax deduction subtracts an expense or expenses associated with a conservation activity, such as improving pollinator habitat, from taxable income. Tax incentives can be designed to deliver a number of ecosystem services and can enhance or maintain multiple ecosystem services; the type and extent provided will depend on the focus of the tax program. For example, in Australia, taxpayers (except mining operation owners) can use a provision in the Income Tax Assessment Act 1997 to claim deductions for expenditures relating to the eradication of animals or pests from the land, the destruction of invasive species, and for activities that prevent land degradation.

Market size and forecast

The global market value for tax incentives is unknown due to the nature of the instrument and the different tax systems. Examples are presented below to illustrate the type of financial incentives available.

Examples

- Under the United States Food, Conservation and Energy Act of 2008 (the "Farm Bill 2008"), a number of provisions provide tax incentives for conservation activities, including[35]:
  - Farmers and ranchers can deduct expenses for activities that lead to improved habitat for endangered species.
  - Qualifying farmers can deduct up to 100% of their annual income in exchange for donating a permanent conservation easement.

- The Forestry Bureau in Costa Rica has established two key tax incentives for conservation:
  - The first allows a Forest Bond Certificate to be used as a negotiable bond for tax payments to landowners who qualify by enacting conservation and reforestation initiatives. The maximum value is US$120 per reforested hectare. Any individual or legal entity involved in a reforestation project is also eligible for exemption from certain land taxes as well. The amount of the Forestry Trust Certification is allocated annually and supports cost-sharing for the establishment and maintenance of planted trees. During the first five years, the certificate is allocated as follows: 50% for year one; 20% for year two; 15% for year three; 10% for year four; and 5% for year five.
  - The second tax-based incentive exempts landowners with ongoing reforestation projects from certain land taxes and from income taxes derived from revenue generated from plantation products.[36]

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[34] A conservation easement is a legal agreement between a landowner and a government agency or conservation organization that constrains future development options to keep the land preserved for the environmental and social value.
[35] United States Department of Agriculture: Farm Bill 2008. www.usda.gov/wps/portal/farmbill2008?navid=FARMBILL2008
[36] Costa Rica Home Pages. Business Incentive Programs in Costa Rica. Website accessed Jan 2, 2009: http://www.costaricahomepages.com/business_and_economy/incentives

Cap and trade

Description

Cap and trade programs are characterized by government regulations that create new rights or liabilities for the use of resources or the release of emissions. These rights and liabilities are issued as permits or allowances, and are allocated among regulated sectors. Allocation is accomplished either through free distribution or auction of allowances (or through a mix of both methods) and creates the right for each entity to emit a set amount of emissions.[37]

Landowners participate in cap and trade markets by implementing land and resource management practices and deploying technologies that reduce the consumption or degradation of a resource. These initiatives earn saleable credits. Regulated buyers purchase credits from other individuals or entities capable of reducing their emissions or consumption at lower cost.

In water quality trading schemes, buyers are mainly wastewater treatment facilities, hydroelectric generating plants, industrial point source emitters, and possibly government agencies as buyers in reverse auctions.[38]

A diversity of ecosystem services can be included in cap and trade schemes. From salinity control in a local watershed to global climate regulation, it is possible to design programs that deliver a single environmental service or multiple services simultaneously. The main cap and trade markets today are for carbon, air pollutants (such as sulphur dioxide), and water quality.

Similar to carbon, water quality trading markets are created by government regulations imposing a limit or cap, on the amount of quality degradation or pollution permitted in a watershed or river system. Water quality markets emerged in the United States as an innovative option for controlling pollutants from multiple sources that are cumulatively impacting the assimilative capacity[39] and water quality of the watershed. The Total Maximum Daily Load (TMDL) establishes the cap—the amount of pollutant that a water system can receive. Point source emitters, such as municipal waste and water treatment facilities and industrial emitters are the primary buyers of water quality credits. They can become sellers if they reduce pollutant discharges below TMDL levels and receive tradable credits.

SOx Trading in the U.S.

The United States has experimented with cap and trade programs since the early 1990s to address acid rain caused by sulphur dioxide (SO_2) emissions. Under amendments to the Clean Air Act, a market emerged by establishing a regulatory cap on the allowable emissions of sulphur dioxide. The largest emitters of SO_2 require permits for every tonne of SO_2 emitted into the atmosphere (Bayon, 2004).

However, unlike internationally tradable carbon credits, watershed services such as improved water quality are not globally fungible and must be traded on a watershed or sub-watershed basis.[40]

Market size and forecast

The potential size of the global cap and trade market is difficult to gauge. Estimates from the Ecosystem Marketplace website suggest water quality trading markets are valued at US$15 million annually.[41]

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[37] Stern, Nicholas. 2007. *Stern Review: The Economics of Climate Change*. Part IV: Policy Responses for Mitigation. Available online: www.hm-treasury.gov.uk

[38] A reverse auction is a market instrument where landowners bid to provide conservation protection and enhancement. Buyers select the most conservation value at lowest cost. Rather than a traditional auction where the price is driven up by bidding, in a reverse auction the price is driven down as government agencies and conservation groups have more bidders to choose from. A number of pilot projects in Australia (e.g., BushTender and EcoTender) met the exclusion criteria for the market analysis, but are examples of reverse auctions.

[39] Assimilative capacity of a water body is defined as the maximum amount of pollutant load that can be discharged without impairing water quality for their designated best usage.

[40] Hawn, Amanda. N.d. Watershed services: the new carbon? Accessed online December 19, 2008: http://ecosystemmarketplace.com/pages/article.news.php?component_id=461&component_version_id=445&language_id=12

According to the World Bank Institute, the global regulated carbon market was valued at US$64 billion in 2007.[42] In a recent report released by New Carbon Finance, the global carbon market in 2008 was worth US$188 billion, with transaction levels 84% higher than 2007.

In 2006, the European Union Emissions Trading Scheme (EU-ETS) was valued at approximately US$24.4 billion, with emissions reductions totalling more than 1.1 million tonnes of carbon dioxide equivalent ($MtCO_2e$); in 2007, the value doubled to US$50 billion, with emission reductions totalling more than 2 $MtCO_2e$.[43]

Carbon markets are developing in regions of the United States, Japan, South Korea, and a number of other countries. Experts suggest that the countries that face emissions reduction targets as a result of their ratification of the Kyoto Protocol will create or participate in national or regional markets in greenhouse gases. What is less clear is when and how regional markets will trade among each other and whether they will coalesce into a global market.[44] [45]

Examples

The U.S. Environmental Protection Agency developed the Water Quality Trading Program, and in a recent program evaluation report (Oct. 2008) revealed that expectations exceeded the actual performance of the market. As of October 2008, only 100 facilities had participated in a trade. The Water Quality Trading Program includes non-point source pollutants, notably non-point source emissions from agriculture, such as sediment, nitrogen, and phosphorus. The program provides an opportunity for farmers to voluntarily reduce pollution to get credits to sell as another source of farm revenue.[46]

The most mature cap and trade market is the European Union's Emissions Trading Scheme (EU ETS).[47] Building on the instruments established by the Kyoto Protocol, the European Union launched the Emissions Trading Scheme (ETS) in 2005. Regulated entities can use the Kyoto Protocol's Joint Implementation (JI) and Clean Development Mechanism (CDM) for flexible compliance purposes.

The CDM is a project-based transaction system where industrialized countries receive carbon credits by financing emission reduction projects in developing countries.[48] Currently, the CDM only allows afforestation and reforestation projects to qualify for carbon credits. This excludes forest conservation (avoided deforestation) and soil carbon sequestration, which are prime opportunities for the agriculture and forestry sectors in these countries. Voluntary carbon offsets however, do allow carbon credits from agriculture and forestry projects. These are described in greater detail in the section *Voluntary offsets* (page 28).

The international carbon market is the largest environmental market in the world. To address increasing concentrations of greenhouse gases, the United Nations Framework Convention on Climate Change developed the enabling instrument, the Kyoto Protocol, to establish limits on the amount of greenhouse gas emissions that industrialized nations can emit. These limits are known as Qualified Emission Limitation and Reduction Objectives. Individual countries have specific targets to meet by 2012 that are below 1990 levels. Countries emitting more than their allowed cap are required to

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[41] Ecosystem Marketplace website. Market Watch. Accessed November 24, 2009: www.ecosystemmarketplace.com
[42] Ibid.
[43] Capoor, Karen and Philippe Ambrosi. 2008. *State and Trends of the Carbon Market 2008*. The World Bank Institute. Accessed online November 26, 2008: www.worldbank.org
[44] Bayon, Ricardo. 2004. *Marking Environmental Markets Work: Lessons from Early Experience with Sulphur, Carbon, Wetlands, and other Related Markets*. Prepared for the Katoomba Group Meeting in Locarno, Switzerland, Fall 2003. Forest Trends. Accessed online November 24, 2008: www.forest-trends.org
[45] Capoor, Karen and Philippe Ambrosi. 2008. *State and Trends of the Carbon Market 2008*. The World Bank Institute. Accessed online November 26, 2008: www.worldbank.org
[46] United States Environmental Protection Agency. 2008. *Water Quality Trading Program Evaluation*. Accessed online January 6, 2009: http://www.epa.gov/evaluate/wqt.pdf
[47] The U.S. Wetland Banking program could also be considered a 'cap and trade' market but it is included as a compliance offset because is it a conservation activity primarily for the purposes of compensating for unavoidable environmental harm, and is more closely associated with the definition of an offset.
[48] Bayon, Ricardo, Amanda Hawn and Katherine Hamilton. 2007. *Voluntary Carbon Markets: An International Business Guide to What They Are and How They Work*. Earthscan: London.

purchase tradable emissions rights (also known as allowances, permits, units, etc.) from those that are able to exceed their reduction targets.[49]

Ongoing international discussions and the possible emergence of greenhouse gas legislation in the United States in 2009 could have a significant influence on the inclusion of agriculture and forestry carbon in domestic and international markets.

Further, as water quality issues and biodiversity loss issues come to the forefront, the potential exists for markets to develop in tradable water quality, endangered species, genetic diversity, biodiversity 'hotspots', and other ecosystem attributes.[50] [51] [52]

Compliance offsets

Description

Compliance offsets are activities designed to compensate for unavoidable environmental harm to ecosystem services and biodiversity from development and land use activities, to ensure "no net loss".[53] Carbon offsets are emissions reduction initiatives that result in surplus carbon being sequestered in addition to what would occur under normal operating circumstances. Biodiversity offsets are measurable conservation outcomes resulting from actions designed to compensate for significant adverse biodiversity impacts arising from land or industrial development. The goal of biodiversity offsets is to achieve no net loss, and preferably a net gain, of biodiversity on the ground with respect to species composition, habitat structure, and ecosystem services.

This type of market includes financial payments paid by developers to undertake compensating conservation activities on a site of comparable ecological value. Markets for compliance offsets can be local or national. The development of an international market is still at the proposal stage.[54] Compliance offsets are a market tool that can deliver carbon sequestration, biodiversity protection (or habitat enhancement), wetland protection, and other multiple ecosystem services simultaneously. As with many environmental markets, the benefits derived from one ecosystem service (e.g., water quality) can also indirectly benefit other ecosystem services (e.g., enhanced aquatic habitat for a native fish species through wetland protection).

Offset credits and third parties who develop comparable ecological sites (called banks) are enabled by regulation. The banks hold privately- or publicly-owned lands that are managed for conservation purposes and that can issue "credits" to offset development impacts. Buyers are regulated entities, primarily real estate developers and the extractive industry (e.g., mining), that are legally required to provide compensation for development impacts to the environment. Suppliers of offsets include mitigation banks, forest landowners, agricultural landowners, other private landowners, and non-governmental organizations.

Selling offset credits provides a new source of income for landowners. To generate credits, landowners can improve management practices (e.g., invasive species control), cease certain land use practices (e.g., collection of firewood) in an area of existing native vegetation, or enhance the extent the native vegetation (e.g., planting of native species, or protecting tree stands).

While there are costs associated with creating offset credits by maintaining or enhancing existing stocks of native vegetation and wetlands, the costs increase significantly if a new site is created. Consequently, the price of the issued credits will be higher than for existing sites and buyers will prefer to buy low-cost compliance options from other sources.

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[49] United Nations Framework Convention on Climate Change Website (UNFCCC). 2008. Kyoto Protocol. Accessed December 4th, 2008: http://unfccc.int/kyoto_protocol/items/2830.php
[50] ten Kate, Kerry, Josh Bishop and Ricardo Bayon. 2004. *Biodiversity Offsets: Views, experiences and the business case.* International Union for Conservation of Nature (IUCN), Gland, Switzerland and Combridge, UK and Insight Investment, London, UK.
[51] The Economics of Ecosystems and Biodiversity (TEEB) Project, Interim Report. 2008. European Commission, United Nations Environment Program and the German Federal Ministry for the Environment. Accessed online November 23, 2008: http://ec.europa.eu
[52] Powell, Ian, Andy White, and Natasha Landell-Mills. 2002. *Developing Markets for the Ecosystem Services of Forests*. Forest Trends. Accessed online December 5, 2008: www.forest-trends.org
[53] Kate, Kerry ten, Josh Bishop and Ricardo Bayon. 2004. *Biodiversity Offsets: Views, experiences and the business case.* International Union for Conservation of Nature (IUCN), Gland, Switzerland and Cambridge, UK and Insight Investment, London, UK.
[54] Ibid.

In a report released by the International Union for the Conservation of Nature, interviews revealed a number of advantages to compliance offsets compared with voluntary approaches. Developers and business have clear guidance and understand their compliance obligations, and as the law applies to all developers equally and competitive advantage is not affected. In addition, whereas a voluntary offset may be eliminated in light of poor economic circumstances, a regulated offset maintains the focus on conservation regardless of the economic landscape.[55]

Market size and forecast

Internationally, legal provisions requiring offsets exist in Australia, Brazil, the European Union, and the United States. Ecosystem Marketplace estimates that the global compliance market is worth US$3.4 billion (2007 dollars), with the U.S. wetland mitigation market worth US$3 billion alone.

