

# Opportunities and Liabilities from Greenhouse Gas Emissions and Greenhouse Gas Emission Reductions

Chris Rolfe, Staff Counsel  
West Coast Environmental Law  
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[Introduction](#)

[Existing International and Domestic Climate Law](#)

[Factors Shaping International Climate Law](#)

[The Kyoto Mechanisms and Sinks](#)

[Domestic Responses to the \*Kyoto Protocol\*](#)

[Opportunities and Liabilities](#)

[Appendix 1 - \*Kyoto Protocol\*](#)

[Endnotes](#)

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## I. Introduction

Human induced climate change is one of humanity's greatest challenges. Over the coming century it is predicted that climatic changes caused by our emissions of greenhouse gases will have drastic environmental consequences, yet these emissions are closely tied too much of our economic activity. International environmental law has been developing at an unprecedented pace to deal with this threat, and faced with impending limits on greenhouse gas emissions, Canadian governments are beginning to develop domestic programs that start us on the road to reduced greenhouse gas emissions. The prospect of constraints on greenhouse gas emissions has already begun to create new opportunities, new markets and new risks. Lawyers advising

large emitters and environmental managers can only benefit from having a sense of these opportunities, markets and risks.

## **A. A Climate Change Primer**

Preventing dangerous anthropogenic interference with the climate system means limiting the human-induced greenhouse effect. Greenhouse gases such as carbon dioxide, methane, water vapour, and nitrous oxide allow solar radiation to penetrate the atmosphere and warm the earth's surface. Greenhouse gases trap some of this heat — or infrared radiation — and stop it from being re-radiated into space. Without the greenhouse effect, the earth would be far colder.

The enhanced greenhouse effect is caused by human activities increasing the concentrations of greenhouse gases in the atmosphere. This changes the relationship between the energy received from the sun and energy escaping to space. More infrared energy is trapped by the atmosphere. This imbalance between the sun's energy received and re-radiated to space has the potential not only to warm the planet, but to increase the energy available to various climatic processes: intensifying evaporation, drought, rainfall and storms.

The sources of greenhouse gases are ubiquitous, but are dominated by fossil fuel combustion and its inevitable by-product, carbon dioxide. Carbon dioxide from the burning of fossil fuels accounts for 75% of the enhanced greenhouse effect. In Canada, 85% of our emissions are from fossil fuel production and consumption. Unlike other pollutants, such as the sulphur dioxide that causes acid rain, there is currently no economical way of scrubbing carbon dioxide. Other sources of greenhouse gases include deforestation, industrial processes such as aluminium smelting and cement manufacture, use of nitrogen fertilisers, cattle production, and rotting garbage in landfills. Effectively reducing greenhouse gas emissions will require myriad changes in behaviour and technologies.

The main methods for reducing greenhouse gas emissions involve improving energy efficiency — wasting less energy — and using less "carbon intensive" forms of energy — for instance switching from carbon intensive fuels like coal to less carbon intensive fuels like natural gas or renewable energy sources like wood-waste, hydro or wind. Other emission reduction activities range from capturing methane from landfills and using it for industrial energy to changing cattle feed to get more beef and less methane. Often these emission reduction activities are worthwhile doing for reasons unassociated with climate change: they save money, they reduce air pollution, they make the economy more efficient. Suffice to say that many opportunities related to emission reduction activities are exciting for reasons other than greenhouse gas emission reductions alone.

## **B. Assessing Opportunities**

In assessing future opportunities and risks, this paper is necessarily speculative. We do not know the exact nature of the international obligations that are likely to evolve in relation to climate change. Nor do we know the type of domestic laws that will be in place two to ten years from now. But we can describe what has evolved to date and identify directions that are relevant today to the profitability of investment decisions and the structuring of asset or share purchases.

## C. Outline

This paper begins with a brief description of existing international and domestic environmental law relating to climate change. It then describes the science and politics that are shaping development in international climate law, and then describes the emerging international regime of greenhouse gas emission limits. This describes how Canadian governments are responding to the possibility of limits on emissions, and identifies the resulting risks and opportunities.

# II. Existing International and Domestic Climate Law

Concerned that human-caused emissions of greenhouse gases would result in global climate change, in 1988 the World Meteorological Organization's Toronto Conference on Climate Change recommended reducing carbon dioxide emissions to twenty percent below 1988 levels by the year 2005. This was quickly followed up by the World Meteorological Organization and the United Nations Environment Program establishing the Intergovernmental Panel on Climate Change (IPCC) in 1988. The IPCC was charged with assessing scientific information related to climate change, evaluating the environmental and socio-economic impacts of climate change, and formulating response strategies. Two years later the first IPCC *Assessment Report* was published, and attention to this report led the United Nations General Assembly to commit to negotiate a Framework Convention on Climate Change.

## A. The Framework Convention on Climate Change

The *United Nations Framework Convention on Climate Change* (FCCC)<sup>1</sup> was tabled at the June 1992 Earth Summit in Rio de Janeiro. The ultimate objective of the FCCC is to stabilise greenhouse gas concentrations in the atmosphere at a level that will prevent dangerous anthropogenic interference with the climate system. "Such a level should be achieved within a time-frame sufficient to allow ecosystems to adapt naturally to climate change, to ensure that food production is not threatened and to enable economic development to proceed in a sustainable manner."<sup>2</sup>

The FCCC notes that the largest share of historic and current emissions originate in

developed countries. The Convention also includes commitments by the nations listed in Annex 1 — i.e. all the nations that were members of the OECD in 1992, and the more developed members of the former Soviet bloc — to "adopt national policies and take corresponding measures on the mitigation of climate change, by limiting [their] anthropological emissions of greenhouse gases...."<sup>3</sup> These policies were to be adopted "with the aim of returning ... to ... 1990 levels" by 2000.<sup>4</sup>

This commitment not only fell far short of the Toronto target, it was worded in such a vague and convoluted manner that it does not amount to a legally binding commitment to stabilise emissions at 1990 levels by 2000. This is important, for, as discussed below, emerging international climate law involves a far clearer legally binding commitment that cannot be as easily ignored. Thus, the wisdom of investing in emission reductions is much greater now than it was in 1992.