Examples

The most mature compliance offset market is the wetland compensatory mitigation market in the United States. Enacted in 1972, the Clean Water Act made it illegal for developers to dredge, fill, or otherwise damage a wetland without a permit from the Army Corps of Engineers (the Corps). Developers must prove to the Corps that no reasonable alternatives exist and therefore unavoidable wetland losses will be mitigated by restoring, creating, or enhancing a wetland with similar functions and characteristics in other areas. Developers are required to provide compensatory mitigation themselves (i.e., to build or enhance a wetland), or to pay a third-party to build, restore, or conserve a wetland on their behalf. Private, for-profit wetland mitigation banks have emerged as a result. Those who finance the development of wetlands can receive credits from the Corps and the Environmental Protection Agency (EPA). These credits can be sold to developers. The value of the bank is determined by the number of credits issued by the Corps.

According to the U.S. EPA, mitigation banks have four distinct components.

- The bank site—the physical site restored, established, enhanced, or preserved,
- The bank instrument—the formal agreement between the bank owners and regulators, which identifies the number of credits available for sale,
- The Interagency Review Team (IRT)—the interagency team that provides regulatory review, approval, and oversight of the bank, and
- The service area—the geographic area in which permitted impacts can be compensated for at a given bank[56].

In 1992, only 46 approved banks had been permitted and, according to the EPA, a large proportion of the total were publicly-sponsored banks, in which entities such as state agencies, stockpiled wetland credits for future development requirements.[57] The first private sector banks emerged between 1991 and 1994. By 2001, approximately 219 approved wetland mitigation banks were in operation. This represented a 376% increase in the number of banks in only 10 years.[58] A 2005 inventory prepared by the Environmental Law Institute estimated that there were more than 450 approved wetland mitigation banks and an additional 198 banks in the proposal stage.[59]

Australian Commonwealth law, through the Environmental Protection and Biodiversity Conservation Act 1999, includes provisions for ensuring that damage to biodiversity requires initiatives to mitigate the damage. This could underpin a national compliance offsets standard. Compliance offsets occur more frequently at the state level. For example, the State of Victoria created the BushBroker program, a market instrument designed to protect native vegetation. The Planning and Environment Act 1978 requires an appropriate offset when a development clears native vegetation. The regulation was created to address the rapid disappearance of native vegetation, particularly in coastal, heavily populated areas.

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[55] Ibid.
[56] United States Environmental Protection Agency website. Wetland Mitigation Fact Sheet. Accessed Nov 24, 2008: www.epa.gov
[57] Ibid.
[58] Wilkinson, Jessica and Jared Thompson. 2006. *2005 Status Report on Compensatory Mitigation in the United States*. Environmental Law Institute. Accessed online December 30, 2008: http://www.epa.gov/owow/wetlands/pdf/ELIMitigation2005.pdf
[59] Ibid.

The prices for compliance offset credits will depend on market conditions. Demand for credits is generated where there is development; for example the 'like-for-like' provision in the Bushbroker program requires compensation for development on a similar landscape (e.g., vegetation types, bioregion, etc.). No price value per credit was available because BushBroker contracts are single transactions based on negotiations between buyers and sellers involving ten-year private contacts.

Voluntary offsets

Description

As described above in the Compliance Offsets section, offsets are compensation mechanisms that aim for zero net loss of an ecosystem asset. Voluntary offset markets are developing for both carbon and biodiversity; however, carbon is by far the more mature of the two. Increased attention is being given to biodiversity offsets[60] as international trade in conservation credits is conceivable.

Carbon offsets are emissions reduction initiatives that result in surplus carbon being sequestered in addition to what would occur under normal operating circumstances. Biodiversity offsets are measurable conservation outcomes resulting from actions designed to compensate for significant adverse biodiversity impacts arising from land or industrial development. The goal of biodiversity offsets is to achieve no net loss, and preferably a net gain, of biodiversity on the ground with respect to species composition, habitat structure, and ecosystem services.

The global voluntary carbon market is essentially an offset market. Buyers voluntarily participate in purchasing available carbon offsets from suppliers in the absence of external mandates or prescriptions. Unlike compliance offsets, buyers who purchase voluntary offsets do not rely on regulation to spur demand.

Participants enter these markets for a variety of reasons, including securing the licence to operate in a localized area, improvement of brand image (e.g., 'greening'), anticipation or preparation for government regulation, enterprise risk management strategy, and philanthropic motivations.

The overall voluntary carbon market can be divided into two distinct sub-markets. The first is an exchange-based market (e.g., the Chicago Climate Exchange (CCX)); the second is a disaggregated over-the-counter (OTC) market. The OTC market is the summation of the mass transactions that occur in the voluntary market on a deal-by-deal basis. Since the OTC market is not part of a cap and trade program in which emission allowances can be traded, all transactions are derived from carbon offset projects. Buyers in the voluntary carbon market are typically large emitters that have committed to GHG reductions below a level measured against an established baseline.

When compared with transactions in regulated markets, voluntary transactions typically have lower management costs. However, consumers increasingly want to know the offsets they purchase are credible and will result in real emissions reductions or avoidance; therefore verification is a key marketing strategy for the over-the-counter (OTC) markets. However, transaction costs increase with third-party verification.

The European Union is the region where most of the demand for credits in 2007 originated (47% of all OTC transactions). The second largest demand came from the U.S. market where 34% of total transactions occurred. However, this figure represents a significant decline as in 2006 the U.S. markets housed 68% of total OTC transactions. In 2007, only 3% of OTC buyer transactions originated in Canada.

Sellers in voluntary carbon markets can be categorized into four major types:[61]

- Project developers—develop GHG emissions reductions and may sell carbon credits to aggregators, wholesalers, retailers, or final customers,

[60] Bishop, Joshua, Sachin Kapila, Frank Hicks, Paul Mitchell and Francis Vorhies. 2008. *Building Biodiversity Business*. International Union for Conservation of Nature, Shell International Limited, Forest Trends, Green Horizons Environmental Consultants Limited and Earthmind

[61] Hamilton Kathering, Milo Sjardin, Thomas Marcello and Gordon Xu. 2008. *Forging a Frontier: state of the voluntary carbon markets.* Ecosystem Marketplace and New Carbon Finance.

- Aggregators/wholesalers—only sell offsets in bulk and often have ownership of a portfolio of credits,
- Retailers—sell small amounts of credits to individuals or organizations, usually online, and have ownership of a portfolio of credits, and
- Brokers—do not own credits, but facilitate transactions between buyers and sellers.

An instrument representing the underlying asset is a necessary element to enable transactions. As discussed, this is a current barrier to broader markets for biodiversity offsets to develop. For the CCX, the enabling instrument is the Carbon Financial Instrument, which represents 100 tonnes CO_2e.

Credits on the OTC are typically legitimized by means of a verified emissions reduction (VER) standard. A number of VERs exist, including Clean Development Mechanism issued Certified Emission Reductions, the Gold Standard for VERs, the Voluntary Carbon Standard (VCS), and ISO standard, 14064. The CCX, similar to other exchanges, has its own registry, whereas for the OTC market a number of registries have been formed that provide a host of services, including tracking credit sales and ownership, increasing market efficiency through information sharing, and protecting against double-counting.

Markets for biodiversity offsets are in different phases of development around the globe. Although regulation is the primary driver, interest in voluntary biodiversity offsets is growing. Evidence of the growth is found in a number of one-off transactions between land developers and extractive resource players, such as Rio Tinto's Kennecott copper mine in Utah, and in the formation of strategic partnerships similar to the one between Shell International Ltd. and the International Union for Conservation of Nature (IUCN).

Mainstream investors are also looking at biodiversity offsets as a new business opportunity. Institutional investors, such as ABN-Ambro, Bank Paribas, ISIS Asset Management, and Insight Investment, have been investigating biodiversity offset opportunities.[62]

Institutional investors, such as ABN-Ambro, Bank Paribas, ISIS Asset Management, and Insight Investment have been investigating biodiversity offsets.

Most significant for the voluntary biodiversity offset market development is the formation of multi-stakeholder initiatives. For example, the Business and Biodiversity Offset Program (BBOP) is a partnership among companies, governments, and conservation experts to explore biodiversity offsets. The program aims to demonstrate through pilot project studies in a range of industry sectors that biodiversity offsets can achieve significantly more, better, and more cost-effective conservation than normally occurs through infrastructure development. Initiatives such as BBOP are likely to make great strides in addressing a key challenge of biodiversity offsets, which is the lack of a homogenous unit for cross-jurisdictional transactions.

Other biodiversity offset registries are surfacing, such as the SpeciesBanking website.[63] SpeciesBanking.com is a new information and registry website launched in December 2008. It was created to provide transparent, fair, and relevant information for people wanting to engage in biodiversity markets worldwide.

Market size and forecast

Estimates from the Katoomba Group's Ecosystem Marketplace indicate the value of voluntary biodiversity offsets to be between US$10 and US$17 million annually.[64] The value of 65.1 $MtCO_2e$ transacted on the voluntary markets in 2007 was reported at US$331 million.[65] Of this amount,

[62] Bishop, Joshua, Sachin Kapila, Frank Hicks, Paul Mitchell and Francis Vorhies. 2008. *Building Biodiversity Business*. International Union for Conservation of Nature, Shell International Limited, Forest Trends, Green Horizons Environmental Consultants Limited and Earthmind
[63] Species Banking website. Accessed January 3, 2009: www.speciesbanking.com
[64] Ecosystem Marketplace: Payments for ecosystem services matrix. Accessed online December 28, 2008. http://ecosystemmarketplace.com/documents/acrobat/PES_MATRIX_06-16-08_oritented.pdf
[65] Hamilton Kathering, Milo Sjardin, Thomas Marcello and Gordon Xu. 2008. *Forging a Frontier: state of the voluntary carbon markets*. Ecosystem Marketplace and New Carbon Finance.

US$258.4 million was attributed to OTC transactions and US$7.4 million was on the CCX (see Section 5: Ecosystem Market Opportunities for more information on the voluntary carbon market).

With increased private sector motivation to purchase biodiversity offsets, and the development of biodiversity registries, significant growth in the global biodiversity offset market is expected. The market is projected to grow to US$30 million by 2010 and to more than US$100 million by 2020.[66]

Significant growth in the voluntary carbon markets is expected to continue. It was reported that the growth in trading during the first four months of 2008 was 240% higher than in 2007.[67] The same report included a survey in which respondents expect a volume of 122 $MtCO_2e$ to be traded by 2010, and a volume of 428 $MtCO_2e$ by 2020.

A significant number of organizations have announced their intention to become carbon neutral or to commit to reducing greenhouse gas emissions in operations and transportation, which will drive short-term demand in the voluntary markets. Forthcoming climate change legislation in both Canada and the United States could impact certain carbon-intensive industries. Non-regulated companies, non-governmental organizations, universities, and governments will likely continue to purchase from the voluntary market.

Examples

The CCX is an example of a voluntary carbon market based on a cap and trade system. It is rule-based, with legally-binding elements controlling greenhouse gas (GHG) emissions reductions and trading. The CCX structure is based on voluntary membership. The CCX members classified as full members are entities with direct GHG emissions who make legally binding commitments to the CCX emission reduction schedule, and who are subject to annual emissions verification. Associate members are firms with negligible reductions that have committed to reporting and offsetting 100% of their indirect emissions resulting from energy purchases and business travel.[68] In 2007, 79% of voluntary credits were purchased by private businesses and 13% by NGOs.[69] The remaining 5% were purchased by individuals and less than 1% by government entities.

In New South Wales, Australia, the Biodiversity Banking and Offsets Scheme[70] (also known as BioBanking) is a voluntary market designed to address biodiversity loss and endangered species (NSW Department of Environment and Climate Change, 2008). The program works by allowing landowners to improve or maintain biodiversity values and apply to receive credits by acting as a biobank, which conducts activities that improve or maintain the landscape and habitat for endangered species. Developers can purchase credits from landowners to offset the negative environmental impacts of their development. The price for each biobank credit is based on the characteristics of the landscape, the connection to other biologically significant areas, the location of the property (which affects property value), and the condition of the site. The program was launched in July 2008 and will produce an annual report outlining the program's performance, including financial information, the number and type of credits issued, and contractual arrangements. No information on the current state of the program is available.

Certification/ecolabelling of products and services

Description

Voluntary or regulated certification describes the process by which an independent third-party verifies that a product or service conforms to required guidelines for environmental performance. The ecolabel is a visual marketing feature on a product that demonstrates the form of certification achieved.

Certification schemes create price premiums for a product that is cultivated, harvested, and produced in a way that is certified to be ecologically friendly. Organic agriculture and sustainable forest

[66] Ecosystem Marketplace: Payments for ecosystem services chart. Accessed online December 28, 2008. http://ecosystemmarketplace.com/documents/acrobat/PES_MATRIX_06-16-08_oritented.pdf
[67] Ibid.
[68] Chicago Climate Exchange (CCX) website. www.chicagoclimatex.com. Accessed on January 2, 2009.
[69] Hamilton Kathering, Milo Sjardin, Thomas Marcello and Gordon Xu. 2008. *Forging a Frontier: state of the voluntary carbon markets.* Ecosystem Marketplace and New Carbon Finance.
[70] The BioBanking market in the state of New South Wales, Australia does not meet the selection criteria that the market must be national or international in scope. However, it is one of the most notable international examples outside of the United States so it is included here.

management (SFM) are broad categories for certification schemes. The incentive for certification is the additional revenue that results when consumers along the value chain pay a premium.

A number of companies have committed to purchasing and supplying consumers with certified agriculture and forestry products. Home Depot sources 95% of wood products from North American forests and has committed to purchasing a proportion of their wood products from companies that are certified.[71] Wal-mart is currently undergoing a supply chain assessment to identify illegal and unsustainable forest products sold in stores. The company has joined the World Wildlife Fund's Global Forest and Trade Network and will work with this not-for-profit organization to phase out products made from illegal logging and to increase the proportion of products sourced from certified forestry.[72]

Forest certification programs have the following four components:[73]

- A voluntary standard that outlines production and resource management requirements.
- An audit process that establishes whether requirements under the standard have been achieved.
- An accreditation mechanism to ensure that the certifier is competent and can produce credible and consistent results.
- A product claims mechanism, which involves tracking the life cycle of the product from cultivation through to production.

Certification imposes costs on producers; therefore, the price premium, market entrance costs, and costs associated with achieving certification (e.g., alterations to harvesting practices) are key influencing factors. These factors are highly dependent on the consumers' willingness to pay for a certified product. A survey of 1,600 U.S. residents revealed that 35% of respondents were willing to pay for certified wood products.[74] Research conducted in the U.S. demonstrates that consumers who were paying a premium for organic products did so because of the environmental and social benefits that accrue from the certification, including reduced pesticide use, the protection of biodiversity, and improved worker safety.[75]

A certification scheme can protect or enhance the provisioning of ecosystems services, such as decreased soil erosion, reduced nutrient pollution, improved soil organic matter, increased carbon sequestration, and enhanced biodiversity. A number of studies conducted by the United States Department of Agriculture confirm the environmental benefits of organic agriculture.[76]

Numerous certification programs are available for agricultural and forestry products. For example, the forest sector has four main internationally-recognized certification programs: the Forest Stewardship Council (FSC); the Programme for the Endorsement of Forest Certification schemes (PEFC); the Rainforest Alliance's SmartWood program (see case study below); and the Sustainable Forestry Initiative Program (SFI).

The International Federation of Organic Agriculture Movements (IFOAM) and the Organic Crop Improvement Association are the largest international organizations certifying organic agriculture. Currently in revision, IFOAM's Organic Standard System is designed to provide international standards for organic verification by a third-party. Other certifying agencies and ecolabels can use

Research conducted in the U.S. demonstrates that consumers who were paying a premium for organic products did so because of the environmental and social benefits that accrue from the certification, including reduced pesticide use, the protection of biodiversity, and improved worker safety.

[71] Home Depot. 2006. Wood Purchasing Policy. Website accessed January 13, http://corporate.homedepot.com/wps/portal/Wood_Purchasing
[72] Wal-mart. 2008. Press Release: "Wal-Mart Joins WWF's Global Forest & Trade Network". Website accessed January 13, 2009: http://walmartstores.com/FactsNews/NewsRoom/8438.aspx
[73] Canadian Sustainable Forestry Certifications Coalition website. Accessed January 2, 2009: www.certificationcanada.org
[74] Jensen, Kimberly. 2004. *Consumers' Willingness to Pay for Eco-Certified Wood Products*. Journal of Agriculture and Applied Economics.
[75] Ibid.
[76] Ribaudo, Mark, LeRoy Hansen, Daniel Hellerstein and Catherine Greene. 2008. *The Use of Markets to Increase Private Investment in Environmental Stewardship*. Unites States Department of Agriculture.

IFOAM as the international standard. EcoCert provides certification for food and non-food products and can be applied to both forestry and agriculture products. It was initially developed in France and is now an ecolabel marketed in 80 countries, including Canada, Japan, and South Africa.

The diversity in certification and ecolabelling options presents opportunities, but also has drawbacks. Similar products with different certification and ecolabels may create new market competition, but consumers may be confused with the options. Moreover, producers can select the most appropriate certification scheme for their operating and marketing strategies when multiple choices are available.

Market size and forecast

The demand for both certified forest products and organic agriculture products is growing. The markets are currently concentrated in North America and Europe. Certified organic agriculture accounts for less than 5% of the overall market today, but the growth rate is three to four times greater than the average market growth. The market for sustainably harvested timber and organic agriculture, in particular, has been growing at double-digit rates.[77] According to Ecosystem Marketplace,[78] the growth of certified organic agricultural products is expected to exceed US$97 billion by 2012 (based on an assumed 15% annual growth rate). Ecosystem Marketplace estimates[79] the value of globally certified agriculture products, based on retail sales, to be US$42 billion (2006 dollars). The growth of the organic and fair-trade certification was estimated at 40% annually, compared to 15% for Rainforest Alliance agricultural certification.

Examples

The Forest Stewardship Council program, which is the world's largest certification program, has increased its number of certified forests from just over 10 million hectares in 1998 to nearly 100 million in 2008.[80] The estimated value of FSC certified and labelled sales are more than US$20 billion.[81] Less than 10% of global forests are certified, with 40% of the global total occurring in Canada.[82] The Forest Stewardship Council was the first widely agreed upon international certification scheme. FSC's standards are claimed to be the most stringent social and environmental requirements in the forestry sector, and they have proven to work across continents, forest types, forest sizes, and ownership.

In the United States, the Organic Foods Production Act of 1990 established national standards for organically produced commodities under the National Organic Program. The USDA Organic Agriculture program outlines national standards for production, certification requirements for growers, a national accreditation program for certifying agents, labelling requirements, and penalties for violations. For products with a minimum of 95% organic ingredients, companies can use the USDA Organic Products ecolabel. For products with a minimum of 70% organic ingredients, the product label can indicate that it is "made with organic ingredients". To export organic products to the United States, the product must be grown, harvested, and labelled according to the USDA National Organic Program standards.

In the European Union, ecolabels were developed in the 1990s to stimulate supply and demand for sustainable production and consumption. The estimated sales of ecolabel products increased from €50 million in 1998 to nearly €800 million in 2005.[83] A number of EU nations have ecolabels as well, including the "Nordic Swan" ecolabel in Sweden, Denmark, and Norway. Germany and France have also developed country-wide certification programs covering a diversity of consumer products. The European Union is currently working to develop a cooperation and certification alignment policy to create consistent standards and criteria for all EU nations.

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[77] Bishop, Joshua, Sachin Kapila, Frank Hicks, Paul Mitchell and Francis Vorhies. 2008. *Building Biodiversity Business*. International Union for Conservation of Nature, Shell International Limited, Forest Trends, Green Horizons Environmental Consultants Limited and Earthmind.
[78] Ecosystem Marketplace website. Accessed December 29th, 2008. www.ecosystemmarketplace.com
[79] Ecosystem Marketplace website. Accessed December 29th, 2008. www.ecosystemmarketplace.com
[80] Forest Stewardship Council website. Accessed January 2, 2009: www.fsc.org
[81] Ibid
[82] Forest Products Association of Canada. Forestry certification fact sheet. FPAC. January 2008.
[83] European Commission website. 2006. Marketing Statistics. Accessed on January 14, 2009: http://ec.europa.eu/environment/ecolabel/marketing/statistics_en.htm

Case Study 2: Rainforest Alliance—Sustainable Agriculture Network (SAN) and SmartWood

Description

The Rainforest Alliance certifies agriculture and forestry products that meet established criteria in categories including the environment, biodiversity, workers' conditions, and local communities. Two certification programs are in operation: the Sustainable Agriculture Network and the SmartWood program.

The Rainforest Alliance certification schemes (SAN and SmartWood) are based on standards that are verified by third-parties. Third-party audits provide consumers confidence that the products they are buying are the result of practices carried out in accordance with a specific set of criteria that balances ecological, economic, and social considerations. The SmartWood program certifies producers using the FSC certification guidelines. In terms of agriculture certification, the Rainforest Alliance is the international secretariat of the Sustainable Agriculture Network (SAN), a coalition of leading conservation groups that links responsible farmers with conscientious consumers. Producers certified as part of the SAN receive the Rainforest Alliance Certified seal of approval, which can be applied to marketed products.

As with any certification regime, it is difficult to determine the specific benefits related to protecting or enhancing ecosystem services. However, in a 2005 study on the impacts of SmartWood certification it was found that significant improvements following SmartWood certification included improved riparian and aquatic management, improved treatment of sensitive sites and high conservation value forests, and improved treatment of threatened and endangered species.

Buyers of Rainforest Alliance certified agricultural products are typically specialty retailers, although the more conventional retailers are selling certified agricultural products to meet increasing consumer demand. For example, the convenience store chain 7-11 in British Columbia purchases Rainforest Alliance certified coffee.

To become a certified supplier of Rainforest Alliance products, a forest resource manager or farmer engages with a Rainforest Alliance expert to scope certification opportunities through an initial assessment in which the strengths and weaknesses of the operation are documented and the steps needed to bring management practices into compliance with predefined standards are detailed. Following the modification of planning and operations, the proponent would then engage in a verification audit conducted by an independent third-party. Agriculture certification sellers are typically small- to medium-sized farm operations in Belize, Brazil, Colombia, Costa Rica, Ecuador, El Salvador, Guatemala, Honduras, and Mexico that are selling cocoa, coffee, fruit, flowers, and tea.

The growing demand for sustainable wood for furniture, pulp, paper, and green buildings will continue. SmartWood program administrators have found that FSC-certified forest owners often experience better market access and value for their timber products than non-certified producers. Growth of certification of non-timber forest products is another opportunity under the Rainforest Alliance program. Standards have already been developed for maple sugaring operations in Eastern Canada.

Driven by consumer demand, large global buyers present a significant opportunity for agriculture products certified under the Rainforest Alliance umbrella. For instance, Kraft Foods International, the single largest global buyer of coffee, increased its purchase of Rainforest Alliance certified coffee from £5 million in 2004 to £13 million in 2005.

5. Ecosystem market opportunities

This section presents additional details on environmental market opportunities for Alberta's agriculture and forestry sectors that were identified during this assessment. A brief description of existing environmental markets and related policy initiatives is presented first since Alberta has already initiated action in this area. The opportunities related to environmental certification and ecolabelling are examined next, followed by a review of voluntary carbon markets. Regulated carbon markets in North America are then explored as medium-term opportunities. Where appropriate, relevant resources (websites, journals, magazines, etc.) are listed as a source of information regarding these opportunities.[84] Also included in this section is a description of innovative ecosystem services markets that could evolve as domestic markets in Alberta, particularly those related to biodiversity and water quality. The section concludes with recommended monitoring tools that may prove useful both for the IAFE, and the agriculture and forestry sectors to stay abreast of progressive information related to ecosystem markets.

Environmental markets in Alberta

Alberta has demonstrated leadership within Canada in developing enabling policies for ecosystem markets. These policies and related initiatives position the province well to explore new ideas and undertake innovative approaches to conservation. This section briefly describes key elements of Alberta's existing policies and initiatives.

The policy drivers and commitments in Alberta's Water for Life Strategy and in the Land-use Framework set the stage to use market-based instruments to serve the dual purposes of achieving environmental goals and enhancing financial returns to the agriculture and forestry sectors. In addition, an enabling infrastructure has been developed for establishing carbon offset protocols and gaining practical experience in creating, registering, and trading carbon credits in Alberta's intensity-based emissions trading system. Thus, the use of market-based mechanisms for pricing ecosystem services could become a key tool to support improved environmental performance in Alberta and position natural resource sectors to be more competitive at home and abroad.

The recently released Land-use Framework[85] notes under Strategy 4, page 20, that, "… the Government of Alberta will develop new policy instruments to encourage stewardship and conservation on private and public lands. These could include: environmental goods and services; support for conservation easements and land trusts; "cluster development" through the transfer of development credits; and allowing improvements in land-trust credits." The Framework further notes on page 34 that, "Market-based incentives and tools can provide a way for private landowners to receive some monetary compensation for the ecological goods and services their lands provide." In January 2009, the Water for Life Strategy[86] was renewed and included a commitment by the Government of Alberta to use best available practices and market-based tools to maintain flexible and adaptive water management. Water for Life will be integrated into other policies and plans, such as Land-use Framework planning, in order to ensure better resource management integration.

The use of markets to achieve environmental goals is not new to industry or policy-makers in the province. Alberta was the first jurisdiction in North America to create a carbon trading scheme (i.e., the Specified Gas Emitters Regulation). The development of offset protocols, the establishment of a carbon offset registry, and the involvement of key players, such as project developers, verifiers and brokers, has established expertise and knowledge about carbon markets and offsets in Alberta.[87] As a domestic market, the Alberta offset system provides immediate opportunities for the forestry and agricultural sectors. In the first compliance period (ending March 2008), 25% of regulated companies used offsets for compliance, eliminating one million tonnes of greenhouse gas emissions[88]. No-till and reduced tillage offset projects were two of the primary project types used. The average value of a

[84] These are not intended to be exhaustive lists, but rather summaries of some of the most commonly referenced resources.
[85] Government of Alberta. 2008. Land-use Framework. Printed December 2008.
[86] Government of Alberta. 2009. Water for Life: A Renewal.
[87] See Ruud, Larry, Fred Siemens and Larry Webber (Meyers Norris Penny) and Haugen-Kozyra, Karen, Karen Gorecki (Climate Change Central). 2008. Alberta Offsets System – First Year Retrospective – Discussion Paper used in conjunction with the Alberta Environment Offset Consultation Workshop. Leduc, Alberta. July 3, 2008.
[88] Ibid.

carbon offset was C$11 per tonne, providing regulated companies with a low-cost compliance option. The policies, information, and infrastructure developed for the Alberta carbon offset market could be used as a model for other ecosystem markets, such as biodiversity offsets, water quality trading, tradable development credits, and wetland mitigation banks.

Immediate international market opportunities

Certification and labelling

This section provides information on the current state of certification and ecolabelling for agriculture and forestry products. It describes key market developments, including standards setting, multi-stakeholder initiatives focused on supply chain responsibility, and commitments to sustainable procurement and other sustainability practices by large food/forest product buyers. The concept of "carbon neutrality" is also introduced as it has implications for agriculture and forestry operations and companies. This section then identifies web-based resources and organizations that Alberta can use to monitor ongoing market developments.

Current state of the market

As noted above, certification and product labelling can be used to penetrate new markets, gain a premium price, and foster consumer confidence in products and services. Certification and ecolabelling provide information to consumers about the processes and practices used to bring a product to market. There is a growing demand for certified products from developed nations (primarily North America and Europe), as well as in large urban areas in non-industrialized countries.[89]

The Hartman Group (a U.S. firm that provides insights into consumer spending habits) conducted an online survey of 1,856 people between September 19-24, 2008, with results included in its recently released report "Sustainability: The Rise of Consumer Responsibility". The survey found that despite the economic crisis, people still want to purchase from environmental and socially responsible companies. Eighty eight percent of consumers said they engage in "sustainability-related" behaviour (consider packaging, recycling, how a product was made, how workers are treated, community issues, etc.). The purchase of food, and the responsible manner in which it is produced and sold to consumers, was the most important household item under consideration for sustainability and responsibility.[90]

Agriculture

Consumer demand in the United States in the certified organic sector of agriculture has grown by more than 10% annually (in some years, 20% or more) for more than a decade.[91] Consumer demand for organic and sustainable products from the United States, Japan, and the European Union is anticipated to increase. The demand for certified and ecolabelled products could translate into a price premium and/or a market advantage for growers and ranchers. Despite the growth in certified organic products, the total volume in any market segment is small—less than 5% of the volume traded internationally.

The organic ecolabel is most prominent in North America. One of the largest barriers to adoption is the cost associated with converting conventional land to organic land, due to labour-intensive practices, longer crop rotations for pest control, reduced yields in early years, and increased management and monitoring for reporting purposes. The costs associated with certification may be viable for large-scale agricultural operations, but for small operators it can be a challenge. However, smaller and less expensive certification schemes are emerging at the grassroots level. For example, Certified Naturally, which uses USDA organic standards and guidelines, is a non-profit alternative certification program tailored to small-scale, direct-market farmers.

According to the Canadian 2006 Census, 91.5% of the 2,629 farms producing organic products in Alberta were not certified to organic standards.[92]

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[89] Bishop, Joshua, Sachin Kapila, Frank Hicks, Paul Mitchell and Francis Vorhies. 2008. *Building Biodiversity Business*. International Union for Conservation of Nature, Shell International Limited, Forest Trends, Green Horizons Environmental Consultants Limited and Earthmind.
[90] The Hartman Group website. Accessed January 25, 2009: www.hartman-group.com/publications/view/81
[91] United States Department of Agriculture. 2009. National Organic Program. Accessed website January 7, 2009: www.ams.usda.gov
[92] Statistics Canada. 2006 Census of Agriculture. Website accessed December 22, 2008: www.statcan.gc.ca

A number of companies have made corporate commitments to certification and/or ecolabelling, as well as sustainable agricultural practices, including:

- The Sustainable Agriculture Initiative Platform (www.saiplatform.org), involving members such as The Coca Cola Company, Kraft, McDonald's, McCain Europe, and Sara Lee.
- The Sustainable Food Lab (www.sustainablefoodlab.org), involving members such as Unilever, Carrefour, General Mills, the U.S. Food Service, Green Mountain Coffee, the International Finance Corporation, and the World Bank.
- Marks and Spencers (M&S)[93] conducted a consumer survey to understand consumer preferences. It found that nearly a third of customers returned clothes to the racks, expressing concerns about the source of their products. One in five shoppers chose another food product because they had concerns about where it came from and how it was made. This led M&S to create the *Look Behind the Label Campaign* to educate consumers about the origins of food, clothing, and other households goods.
- Wal-mart Supercentres and Neighbourhood Markets carry a selection of organic products (dependent on season and availability in the community). Products offered include: pasta, olive oil, coffee, tea, peanut butter, bread, oranges, tomatoes, lettuce, apples, fresh herbs (thyme, sage, mint, etc.), packaged salads, baby formula, milk, cheese, sour cream, ice cream, cottage cheese, sauces, and seafood. Wal-mart also attempts "to offer produce that is also locally sourced. As with all fresh merchandise, we try to purchase fresh organic products from local suppliers for distribution to our stores in their areas."[94]

A recent initiative that has been launched involves a number of influential companies.

- In December 2008, a group of more than thirty growers, suppliers, buyers, technical experts, and environmental and public interest groups announced the formation of the Stewardship Index for Speciality Crops.[95] The group will develop and share a system for measuring stewardship performance across the supply chains of farms, processors, distributors, food service providers, and retailers. Specialty crops include fruits, vegetables, nuts, and horticulture. This initiative will not create a prescriptive standard or define performance criteria; instead, its aim will be to provide a comprehensive system for monitoring and reporting stewardship performance. While certification focuses on niche markets (e.g., coffee, palm oil), this effort aims to be inclusive of all aspects of the value chain and will be designed to be an industry-wide system for measuring the stewardship performance of the sector. The project is at the very early development stages and has requested public feedback for issues that should be included on the sustainability index. Organizations participating include:
  - American Farmland Trust
  - Community Alliance with Family Farmers
  - Natural Resources Defence Council
  - The Organic Sector
  - World Wildlife Fund
  - Western Growers Association
  - Wine Institute
  - National Potato Council
  - Produce Marketing Association
  - Heinz
  - Sam's Club
  - Unilever
  - Wal-mart
  - SYSCO

[93] Marks & Spencer website. Plan A: Because there is no Plan B. Accessed January 26, 2009: www.corporate.marksandspencer.com
[94] Walmart website. Organics. Accessed January 26, 2009: www.walmartstores.com
[95] Stewardship Index For Specialty Crops. 2008. Press release: Group Seeks to Measure Sustainability Performance for Specialty Crops: Entire Supply Chain Targeted for Measurement, Improvement. Accessed January 27, 2009: www.stewardshipindex.org

The message for Alberta is that sustainable agriculture and related certification and labelling schemes are becoming increasingly important in niche markets, and potentially in larger consumer markets. Alliances between large companies and not-for-profit organizations are becoming mainstream.

Forestry

Uncertainty exists regarding buyers' willingness to pay for certified forest products. One study, commissioned by the Rainforest Alliance, found that FSC-certified buyers paid approximately a 10% premium for FSC-certified products.[96] Despite uncertainty about the willingness to pay for certified forest products, consumers increasingly expect that the products they purchase will not result in the degradation of forest ecosystems.

The message for Alberta is that sustainable agriculture and related certification and labelling schemes are becoming increasingly important in niche markets, and potentially in larger consumer markets.

Similarly, due to consumer and shareholder influence, companies that use wood and paper for everyday business operations are incorporating forest certification into their procurement policies. Companies such as Time Warner, Office Depot, Nike, and Starbucks explicitly purchase certified forest products according to well-established policies.

Certification programs are already firmly established in Canada and Alberta. Canada has the largest area of third-party, independently certified forest in the world.[97] Of the 25 million hectares of provincially-managed forested land in Alberta, more than 17 million hectares have been certified.[98] The certification standards currently used in Alberta include the Canadian Standards Association's Sustainable Forest Management (SFM) standard, the Sustainable Forestry Initiative (SFI) standards, and the Forest Stewardship Council (FSC) standards (see Table 2).

Table 2: Certified forest area in Alberta[99]

Certification standard	Area certified (hectares)
Canadian Standards Association (CSA-SFM)	9,463,160
Sustainable Forestry Initiative (SFI)	3,655,839
Forest Stewardship Council (FSC)	5,490,000

Two large companies that have made commitments to forest stewardship and/or certification schemes are provided as examples below:

- Home Depot—focuses on procurement policies that eliminate illegal logging sources and increase the proportion of forest products purchased from sustainably managed forests.
- Wal-mart—collaborates with the World Wildlife Fund's Global Forest and Trade Network to phase out illegally logged wood. In addition, the company has committed to introducing a new supplier preference program that will give procurement benefits to suppliers who make their products with sustainably harvested wood. The long-term goal is to eliminate non-sustainably harvested forest products throughout their product line.[100]

Public sector demand for certified forest products is in the range of 10 - 25%[101] of total forest product consumption, depending on the country. Thus, public purchasing decisions are influential in the marketplace and can be used to set standards for the private sector.

Future efforts directed towards the education and marketing of certified products will likely increase demand for certified forest products, particularly when factoring in the climate change benefits. The forest products industry is one of the least carbon-intensive manufacturing sectors and, despite

[96] Newsom, Deanna, Terrence Bensel and Volker Bahn. 2008. Are There Economic Benefits from Forest Stewardship Council Certification? An Analysis of Pennsylvania State Timber Sales. Rainforest Alliance.
[97] Natural Resources Canada website: Forest certification trend analysis. Accessed January 25, 2009. www.canadaforests.nrcan.gc.ca/articletrend/213#if
[98] Alberta Wood Market Statistics, Including Pulp and Paper. 2008 Edition. FPInnovations, 2008.
[99] Ibid.
[100] Wal-mart website. Press Release: Wal-Mart Joins WWF's Global Forest & Trade Network. Accessed January 14, 2009: www.walmartstores.com
[101] Simula, Marrku. 2006. Public Procurement Policies for Forest Products and Their Impacts. United National Food and Agriculture Organization.

growing public awareness of climate change, the climate change benefits of sustainable forest products are not widely understood.[102]

Carbon footprints and labelling

On a broader level, there is a growing opportunity to differentiate among agriculture and forestry products based on their carbon footprints. Procurement policies may shift to focus on identifying and purchasing products with a low carbon footprint, as well as those that are brought to market with harvesting and production techniques that remove carbon from the atmosphere. Some examples are given below:

- The Carbon Trust's Carbon Label (UK)
  - The Carbon Trust Standard Methodology provides guidance for organizations wanting to reduce the carbon footprint of their product or service.
  - The methodology was developed using a number of internationally recognized standards, including the WRI/WBCSD GHG Protocol.
  - To achieve the standard (and carbon label) an organization must:
    - Measure direct emissions using the Standard's methodology;
    - Meet an absolute reduction of emissions compared with a previous footprint assessment, or a 2.5% per annum reduction in carbon efficiency; and,
    - Provide evidence that the organization is managing emissions in a responsible manner (e.g., adequate governance, accurate carbon accounting, and carbon management programs have been established).
  - The program is fee-based, meaning that organizations must pay to use the label once they meet the standard.
  - The label will be permitted only for use on corporate materials (e.g., letterhead, annual reports, property/buildings, marketing materials/advertising); it is not permitted on product packaging or materials directly marketing the specific certified product.
- BSI British Standards, DEFRA and the Carbon Trust—the PAS 2050:2008
  - PAS 2050 provides a methodology to calculate a product's carbon footprint from 'cradle to grave'—greenhouse gas emissions at every stage of the supply chain, from sourcing, production, and storage to retail and disposal.
  - Gaps in corporate GHG data will be a key challenge.
  - The standard allows for the comparison of GHG emissions between two products; it is important to note that there is no requirement to publicly report.
  - There is no label available for the PAS standard; participants can opt to seek out the Carbon Trust's Carbon label, which is aligned with this initiative.

The forest products industry is one of the least carbon-intensive manufacturing sectors and, despite growing public awareness of climate change, the climate change benefits of sustainable forest products are not widely understood.

Key resources to track ongoing market developments

The following resources and websites could be tracked by Alberta to keep informed of new market developments for certified and ecolabeled products.

- Information providers
  - Environmental Leader—www.environmentalleader.com
  - Ecosystem Marketplace—www.ecosystemmarketplace.com
  - Environmental Defense Fund Innovation Exchange—www.innovation.edf.org
  - Forest Trends—www.forest-trends.org
  - The Katoomba Group—www.katoombagroup.com
  - Canadian Sustainable Forestry Certification Coalition—www.certificationcanada.org/english/

[102] Aulisi, Andrew, Amanda Sauer and Fred Wellington. 2008. *Trees in the Greenhouse: Why Climate Change is Transforming the Forest Products Industry*. World Resources Institute.

- Certification organizations
  - USDA Organic Program—www.usda.gov
  - Forest Stewardship Council—www.fsc.org
  - Sustainable Forestry Initiative—www.sfiprogram.org
  - Canadian Standards Association—www.csa.ca
  - Program for the Endorsement of Forest Certification Schemes—www.pefc.org
  - The Carbon Trust Standard—www.carbontruststandard.com
  - Rainforest Alliance's Sustainable Agriculture Standard—www.rainforest-alliance.org
  - EocLogo Program—www.ecologo.org

- Green consumer magazines/e-zines
  - Plenty: The World in Green—www.plentymag.com
  - TreeHugger—www.treehugger.com
  - Grist Environmental News—www.grist.org
  - Mother Jones—www.motherjones.com
  - GreenBiz—www.greenbiz.com
  - National Geographic's The Green Guide—www.thegreenguide.com
- Green consumer advocacy
  - Consumer Report's Greener Choices resource—www.greenerchoices.org
- Additional resources
  - Stewardship Index for Specialty Crops—www.stewardshipindex.org
  - The Sustainable Agriculture Initiative Platform—www.saiplatform.org
  - The Sustainable Food Lab—www.sustainablefoodlab.org
  - Centre for Environmental Leadership in Business—www.celb.org
  - World Business Council for Sustainable Development—www.wbcsd.org
  - The Global Footprint Network—www.footprintnetwork.org
- Carbon neutrality
  - The PAS 2050:2008—www.bsigroup.com
  - The Carbon Trust—www.carbontruststandard.com/

Voluntary carbon market

This section provides additional information on the current state of the voluntary carbon market. It describes key market developments, including standards and a key driver for the voluntary market (i.e., non-regulated companies seeking carbon neutrality or just improved carbon management performance). Finally, it identifies web-based resources and organizations that Alberta can access to monitor ongoing market developments.

Current state of the market

Voluntary carbon markets support activities to reduce emissions that are not yet mandated by policy-makers.

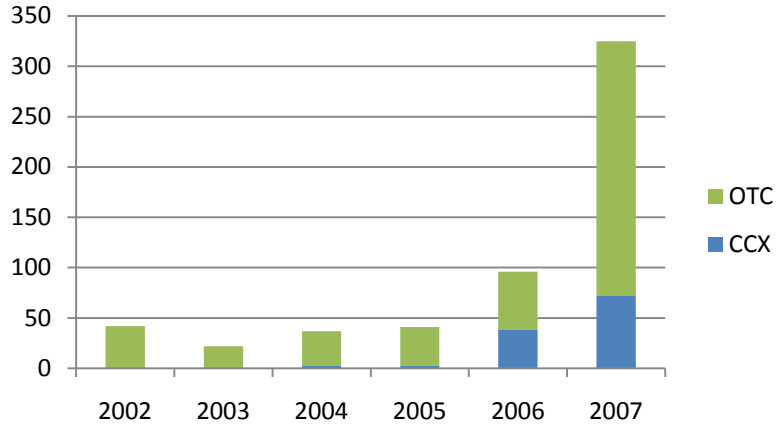
The benefits of voluntary credits include flexibility, a potentially increased focus on social and environmental benefits, lower unit costs, and, for some voluntary markets, relatively lower transaction costs (primarily due to the limited assurance that is required). Risks include the lack of generally accepted standards, protocols and verification procedures for projects, the absence of a centralized authority and oversight, and the limited ability of registries to prevent double-counting. However, project validation and offset verification are increasing in the voluntary market to improve its credibility.

See Appendix B for charts and graphs that illustrate the size and volume of transactions in voluntary carbon markets by standard, project type, and project location.

Demand for credits in the voluntary carbon market is generated by individuals and firms voluntarily choosing to mitigate GHG emissions through the use of projects that either eliminate GHGs from the emissions source or remove emissions by sequestering GHGs through terrestrial or aquatic system processes. Individuals are driven by a sense of responsibility to manage their personal and household emissions, whereas the private sector is driven by stakeholder pressure, corporate citizenship, license

to operate, access to new market opportunities, public relations, and preparation for regulated markets.

Figure 1: Transaction values in voluntary carbon market (US$ millions)[103]



The two most important variables affecting the carbon offset price are the cost of the project itself (e.g., technical cost, size, location, upfront costs vs. length of return, profits from co-benefits, and additionality) and the cost of getting the credit to the final buyer (e.g., transaction costs, verification, and project developer's profit).[104] The market is set to continue to grow (see Figure 1) for a number of reasons, such as increasing consumer demand for low-carbon products and services, increasing regulation, stifled license to operate as resource quality and quantity diminishes, and investors who are increasingly drawn into the market—all of these are factors that increase the demand for carbon reduction credits. However, the market is far from mainstream at this point and a great amount of uncertainty exists.[105]

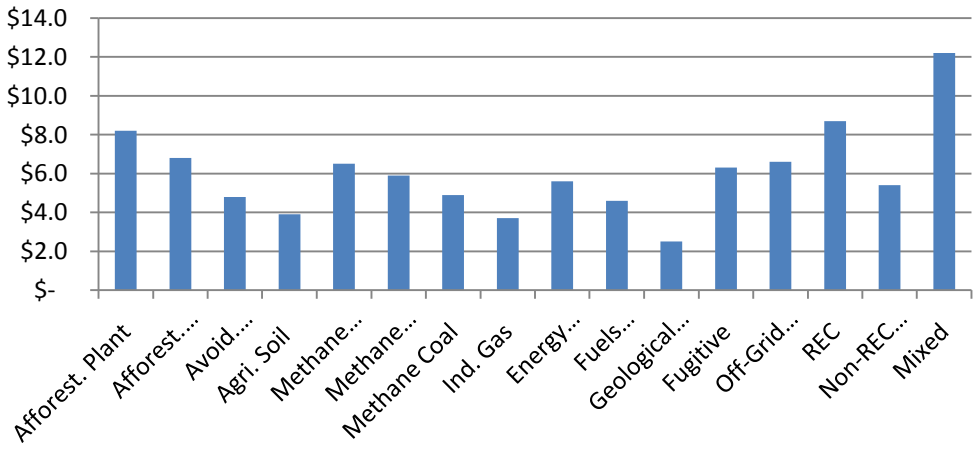
Voluntary markets will likely be small relative to regulated markets; however, the relationship between voluntary and regulated markets could develop complementarily. In regulated markets, there will be large bureaucracies, more money, and larger players, whereas in voluntary markets there will most likely be smaller players and more variety in credit options in order to be nimble and capable of adapting to consumer preferences. According to Bayon et al (2007), "a portion of the voluntary markets appears to be gravitating towards a value-added model; one that seeks to provide 'gourmet carbon', in which the provenance and feel-good attributes of the carbon play an increasingly important role."

Research conducted by the Ecosystem Marketplace and New Carbon Finance found that average prices for offsets increased as they progress up the value chain. For example, the average price charged by retailers was US$8.04/$tCO_2e$; brokers charged US$6.03/tCO_2e; wholesalers/aggregator charged US$5.31/$tCO_2e$; and project developers charged US$3.88/$tCO_2e$. The offset price for Verified Emissions Reductions (VERs) is heavily influence by project type. For example (US$/$tCO_2e$):[106]

- Afforestation/ reforestation monoculture: $10-13
- Afforestation/ reforestation mixed native: $0.5 – 45
- Avoided deforestation: $10 – 18
- Methane – livestock: $6

[103] Adapted from the Ecosystem Marketplance, New Carbon Finance
[104] Hamilton Kathering, Milo Sjardin, Thomas Marcello and Gordon Xu. 2008. *Forging a Frontier: state of the voluntary carbon markets.* Ecosystem Marketplace and New Carbon Finance.
[105] Bayon, Ricardo, Amanda Hawn, and Katherine Hamilton. 2007. Voluntary Carbon Markets: An International Business Guide to What They Are and How They Work. London: Earthscan.
[106] Hamilton Katherine, Ricardo Bayon, Guy Turner and Douglas Higgins. 2007. *State of the Voluntary Carbon Markets 2007: Picking Up Steam*. Ecosystem Marketplace and New Carbon Finance

Figure 2: Voluntary carbon market credit prices by project type (OTC, 2007, US$/t) [107]



Differences in price were based on the standard which was used in the verification process. For example, projects verified to stringent standards, such as the pre-Clean Development Mechanism (CDM), garnered the highest prices.

According to Bayon et al[108], "The market suffers from fragmentation and a lack of widely available impartial information. The fragmented and opaque nature of the voluntary market can, in large part, be attributed to the fact that it is partially composed of deals that that are negotiated on a case-by-case basis, and that many of these deals neither require the carbon credit to undergo a uniform certification or verification process nor register them with any central body." Between 2005 and 2006, the OTC market[109] grew by 200%[110]. Growth is expected to continue—in a recent survey (2008) of voluntary offset consumers, 25% plan on purchasing offsets in the next one to two years as part of their climate change strategy.[111]

Forestry already accounts for a large portion of the voluntary carbon market. Of the three project types that dominated the market in 2006, forestry represented 37% of all transactions.

Forestry already accounts for a large portion of the voluntary carbon market (see Figure 2). Of the three project types that dominated the market in 2006, forestry represented 37% of all transactions[112]. In 2007, forestry represented 18% of project types. The change represents an increase in the diversity of offset project types.

Developments in the voluntary market are important for three reasons: firstly, they reflect the demand from individuals and organizations, primarily in North America and Europe, to offset greenhouse gas emissions in the absence of regulation; secondly, voluntary carbon markets allow forestry and soil sequestration offsets more readily than limitations posed by the European Union's Emissions Trading Scheme (EU-ETS); and thirdly, the demand for different types of voluntary offsets is dependent on price, availability, and consumer perceptions of credibility. As a result, the voluntary market can influence the inclusion (or exclusion) of project types in emerging regulatory programs, such as the Western Climate Initiative in North America.

There are two main offset project types: avoiding emissions at the source and sequestering carbon from the atmosphere. "Proponents of land-based projects note that, while sequestration projects are

[107] Adapted from New Carbon Finance, 2008
[108] Bayon, Ricardo, Amanda Hawn, and Katherine Hamilton. 2007. Voluntary Carbon Markets: An International Business Guide to What They Are and How They Work. London: Earthscan.
[109] An OTC market is a decentralized market of securities not listed on an exchange where market participants trade over the telephone, facsimile or electronic network instead of a physical trading floor. There is no central exchange or meeting place for this market. Investopedia®. Website accessed on February 11, 2009.
[110] Hamilton, Katherine, Ricardo Bayon, Guy Turner and Douglas Higgins. 2007. State of the Voluntary Carbon Market 2007: Picking Up Steam. Ecosystem Marketplace and New Carbon Finance.
[111] Ecosecurities and Climate Biz. Carbon Offsetting Trends Survey 2008. Accessed online Dec 19, 2008: www.climatebiz.com.
[112] Ibid.

not permanent, they immediately slow down the amount of GHGs entering the atmosphere and could help mitigate climate change during a critical period while other technologies are developed."[113]

Land-use projects of interest to this report include:

- Forestry—agro-forestry, afforestation (planting trees on areas with no previous cover), reforestation, and forest conservation projects. Numerous co-benefits can be associated with forest-based offset projects, including contributing to biodiversity conservation, reduced erosion, potential to improve water resource availability, as well as providing economic returns for local communities. These projects carry a high risk, including those related to permanence and to financing. Also, large agro-forestry plantations may have adverse impacts, such as reduced biodiversity, reduced water supplies, and negative social impacts.
- No-till/ reduced till agriculture—less common type of credit, but it is accepted on the Chicago Climate Exchange (CCX). Activities include leaving 30% or more of the crop residue on the soil after planting, thus allowing for soil carbon to accumulate, as well as planting grass/trees along streams and croplands to prevent soil erosion and nutrient leaching.

There are considerable challenges with agriculture and forestry based offsets, including: ensuring additionality (i.e., beyond business as usual carbon reductions); permanence (i.e., reductions may be reversible); leakage (i.e., carbon reductions due to tree planting in one area could be offset by cutting down trees in another area); and problems with accurate measurement and monitoring. However, several standards and related guidance to address projects risks are available. Some of the more prominent standards are described below.

Voluntary Carbon Standard (VCS)

- Initiated by The Climate Group, the International Emissions Trading Association, and the World Economic Forum in late 2005; the World Business Council for Sustainable Development joined the initiative as a founding partner in 2007. After two years of work, VCS 2007 was released on 19 November 2007.
- The CDM, JI, and California Climate Action Registry are all approved under the VCS.
- The VCS is basically a 'quality threshold', rather than a competitive standard. The 'instrument' is the Voluntary Carbon Unit (VCU).
- In November 2008, the VCS became the first voluntary market standard to release an offset project standard for Agriculture, Forestry and Other Land Uses (AFOLU), based on a new approach to manage 'non-permanence' risks. Currently the following categories of AFOLU project activities are eligible under the VCS Program:[114]
  - Afforestation, Reforestation and Revegetation (ARR)
    - Establishing, increasing, or restoring vegetative cover through the planting, sowing or human-assisted natural regeneration of woody vegetation to increase carbon stocks in woody biomass, and in certain cases, soil.
    - Land conversion to forest vegetation.
  - Agricultural Land Management (ALM)
    - Land use and management activities demonstrated to reduce GHG emissions on cropland and grassland.
    - Increasing carbon stocks (e.g., soils) and decreasing emissions from soils.
    - Conversion to grasslands.
  - Improved Forest Management (IFM)
    - Activities that are implemented on land managed for forests (wood products, such as saw timber, pulpwood, fuelwood) are included in the IPCC's "forests remaining as forests" guidelines.
    - Only land that has been designated or approved for such activities is eligible under this category.
    - Conversion of conventional logging to reduced impact logging; conversion of logged forests to protected forests (e.g., protection from further degradation and protecting unlogged forests that would be logged in the absence of carbon finance); extending the rotation age of evenly aged forests; and, conversion of low productive forests to high-productive forests.

[113] Bayon, Ricardo, Amanda Hawn, and Katherine Hamilton. 2007. Voluntary Carbon Markets: An International Business Guide to What They Are and How They Work. London: Earthscan.
[114] Voluntary Carbon Standard. 2008. Tool for AFOLU Methodological Issues. Website accessed January 21, 2008: www.v-c-s.org

- Reducing Emissions from Deforestation and Degradation (REDD)
  - Reduction in the conversion of native or natural forests to non-forest land that would be deforested in the absence of carbon finance.
  - Avoided planned/authorized deforestation; avoided unplanned frontier deforestation (protection of mature forests that could be deforested in the future); and avoided unplanned fragmented deforestation and degradation.
- To qualify under the VCS, project developers can use the IPCC's guidelines on AFOLU, or approved CDM or VCS specific methodologies.
- Projects registered under other VCS program-approved GHG programs (such as the CDM) are eligible to create Voluntary Carbon Units (VCUs) for the emissions reductions or removals not registered under that GHG program.
- Projects cannot be registered with more than one registry to avoid double-counting.

Climate Community and Biodiversity Standards (CCB)

- According to the CCB, the standards were created to foster the development and marketing of carbon offset projects that deliver credible and significant climate, community, and biodiversity benefits in an integrated manner.[115]
- The standards can be applied to any land-based carbon projects, including both projects that reduce greenhouse gas emissions through avoided deforestation and forest degradation (REDD) and projects that remove carbon dioxide by sequestering carbon (e.g., reforestation, afforestation, revegetation, forest restoration, agroforestry, and sustainable agriculture).
- They can be employed regardless of a project's geographical location, start date, or size, for projects funded with either private or public investment, and they apply to projects that generate carbon credits for either compliance or voluntary markets.
- It is important to note that the CCB does not issue quantified emissions reduction certificates and encourages the additional use of a carbon accounting standard (such as CDM or VCS).
- As of November 2008, six projects had completed the validation process, ten projects were in the public comment phase. About 100 additional projects have indicated to the CCB their intent to use the CCB standards. Of these, approximately 40% are in Latin America, 35% in Africa, 20% in Asia, and a few projects each are in Europe, Australasia, and North America. About 43% of these projects will involve reduced emissions from avoided deforestation or forest degradation (REDD), 30% will include reforestation, 30% will include native forest restoration, 16% will include agroforestry, 14% will include sustainable forest management, and 3% will include afforestation.
- The high percentage of anticipated REDD projects (43%) reflects the potential for multiple benefits associated with REDD projects and the increasingly favourable international perception of this type of project.
- The multiple benefits of CCB standards could garner preferential investment and a price premium. For example, a reforestation project that provides both environmental and social benefits may attract funding from a variety of sources, including NGOs, private investors, government agencies, and philanthropic organizations.
- The standards assist investors in minimizing risks by identifying high-quality projects.

World Resources Institute/World Business Council for Sustainable Development (WRI/WBCSD GHG Protocol)

- The WRI/WBCSD GHG Protocol is an accounting guideline for offset projects, which does not provide certification or verification for credits.
- It is a widely accepted standard used by project developers and incorporated into other standards, such as the California Climate Action Registry Protocols, the CCX, and ISO 14064.
- The GHG Protocol provides guidelines to develop Land Use, Land Use Change and Forestry (LULUCF) projects. According to the IPCC, LULUCF projects remove GHG emissions by increasing sinks (e.g., planting forests) or reducing emissions (e.g., reducing deforestation). These types of projects are challenging as it can be difficult to quantify the GHG removals and reductions. Also, emissions may be unintentionally released if a 'sink' is damaged or destroyed by fire, pests, or unintended land management practices.

[115] CCBA. 2008. Climate, Community & Biodiversity Project Design Standards Second Edition. CCBA, Arlington, VA. December, 2008. Accessed January 26, 2009: www.climate-standards.org.

United Kingdom's Voluntary Code of Best Practice on carbon offset providers

- In draft format (February 2008)—as of October 2008, all energy and climate change related matters will be the mandate of the new UK Department of Energy & Climate. The Code establishes voluntary best practices for offset products. Those that meet the requirements can be accredited under the Code and awarded a label/quality mark to market to consumers.
- The offset provider is defined as the offset seller to the end consumer; the offset provider can purchase offsets directly from the project developers or brokers (or other intermediary). The offset provider is the only aspect of this value chain that can receive the accreditation.
- The core requirements of the Code include:
  - Accredited offsets must meet the Code throughout the accreditation period.
  - The Code's quantification protocol must be used.
  - Only direct emissions can be offset with accredited offsets (e.g., travel, home electricity use, etc.); indirect activities, such as the lifecycle carbon footprint of a product, cannot be accredited.
  - If offsets are derived from forestry based projects, the offset provider must guarantee that the credits will be renewed or replaced if expired.
  - Clear and transparent pricing must be provided to the consumer at the time of purchase.

Key resources to track ongoing market developments

Information providers

- Ecosystem Marketplace—www.ecosystemmarketplace.com
- Point Carbon—www.pointcarbon.com
- Environmental Leader—www.environmentalleader.com
- Ecosystem Marketplaces' Forest Carbon Portal—www.forestcarbonportal.com
- Environmental Finance—www.environmental-finance.com
- Forest-Trends—www.forest-trends.org
- International Energy Agency—www.iea.org

Associations/organizations

- National Carbon Offset Coalition—www.nocc.us
- The Katoomba Group—www.katoombagroup.org
- International Emissions Trading Association—www.ieta.org
- Environmental Trading Network—www.envtn.org
- Climate Capital Network—www.climatecapital.net
- Climate Neutral Network—www.climateneutral.unep.org
- Clean Air Cool Planet—www.cleanair-coolplanet.org
- Pew Centre on Global Climate Change—www.pewclimate.org

Standards

- Voluntary Carbon Standard—www.v-c-s.org
- Climate, Community & Biodiversity Standards—www.climate-standards.org

Medium-term international market opportunities for agriculture and forestry

This section provides information on the current state of existing and emerging regulated carbon markets, including size of the markets, offsets available to meet compliance, and examples of institutional buyers. It describes key market developments to monitor and identifies web-based resources and organizations that monitor market developments.

Regulated emissions trading with compliance offsets

To avoid duplication with information presented earlier in this report, the following information focuses on compliance offsets in various regulated emissions trading programs and project types.

Forestry and agriculture have key roles to play in regulated GHG emissions trading schemes. The United Nations Framework Convention on Climate Change (UNFCCC 1992) recognized that activities in Land Use, Land Use Change and Forestry (LULUCF) could provide a relatively low-cost way of offsetting emissions.[116] The Kyoto Protocol permits afforestation and reforestation projects, but only emission reductions/removals that are not covered by a regulated emissions cap and trade program can qualify as offsets.

Forestry and agriculture have key roles to play in regulated GHG emissions trading schemes.

Two North American regional GHG trading systems are briefly profiled below:

Western Climate Initiative (WCI)

- The WCI is a partnership among seven states and four Canadian provinces (British Columbia, Manitoba, Ontario and Quebec are "partners" and Saskatchewan is an "observer") that have agreed to a common GHG emissions reduction target and the creation of a regional emission cap and trade program (target: GHG emissions reduction by 15% below 2005 levels by 2020).
- Reporting of emissions begins in 2011 for emissions that occur in 2010. The first phase of the cap and trade program will begin on January 1, 2012, with a three-year compliance period. The second phase will begin in 2015, when the program is expanded to include transportation fuels and residential, commercial, and industrial fuels not already covered in the first phase.
- It will cover nearly 90% of the region's emissions, including those from electricity generation, industrial process emission sources (including oil and gas process emissions), transportation fuel combustion from gasoline and diesel, combustion at industrial and commercial facilities, and residential, commercial and industrial fuel combustion.
- Entities or facilities that will be included for regulatory compliance purposes are those that exceed the threshold of 25,000 tCO_2e in annual emissions.
- Compliance options include emissions trading, allowance banking, and offsets.
- The cap and trade program is currently in draft format (released 23 September 2008); design is anticipated to be completed in 2009.
- The draft recommendations on offsets are as follows:
  - The use of offsets will be limited to 49% of compliance from 2012-2020; each member jurisdiction can lower this limit at its discretion.
  - Criteria for offsets will be created by the WCI; quantification protocols for specific offset projects have not been developed and are anticipated to be released prior to the first cap and trade phase (January 1, 2012).
  - The following project types have been identified as a priority for investigation (not guaranteed to be included, but will be examined further):
    - Agriculture: soil sequestration and manure management,
    - Forestry: afforestation/reforestation, forest management, forest preservation/conservation, and forest products,
    - Waste management: landfill gas and wastewater management.
  - WCI will make use of existing standards where possible.
  - WCI encourages the creation of offset projects within the WCI boundaries, but they may approve and certify offset projects located in the U.S., Canada, and Mexico.
  - WCI may accept CDM.

[116] UNFCCC. N.d. Accessed January 26, 2009: www.unfcc.int

Regional Greenhouse Gas Initiative (RGGI)

- The Regional Greenhouse Gas Initiative (RGGI) is the first mandatory, market-based effort in the United States to reduce greenhouse gas emissions. Ten northeastern and mid-atlantic states will cap and then reduce CO_2 emissions from the power sector 10% by 2018. States will sell emission allowances through auctions and invest proceeds in consumer benefits: energy efficiency, renewable energy, and other clean energy technologies. The goal of RGGI is to spur innovation in the clean energy economy and create green jobs in each state.
- In September 2003, RGGI members endorsed an action plan to develop a core cap and trade program for power plants, with subsequent design phases to consider offset protocols. In the future, RGGI may also be extended to include other sources of greenhouse gas emissions and greenhouse gases other than CO_2. RGGI allows for other states and jurisdictions to join the initiative. Ontario is currently participating as an observer and has expressed an interest in potentially joining RGGI.
- The program scope involves fossil fuel-fired electric generating units serving a generator of 25 MW or larger. Once a unit triggers applicability under the program, that entity will remain subject to the program, regardless of changes to the unit.
- Offsets allowances may be used for a limited portion of a source's compliance obligation. In the early program phase, the use of offsets is constrained to 3.3% of a power plant's total compliance obligation during a control period, though this may be expanded to 5% and 10% if certain CO_2 allowance price thresholds are reached.

The integrity of a cap and trade program that permits the use of compliance offsets is maintained by the strict application of credible standards and criteria for inclusions. Certain forestry and agriculture based offsets have quantification uncertainties subject to more measurement requirements (e.g., baselines, reversibility, leakage, etc.), which contribute to higher transaction costs.

According to the World Resources Institute,[117] there are three possible mechanisms to mitigate issues associated with possible reversible reductions/removals from agriculture and forestry offset projects:

- Issue credits on a discounted basis (e.g., one credit issued for every two tCO_2e)—this does not occur in current offset programs.
- Issue temporary or expiring credits (e.g., credits issued expire at a defined date or are cancelled if the verification indicates a reversal occurred)—CDM uses this approach for afforestation and reforestation projects.
- Establish an insurance or buffer system (e.g., buyers or sellers would be required to purchase insurance to compensate for potential reversals, or to establish carbon sequestration buffers)—RGGI has taken this approach.

Key market developments to watch closely include:

- Policy developments in the new Obama administration.
- The Canadian Federal Government's "Turning the Corner" regulatory framework on industrial GHG emissions.
- International treatment of Reducing Emissions from Deforestation and Degradation (REDD) in any post-Kyoto agreements on climate change.
- The Copenhagen Climate Conference in December 2009 (see the Copenhagen Climate Network for reports and information on the event).
- Trends that have the potential to increase the price of carbon:[118]
  - Colder winters/warmer summers (impacts energy demands),
  - Tightening of carbon credits in regulated markets,
  - Canadian and U.S. regulated markets allowing compliance offsets—the more offsets allowed, the lower the price; the less offsets allowed, the higher the price

[117] Broekhoff, Derek. 2008. Creating Jobs With Climate Solutions: How Agriculture and Forestry Can Help Lower Costs in a Low-Carbon Economy. Testimony before the Senate Subcommittee on Rural Revitalization, Conservation, Forestry, and Credit of the United States Senate Committee on Agriculture, Nutrition and Forestry. May 21, 2008. Accessed January 27, 2009: www.wri.org/
[118] Adapted from Labatt, Sonia and Rodney R. White. Carbon Finance: The Financial Implications of Climate Change. New Jersey: John Wiley & Sons.

Key resources to track ongoing market developments

Information providers

- Point Carbon—www.pointcarbon.com
- Ecosystem Marketplace—www.ecosystemmarketplace.com
- Environmental Finance—www.environmental-finance.com
- Climate Change Corp—www.climatechangecorp.com

Organizations/ associations

- International Emissions Trading Association—www.ieta.org
- Center for International Forestry Research (CIFOR) —www.cifor.cgiar.org
- Food and Agriculture Organization of the United Nations—www.fao.org
- Conservation International—www.conservation.org
- The Global Canopy Programme—www.globalcanopy.org
- Friends of the Earth International—www.foei.org
- Resources for the Future—www.rff.org
- United Nations Framework Convention on Climate Change—www.unfccc.int
- Union of Concerned Scientists—www.ucsusa.org
- World Bank's Carbon Finance Unit—www.worldbank.org
- World Resources Institute—www.wri.org
- Forest-Trends—www.forest-trends.org
- Pew Centre on Global Climate Change—www.pewclimate.org
- Intergovernmental Panel on Climate Change—www.ipcc.ca
- Natural Resources Defense Council—www.nrdc.org
- The Climate Registry—www.climateregistry.org

Regulated markets

- Western Climate Initiative—www.westernclimateinitiative.org
- Regional Greenhouse Gas Initiative—www.rggi.org
- European Union Emissions Trading Scheme—www.ec.europa.eu
- New Zealand Emissions Trading Scheme—www.climatechange.govt.nz
- Australia Carbon Pollution Reduction Scheme—www.climatechange.gov.au

Emerging international market opportunities for agriculture and forestry

This section describes different types of emerging ecosystemn markets and potential opportunities available for agriculture and forestry. It gives examples and case study information (e.g., wetland banking, biodiversity credits), and it identifies market developments, including regulatory policy, organizations working on ecosystem services markets, and government agencies and other large institutions working to develop market-based instruments and supporting tools/ methodologies to value ecosystem services. It also identifies web-based resources and organizations that can be accessed to monitor ongoing market developments.

Ecosystem markets can provide land owners with a suite of new options for generating profit on their land. Watershed protection, improved water quality, protection for endangered species, maintenance of biodiversity, and sequestration of GHG emissions from the atmosphere are just a few examples of "products" that landowners will be able to "produce" and maintain to sell in the emerging ecosystem marketplace. Land managers/natural resource companies that understand these markets (e.g., identifying the buyers, supporting the sellers to develop the credits, understanding how the credits are determined and quantified, and knowing what the participation requirements are in these markets) will be well-situated to capitalize on future markets for carbon, wetlands, water quality, biodiversity, and bundled ecosystem services.

Current state of the market

Assessing the total value of the biodiversity market is difficult as there is no single market. However, niche markets do exist, as described above. Compliance biodiversity offsets exist in the U.S., New Zealand, Australia, Switzerland, and the European Union. There is also growing interest in voluntary biodiversity offsets. While in the long-term an internationally-traded "conservation credit" or similar instrument is possible, biodiversity markets are currently local and regional in nature.

Biodiversity offers a unique opportunity to develop markets because it is not location-specific. Biodiversity is a feature of an ecosystem. Organizations such as Conservation International are using a 'hotspot' approach in which biodiversity protection is focused on critical, endangered, and unique "areas featuring exceptional concentrations of endemic species and experiencing exceptional habitat loss."[119]

Bishop and colleagues[120] have identified three biodiversity opportunities:

- Local ecosystem banks—buy or lease land, restore it, then sell the credits to government agencies and private companies that need offsets for regulatory compliance or for other voluntary reasons, such as regulatory 'goodwill' or licenses to operate.
- Ecosystem service brokers—purchase biodiversity credits from landowners (with a contractual, legally binding arrangement—e.g., conservation easement) then sell the biodiversity credits (as above).
- Biodiversity offsets for imports—identify global conservation priorities, establish standards for credible international offsets, and set up a verification system to provide credible biodiversity credits for all imports not recognized under an existing certification. Accredited providers would sell the offsets.

Buyers are interested in maximizing the biodiversity protection achievable; sellers try to maximize their returns. In a report prepared for the World Conservation Union,[121] research revealed modest growth in private sector interest in developing biodiversity offsets. These initiatives are increasingly tied to a corporate commitment to sustainability and are embedded in environmental policies. The challenge is a lack of a clearly defined, universally agreed upon definition of biodiversity. A definition is required to be clear about what is being bought and sold in new markets and to create a fungible commodity to transact at the international level.

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Examples of conservation markets are described below.

Biodiversity Banking and Offsets Scheme (biobanking)

- Landowners create a biobank site and commit to establishing criteria and performance standards for maintaining and enhancing the biodiversity value.
- Credits are provided to the landowner based on an improvement in the condition of biodiversity values (e.g., improvement in the habitat, increased habitat, increased species population).
- Landowners sell the credits to developers who want to voluntarily purchase credits to offset their development.
- Demand for offsets may also come from organizations (private and public) that want to mitigate their environmental impact and secure conservation outcomes.

Wetland Mitigation Banking

- In the United States where there is a demand for wetlands, there has been experimentation with and deployment of regulatory frameworks for wetland mitigation banking and other conservation markets. The demand is driven by public sector interest in conserving vital wetland resources.

[119] Myers, Norman, Russell Mittermeier, Cristina Mittermeier, Gostavo A. da Fonseca and Jennifer Kent. 2000. "Biodiversity hotspots for conservation priorities". Nature 6772: 853-858/
[120] Bishop, Joshua, Sachin Kapila, Frank Hicks, Paul Mitchell and Francis Vorhies. 2008. *Building Biodiversity Business*. International Union for Conservation of Nature, Shell International Limited, Forest Trends, Green Horizons Environmental Consultants Limited and Earthmind.
[121] ten Kate, Kerry, Josh Bishop and Ricardo Bayon. 2004. *Biodiversity Offsets: Views, experiences and the business case.* International Union for Conservation of Nature (IUCN), Gland, Switzerland and Cambridge, UK and Insight Investment, London, UK.

- "Producers have some opportunities to sell wetland services directly to consumers, but functioning markets are rare."[122] The U.S. Clean Water Act includes regulations to create offset markets for wetlands. The Act requires that any wetland requires compensation by creating an offset that creates a new wetland or restores a degraded system.
- Producers can supply wetland credits for developers to purchase. They are required to guarantee long-term protection of the wetland bank; as such, producers/wetland credit developers are responsible for the long-term maintenance costs to ensure that the wetland banks continue to meet contractual obligations.
- The key risks for producers are associated with the possible lag time between building or restoring a wetland and the provision of the credit. The loss of land value for traditional activities (e.g., ranching, farming) and the capital costs to "build" the wetland pose risks that individual producers do not want to be burdened with.
- Non-profit organizations are also driving demand for wetland conservation: the Nature Conservancy and Ducks Unlimited are involved in a variety of programs, including conservation easements and the direct purchase of land.[123] Both organizations are interested in working on projects that improve ecosystem services that can qualify as credits in existing or developing ecosystem markets, such as wetland banks, water quality trading systems, and carbon markets.

The Willamette Partnership

- To address increasing water temperature issues in the Willamette River, the Oregon Department of Environmental Quality created regulations requiring entities (e.g., water treatment facilities and factories in the Willamette River Basin) that discharge effluent contributing to the higher river temperatures to meet a Temperature Total Maximum Daily Load (or Temperature TMDL).
- Expensive technologies could be deployed to meet the regulations, but an alternate option using natural infrastructure emerged: riparian vegetation and gravel channels naturally cool the river.
- A conservation credit trading program was created to financially incent landowners to "build" natural infrastructure (e.g., plant trees and protect riverside vegetation), and sell the acquired conservation credits to regulated entities to meet regulatory obligations.
- The Temperature Trading program represents the first of many ecosystem markets the Willamette Partnership is focused on developing. The partnership's goal is to develop an "Ecosystem Service Marketplace" that accommodates transactions of a variety of ecosystem services. This will build off of existing markets that have developed through regulation, such as wetland banking and endangered species conservation banking.
- As of December 2008,[124] the partnership had released "Trading Temperature Credits from Riparian Shade: A Handbook for Buyers and Sellers in the Willamette Partnership." The development of a comprehensive, integrated marketplace is an ongoing initiative.

In March 2008, Mongabay[125] and other news agencies reported that a private equity firm, UK-based Canopy Capital, purchased the rights to environmental services generated by a 370,000 hectare rainforest reserve in Guyana, setting a precedent; a financial firm is betting that the ecosystem services generated by a rainforest–climate regulation, biodiversity maintenance, water storage, etc. will be eventually valued on international markets. Also in March 2008, according to the Wall Street Journal,[126] Merrill Lynch partnered with Australia-based Carbon Conservation to invest US$9 million over four years to protect 750,000 hectares of forest in Indonesia's Aceh province. It was a notable development because it marked the first time a U.S. bank signalled to the market that there is money to be made in leaving trees standing. It also signals that the international perception of forestry and other land-based carbon offset projects is changing. Merrill Lynch is banking that forestry-based carbon credits will be viable in an international carbon market. The project aims to prevent

[122] Ribaudo, Mark, LeRoy Hansen, Daniel Hellerstein and Catherine Greene. 2008. The Use of markets to Increase Private Investment in Environmental Stewardship. Unites States Department of Agriculture.
[123] Ducks Unlimited website. Ecological Goods and Services. Accessed January 29, 2009: www.ducks.org
The Nature Conservancy website. Funding for Conservation. Accessed January 29, 2009: www.nature.org
[124] Willamette Partnership. 2008. The Willamette Partnership Newsletter December 31, 2008, Vol. I Issue 4. Accessed January 28, 2009: www.willamettepartnership.org
[125] Mongabay. 2008. Private equity firm buys rights to ecosystem services of Guyana rainforest. Accessed online January 29, 2009: www.news.mongabay.com
[126] Wall Street Journal. 2008. Merrill Lynch: Turning Trees into Money. WSJ Environmental Capital, March 11, 2008. Accessed January 29, 2009: www.wsj.com

deforestation, effectively avoiding the release of 3.4 million tons of CO_2 annually while generating US$432 million in carbon financing over the next 30 years.

Key resources to track ongoing market developments

Organizations/ associations / information providers

- Convention on Biological Diversity Information Database on Incentive Measures—www.cbd.int
- Biodiversity and Economics for Conservation—www.bioecon.ucl.ac.uk
- United Nations Conference on Trade and Development BioTrade Initiative—www.biotrade.org
- Conservation International—www.conservation.org
- United Nations Green Economy Initiative—www.unep.org/greeneconomy
- Ecosystem Valuation—www.ecosystemvaluation.org
- EnValue— www.environment.nsw.gov.au/envalue
- International Institute for Environment and Development—www.iied.org
- IUCN Forest Conservation Program, Biodiversity and Trade Program—www.iucn.org
- Organization for Economic Cooperation and Development—www.oecd.org
- The Beijer International Institute for Ecological Economics—www.beijer.kva.se
- The Environmental Valuation Reference Inventory—www.evri.ca
- The Katoomba Group—www.katoombagroup.org
- The Ecosystem Marketplace—www.ecosystemmarketplace.com
- The Ecosystem Marketplace's Species Banking portal—www.speciesbanking.com
- Forest-Trends Business and Biodiversity Offset Program—www.forest-trends.org
- Global Environment Fund—www.globalenvironmentfund.com
- The Milken Institute—www.milkeninstitute.org
- The Nature Conservancy—www.nature.org
- Natures Services—www.naturesservices.org
- The Land Stewardship Project—www.landstewardshipproject.org
- The Ecosystem Services Project – www.ecosystemservicesproject.org
- The Woods Institute for the Environment at Stanford University–The Natural Capital Project—www.naturalcapitalproject.org
- The USDA Forest Service Ecosystem Services project—www.fs.fed.us/ecosystemservices/

Recommended tools and actions to monitor emerging information related to ecosystem markets

The rapid growth of global ecosystem markets means that new and important information is continually becoming available. The information need not only be monitored, but also be studied and assessed for applicability to the Alberta situation. To be best positioned for leadership in ecosystem market participation and development, the IAFE and the agriculture and forestry sectors should be aware of important ecosystem market news and developments. In addition, an "ecosystem markets" advisory group could be struck to provide expert opinion and assessment on key market initiatives and opportunities.

News and website feeds / RSS (Really Simple Syndication)

Information feeds from news providers and specific websites can be sent to readers with RSS technology. RSS allows subscribers to access to timely updates from specific websites. Two common methods for receiving feeds are described below.

Inbox method

- Google News Alert—www.news.google.ca
  - Use this link to select themes/issues that Google will search in daily news headlines and stories. The News Alerts link is located on the left column. As requested, your news alerts will be sent to your email. For example, select "*climate change*" or *sustainability*, and all relevant stories will be listed in one email and sent to your inbox. Tip: use "….." for multiple words.
- Site-specific emails
  - Many websites offer the option to join a list serve or emailing list. While your inbox can quickly fill, there are some essential sites related to sustainability that provide weekly or monthly postings. Tip: check the website for an **RSS** feed, and follow the instructions below for creating your own feed list.

While not an exhaustive list, a sample of websites with information includes the following (with RSS noted if available):

- Planet 2025 News Network—http://www.planet2025news.net/ (RSS)
- The Corporate Responsibility Network—http://www.csr-news.net/
- Corporate Responsibility News—http://www.csrwire.com/ (RSS)
- Ethical Performance—http://www.ethicalperformance.com/
- Environmental News Network—http://www.enn.com/ (RSS)
- Environmental Leader—http://www.environmentalleader.com/ (RSS)
- World Watch Institute—http://www.worldwatch.org/ (RSS)
- Corporate Responsibility Office—http://www.thecro.com
- Earth Island Institute—http://www.earthisland.org/
- Earth Trends (WRI) —http://earthtrends.wri.org/ (RSS)
- Low Carbon Innovation Network—http://www.carbon-innovation.com/
- Ecosystem Marketplace—http://www.ecosystemmarketplace.com/
- GreenBiz—http://www.greenbiz.com/ (RSS)
- Eldis (articles re: policy, practice, etc., tailored to your interests) —http://www.eldis.org/
- CERES—http://www.ceres.org/ (RSS)
- Global Footprint Network—http://www.footprintnetwork.org/
- The Climate Registry http://www.theclimateregistry.org/
- Point Carbon-Carbon Market NA—http://www.pointcarbon.com/ (RSS)
- WBCSD—http://www.wbcsd.org/ (numerous e-letters to sign on to)

Portal method

A number of websites act as "feed aggregators". An RSS "feed" is a direct connection to a website of interest filtered to your own portal. An "aggregator" is a 'one-stop-shop' for the latest headlines, news, etc. The benefits include reducing the time and effort of checking individual websites separately, in addition to limiting the number of sites where you have to enter your email address to receive news and updates.

Search engine words and phrases for ecosystem markets

To assist readers in conducting manual searches for information related to ecosystem markets, the following list of relevant terms is included.

- Markets for ecosystem services
- Markets for ecosystem goods and services
- Markets for environmental services
- Markets for watersheds
- Markets for biodiversity
- Markets for wetlands
- Markets for conservation
- Markets for stewardship
- Markets for natural resources
- Market solutions for conservation
- Market-based instruments
- Forest ecosystem services
- Payments for agriculture ecosystem services
- Payments for ecosystem services from forests
- Payments for ecosystem services
- Payments for ecosystem goods and services
- Payments for stewardship
- Stewardship payments
- Payments for conservation
- Certification of food products
- Certification of forest products
- Eco label
- Green label
- Green consumer preferences
- Carbon label
- Ecolabel marketing
- Voluntary carbon markets and agriculture
- Voluntary carbon markets and forestry

- Terrestrial carbon offsets
- Biodiversity offsets
- Carbon offsets
- Development offsets
- Wetland banking
- Conservation banking
- Water markets
- Water conservation markets
- Biodiversity banking
- Food – Associations – Certification
- Forest – Associations – Certification
- Farmers and ecosystem markets
- Ranchers and ecosystem markets
- Forestry companies and ecosystem markets
- Forest products and ecosystem markets
- Environmental finance
- Ecosystem finance
- Investors and ecosystem markets
- Investors and ecosystem services
- Investors and ecosystem goods and services
- Private sector investment in ecosystem markets

Ecosystem markets advisory panel

The monitoring of information will be needed to stay informed of related developments, but also important will be the evaluation, synthesis and dissemination of that information. The formation of an ecosystem markets advisory panel would be an important complement to a monitoring program. It is recommended that the advisory panel be comprised of related subject matter experts, academia, agriculture and forestry sector representatives, government representatives, and business advisors. The advisory panel could be relied upon to assess market developments, review implementation scenarios, and make specific recommendations to the IAFE.

6. Summary

Globally, diverse institutions appreciate that the natural environment and natural systems contribute tangible and intangible assets that provide material and immaterial value to business. It is also recognized that natural systems are under significant pressures from human demands and in many cases are in a state of decline. Market-based instruments can provide opportunities to natural resource companies to harness this value through the development of public policy and contractual agreements that incent investment in conservation and restoration of natural systems. Due to the relationship and management responsibilities the agriculture and forestry sector in Alberta have with the natural environment, they are in a unique position to take advantage of new business opportunities that emerge with market-based conservation instruments.

The research conducted suggests that local ecosystem services markets such as wetland banking do not present global market opportunities for the sectors. However, if developed domestically they could contribute to the goal of positioning Alberta as a green economy leader, strengthen the province's international image, and potentially attract businesses seeking progressive jurisdictions in which to locate operations.

Government-mediated ecosystem markets are the most common example observed globally, however, forestry and agriculture companies are not able to access such extra-jurisdictional markets. Private sector investment in for example, water quality protection through improved land management options is a possible opportunity, however contractual agreements are negotiated in an ad-hoc manner and are therefore not identified as an immediate, or near term opportunity.

The key immediate opportunities identified that enable the forestry and agriculture sectors to participate in international ecosystem market are with certification and ecolabelling initiatives, as well as with the voluntary "over-the-counter" carbon market. Medium-term opportunities for both sectors include the development of carbon offset credits for participation in regulated carbon markets. Alberta has an existing carbon offset system through the Specified Gas Emitters Regulation for industrial emitters, and it is anticipated that a North American system will emerge in the near future. Regional carbon markets such as the Western Climate Initiative could also enable organizations to acquire and sell carbon credits from Alberta-based projects. In the longer term, other global ecosystem markets in addition to carbon may develop, for instance biodiversity. In addition, "bundled" or integrated ecosystem service markets are plausible if a number of issues related to instrument development, and the creation of fungible conservation credits, are resolved.

Alberta is well positioned to look creatively at mechanisms to develop ecosystem services markets (biodiversity offsets, wetland mitigation banks, water quality trading, nutrient trading and salinity trading, etc.) in the province. With the recent environmental scrutiny that the province has been exposed to, there is an added incentive for the province to pursue innovative ways to address environmental concerns. As numerous case studies suggest, tailoring the market instrument to desired environmental and social outcomes is a critical consideration for success. For instance, the Willamette Partnership in Oregon presents an innovative option for an integrated ecosystem services market in which multiple attributes might be traded. Alberta could learn from, and build upon, such leading initiatives to achieve cumulative results.

As evidenced by a number of indicators including international interest from global institutions and companies such as the U.N. Finance Initiative and the World Bank, ecosystem markets are rapidly evolving and new information is continually becoming available. To continue with the Institute's aim of pursuing opportunities in the ecosystem marketplace, IAFE should consider the following in terms of next steps.

Strategic Partnerships
By establishing linkages with stakeholders and becoming involved in related initiatives in existing and emerging ecosystem markets, Alberta will get direct exposure to the challenges, successes and potential opportunities in ecosystem markets. Ideas for partnerships include:

- Engaging in a dialogue with leading institutions and key players in emerging or established ecosystem markets.
- Building partnerships with businesses, non-governmental organizations, academia and multi-stakeholder associations (e.g. industry associations) both from within Alberta and from outside the province.

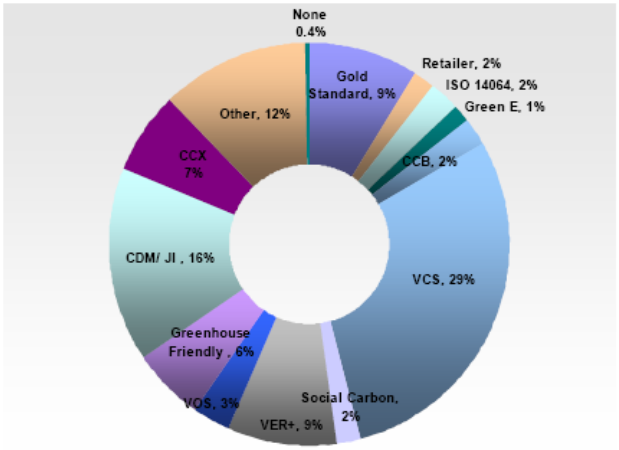
Monitoring

Developing an understanding of private and public sector commitments to minimize environmental impacts, such as reducing carbon footprints, will be important in identifying emerging opportunities for both the agriculture and forestry sectors. Monitoring and other considerations include:

- Assessing private and public sector commitments to become "carbon neutral" and/or minimize environmental impacts.
- Conducting a comprehensive detailed analysis of the trends and opportunities for certification and ecolabelling for both the agriculture and forestry sectors.
- Developing a formal monitoring program to track ecosystem market information in general:
  - Trends, developments, lessons learned in existing markets and pilot projects,
  - Emerging consumer trends,
  - Regulatory developments,
  - Non-governmental organization campaigns.

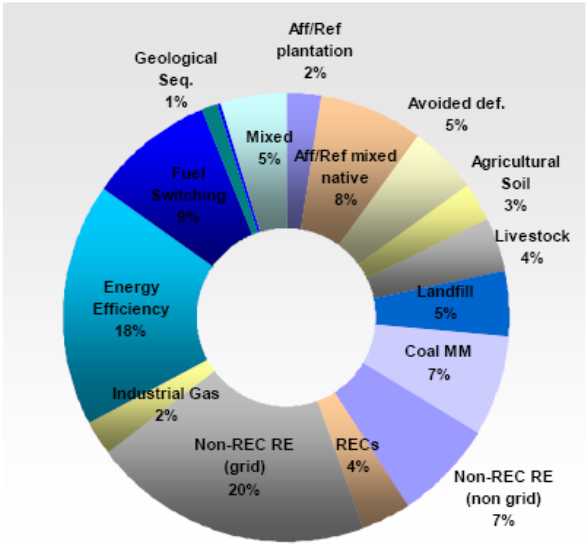
Appendix A—OTC transactions by standard, project type, and project location

Transaction Volume by Standard Used, OTC 2007



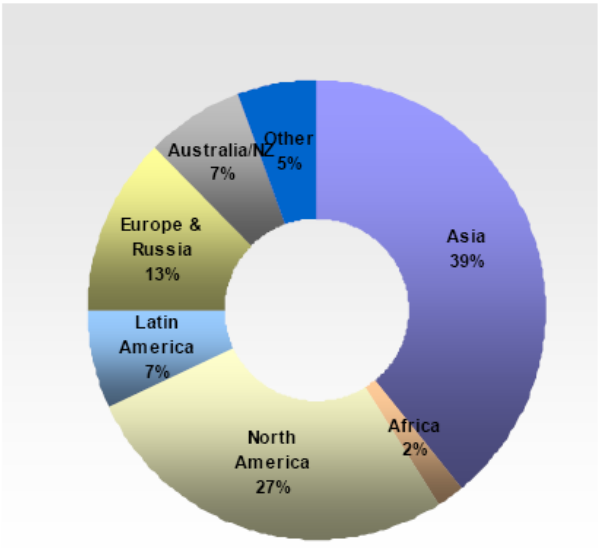
Source: Ecosystem Marketplace, New Carbon Finance

Transaction Volume by Project Type, OTC 2007



Source: Ecosystem Marketplace, New Carbon Finance

Transaction Volume by Project Location, OTC 2007



Source: Ecosystem Marketplace, New Carbon Finance

Appendix B—Global environmental/ ecosystem markets scan

Compendium of examples of environmental markets and payments for ecosystem services

The following table (Table 3) provides a listing of examples reviewed by market/payment type. The key information provided is the market classification or type of payment scheme used, the primary location where transactions occur, the primary enabling instrument driving transactions, the ecosystem goods/services represented, and a reference or website link.

Table 3: Examples by type of market/payment

Market classification / type of payment	Name / case study	Location	Enabling instrument	Ecosystem service(s) provided	Reference
Cap and trade	Kyoto Protocol compliance mechanisms	International	Four "flexibility mechanisms": Assigned Amount Units, Certified Emission Reductions, Emission Reduction Units, Removal Units	Carbon	http://unfccc.int/2860.php
Cap and trade	Water Quality Trading	United States	EPA's Water Quality Trading Policy	Water quality	http://www.epa.gov/owow/watershed/trading.htm
Cap and trade	Western Climate Initiative	United States	Market-based cap-and-trade system in several states and provinces in U.S. and Canada	Carbon	http://www.westernclimateinitiative.org/
Cap and trade	Regional Greenhouse Gas Initiative	United States	Emission allowances sold through auctions in Northeastern US states	Carbon	http://www.rggi.org/home
Cap and trade	New South Wales GHG Reduction Scheme - GHG units	Australia	Greenhouse Gas Abatement Scheme regulations	Carbon	http://www.greenhousegas.nsw.gov.au/
Cap and trade	U.S. Conservation Banking	United States	U.S. Endangered Species Act (1982) - Habitat Conservation Plans	Biodiversity, water (watersheds, rivers)	http://www.dfg.ca.gov/habcon/conplan/mitbank/ http://www.speciesbanking.com
Cap and trade	Hunter River Salinity Trading Scheme - auction of salinity credits	Australia	Regulation/ Auction - Protection of the Environment 2002	Water quality	http://www.environment.nsw.gov.au/licensing/hrsts/index.htm
Certification /ecolabelling	Rainforest Alliance / Sustainable Agriculture Network Standards	International	Certification and labeling schemes	Bundled	http://www.rainforest-alliance.org
Certification /ecolabelling	Forest Stewardship Council	International	Standards, trademark assurance and accreditation services	Bundled - sustainable forest management	http://www.fsc.org

Market classification / type of payment	Name / case study	Location	Enabling instrument	Ecosystem service(s) provided	Reference
Certification /ecolabelling	CSA	International	Internationally recognized and accredited standards	Bundled - sustainable forest management	http://www.csa-international.org/product_areas/forest_products_marking/Default.asp?language=english
Certification /ecolabelling	Sustainable Forestry Initiative	United States	Certification labels and claims	Bundled- sustainable forest management	http://www.sfiprogram.org/
Certification /ecolabelling	USDA National Organic Program	United States	Organic Food Production Act 1997	Bundled	http://www.ams.usda.gov
Certification/ ecolabelling	Global GAP (Good Agriculture Practice)	International	Voluntary market	Bundled	http://www.globalgap.org
Certification/ ecolabelling	EcoCert	International	Voluntary market - accredited with US, Japan and the European Union	Bundled	http://www.ecocert.com
Compliance offsets	Wetland Banking	United States	Clean Water Act (1978) and the Army Corp of Engineers Regulations ("compensatory mitigation")	Water /wetlands	http://www.epa.gov/owow/wetlands/facts/fact16.html
Compliance offsets	Forest offsets	Brazil	Brazilian Forest Code of 1965 and the National System of Conservation Units	Biodiversity	http://www.idrc.ca/en/ev-43424-201-1-DO_TOPIC.html; Landell-Mills and Porras (2002)
Compliance offsets	** this legislation enables to creation of state level offset programs	Australia	Commonwealth Environmental Protection and Biodiversity Conservation Act 1999	Bundled	Landell-Mills and Porras (2002)
Compliance offsets	BushBroker - a native vegetation credit trading system	Australia, State of Victoria	Planning and Environment Act; Native Vegetation Management Framework	Biodiversity	http://www.dse.vic.gov.au
Compliance offsets	Habitats and Birds Directive	European Union	Council Directive 92/43/EEC on conservation of natural habitats and Council Director 79/409/EEC on wild flora and fauna	Bundled	http://ec.europa.eu/environment/nature/legislation/habitatsdirective/index_en.htm
Direct government payment	Conservation Reserve Program	United States	Farm Bill	Water quality and flow; soil fertility and stability; biodiversity and habitat	http://www.nrcs.usda.gov/programs/CRP/
Direct government payment	Environmental Quality Initiatives Program (EQIP)	United States	Farm Bill	Bundled	http://www.nrcs.usda.gov/
Direct government payment	Wetland Reserve Program	United States	Farm Bill	Water	http://www.nrcs.usda.gov/

Market classification / type of payment	Name / case study	Location	Enabling instrument	Ecosystem service(s) provided	Reference
Direct government payment	Conservation Security Program	United States	Farm Bill	Bundled	http://www.nrcs.usda.gov/
Direct government payment	Mexican Forestry Fund	Mexico	Regulation	Bundled	Ecosystem Marketplace, Ricardo Bayon (2003) http://ecosystemmarketplace.com/pages/article.news.php?component_id=2049&component_version_id=6441&language_id=12
Direct government payment	Sloping Land Conversion Program (AKA - Grain for Green)	China	Payment to landowners for provision of environmental services.	Bundled	Landell-Mills and Porras (2002)
Direct government payment	Forest Ecological Compensation	China	Payment to landowners for provision of environmental services.	Bundled	Landell-Mills and Porras (2002)
Direct government payment	Costa Rican Forest (Private Land Forest Conservation)	Costa Rica	Payment to landowners for provision of environmental services.	Bundled	Landell-Mills and Porras (2002)
Direct government payment	National Forestry Fund's Payments for Environmental Services program	Colombia	Payment to landowners for provision of environmental services.	Bundled	Landell-Mills and Porras (2002); http://www.fao.org/docrep/003/x6821e/X6821E06.htm
Direct government payment	EcoTender	Australia, State of Victoria	Auction-based: evaluation of tenders, based on potential improvements in salinity, biodiversity, carbon sequestration and water quality.	Bundled	http://www.dse.vic.gov.au/dse/index.htm
Direct government payment	Ecological Compensation Areas	Europe - Switzerland	Swiss Agriculture Policy / Regulation	Bundled	http://www.art.admin.ch/themen/00563/00684/index.html?lang=en
Direct government payment (hybrid)	New York Catskills-Delaware watershed payments	United States	Taxes on water users; New York City bonds; trust funds; subsidies; logging permits; differential land use taxation; development rights; conservation easements	Water quality	http://www.nysefc.org/home/index.asp?page=294 http://www.nysefc.org/home/index.asp?page=19
Direct payment	FONAFIFO / ESPP (Environmental Services Payment Program)	Costa Rica	Environmental Services Certificate	Bundled	http://www.fonafifo.com/english.html

Market classification / type of payment	Name / case study	Location	Enabling instrument	Ecosystem service(s) provided	Reference
Private sector payment	Vittel/Nestle payments for water quality	Europe - France	Contractual agreement between the company and upstream farmers to improve agricultural practices and to reforest sensitive watershed forestry zones	Water quality	Various sources
Tax incentives	Australian Tax Office - Carbon Forest Sinks; Tax deduction for expenditures incurred for the established of tress in a carbon sink	Australia	Income Tax Assessment act 1997	Carbon	http://www.climatechange.gov.au/land/tax-deduction.html
Voluntary offsets	State Forests New South Wales - Biobanking	Australia, State of New South Wales	Private sector offsets (confirm if other participants are involved)	Carbon	http://www.environment.nsw.gov.au/biobanking/
Voluntary offsets	Offsets - over-the-counter (OTC)	International	Retail-based market	Carbon	Various sources; EcoSecurities and ClimateBiz - Carbon Offsetting Trends survey 2008; New Carbon Finance - state of the voluntary carbon markets report, etc.
Voluntary offsets	BioCarbon Fund - World Bank	International	Selective offsets - purchases carbon from a variety of land use and forestry projects	Bundled	http://wbcarbonfinance.org/Router.cfm?Page=BioCF
Voluntary offsets	Offsets, futures - CCX	United States	Voluntary market	Carbon	http://www.chicagoclimatex.com/
Voluntary offsets	SpeciesBanking.com	United States	Conservation offsets provided through an online information hub.	Biodiversity	http://www.speciesbanking.com/
Voluntary offsets	Voluntary agreements/ offsets - New South Wales - Native Vegetation Offsets	Australia, State of New South Wales	Native Vegetation Act 2003, Native Vegetation Regulation 2005	Biodiversity	http://www.environment.nsw.gov.au/vegetation/nvmanagement.htm

Appendix C—Sector overviews

Agriculture

Sector description

The agriculture sector contributed to 1.9% of Alberta's GDP in 2007. According to Statistics Canada, 2007 revenues were C$8.7 billion. The 2006 Census reported 49,431 farms with 52.1 million acres being farmed (21.1 million ha). It is an export-oriented sector and is Canada's second-largest agri-food exporter after Ontario. The total value of agri-food exports from Alberta in 2007 was $6.6 billion.[127]

Export markets

For the purposes of determining exports, Alberta Agriculture and Rural Development refers to agri-food exports as primary agricultural commodities (animals and crops) and processed agricultural and ford products (value-added exports).[128]

The top five agri-food exports from Alberta in 2007 and associated values were:

1.	Wheat	$1,554 million
2.	Canola seed	$923 million
3.	Beef	$887 million
4.	Live cattle	$702 million
5.	Pork	$346 million

The top five export markets for agri-food producers in Alberta and associated expenditures, as a percentage of total export revenue were:

1.	Unites States	41.1%
2.	Japan	13.8%
3.	Mexico	7.0%
4.	China	6.8%
5.	Indonesia	2.3%

Forestry

Sector description

The forestry sector is Alberta's third-largest economic sector behind oil and gas, and agriculture. The forest industry produces a variety of products with the emphasis being on wood products, namely softwood lumber, plywood, and oriented strand board (OSB).

Fast facts:[129]

- Forested land in AB = 27.7 million ha
- 89% provincially-owned (8% federal / 3% private)
- Third-largest economic sector in the province behind oil and gas, and agriculture
- Facilities (as of May 2008)
  - 24 sawmills (over 100,000 cubic meters)
  - 6 pulp mills
  - 1 paper mill
  - 8 panel board mills
  - 1 laminated veneer lumber mill

[127] Alberta Agriculture and Rural Development, Agri-Food Statistics Update. Issue No: EXPO8-1, 2008.
[128] Ibid
[129] Alberta Wood Market Statistics, Including Pulp and Paper. 2008 Edition. FPInnovations.

Export markets

The Alberta forestry sector is heavily dependent on the U.S. market. As summarized in a recent report from FPInnovations,[130] wood product exports to the U.S. in 2007 was nearly **95%** of total export revenue. The next most important market is Japan where exports were just under **3%**.

[130] Alberta Wood Market Statistics, Including Pulp and Paper. 2008 Edition. FPInnovations.

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