As its name implies, the FCCC is a framework of general principles and institutions which are intended to create a process by which more meaningful commitments can be developed. A series of protocols under the FCCC are likely to emerge over the next decade.

Indeed, the First Conference to the Parties of the FCCC (COP-1) initiated the trend toward firmer commitments. Based on work by the IPCC, COP-1 agreed that the FCCC commitments were inadequate to achieve the objectives of the Convention. The Conference also initiated a process to strengthen the commitments on the part of industrialised countries to reduce greenhouse gas emissions beyond the year 2000 through the adoption of a *Protocol* by Third Conference of the Parties (COP-3). COP-3 occurred in December 1997, in Kyoto, Japan.

## B. The Kyoto Protocol

The *Kyoto Protocol to the United Nations Framework Convention on Climate Change* establishes a commitment period between 2008 and 2012 in which average emissions for Annex 1 Parties are to be 94.8% of 1990 levels. Individual allowable emissions targets or "assigned amounts" are set for different nations. Canada is to reduce its emissions by six percent; the US by seven percent; European Union nations by eight percent. The Russian Federation is only required to stabilise emissions. Iceland is allowed to increase emissions by up to ten percent. In this paper, portions of the assigned amounts are referred to as International Emission Allowances. A copy of the *Kyoto Protocol* is attached as Appendix 1.

In November 1998 the *Kyoto Protocol* was signed by the United States. The US was the last major developed nation to sign the *Protocol*. While signing the *Protocol* is not equivalent to ratification, it indicates an intention to ratify. However, it does not commit a nation to implementation.

The Kyoto commitments fall far short of those called for by many climatologists and

environmentalists, but they are significant nonetheless. Canada's emissions are already thirteen percent above 1990 levels and, under a business-as-usual scenario, are projected to be 26% above 1990 levels by 2010. Although many studies suggest these emission reductions can occur at no net cost to society, they have become a major challenge for governments to achieve.

A number of the mechanisms established by the *Protocol* need to be refined before the ratification occurs. These novel mechanisms are intended to reduce the cost of emission reductions (and, depending on design, may possibly reduce the effectiveness of the *Protocol*).<sup>5</sup> The so-called Kyoto Mechanisms include:

- International emissions trading;
- Joint Implementation;
- Joint Fulfilment; and
- the Clean Development Mechanism.

Also, the *Protocol* provides flexibility by allowing nations to count atmospheric removals of carbon dioxide by forests, soils and other "carbon sinks". Before describing these mechanisms in section 4, section 3 describes the science and geopolitics that are shaping the *Protocol's* elements and driving ratification.

## III. Factors Shaping International Climate Law

Will the *Kyoto Protocol* simply go away? Not likely. While it is not the purpose of this paper to discuss climate change science or geopolitics, science and geopolitics will be key to determining if the *Kyoto Protocol* is ratified and if it will impact on the risks and opportunities associated with investing in greenhouse gas emissions and emission reductions.

### A. Science

As noted above, the primary objective of the FCCC is to stabilise greenhouse gas concentrations in the atmosphere at a level that will prevent dangerous anthropogenic interference with the climate system. Scientists have quite rightly stated that what is "dangerous" is a political determination.

A general sense of the state of climate science may be helpful to someone involved in making investment decisions either in relation to facilities that are greenhouse gas emitters or in relation to emission reduction projects. In the opinion of the author, science is increasingly raising alarm bells as to current emission trends, and this is likely to force both ratification of the *Kyoto Protocol* and, in the longer run, far more aggressive obligations for greenhouse gas emission reductions.

Although the unambiguous detection of human-induced climate change will always be difficult because of the complexity of climate systems, a number of observed changes consistent with human induced climate change have occurred. In 1995, the Intergovernmental Panel on Climate Change (IPCC) issued the summary of its Second Assessment Report. This represents an international scientific consensus agreed to by scientific representatives of over 100 nations. It states:

Global mean surface temperatures increased by between 0.3 and 0.6° C since the late 19th century, a change that is unlikely to be entirely natural in origin. The balance of evidence ... suggests a discernible human influence on global climate...<sup>6</sup>

Although scientists face challenges definitively linking particular regional or local events to human induced climate change, a number of changes have occurred on a regional scale which are consistent with changes predicted by climate scientists. Temperatures in Canada have increased 1.1°C on average in the last century.<sup>7</sup> The greater rate of warming in Canada is consistent with climate model predictions of greater temperature changes in higher latitudes.

The changes to date pale in comparison to the changes which scientists predict will occur. The IPCC predicted that, if strong action is not taken, mean global temperature will increase by 1° C to 3.5° C between 1990 and 2100, with the best estimate being a 2° C increase. These numbers may seem low, but the Earth today is only four degrees warmer than at the height of the ice age 20,000 years ago,<sup>8</sup> a time when ice covered almost all of Canada. Even if the temperature increase is limited to the lowest of the IPCC projections (a 1°C increase) the average rate of warming would probably be greater than seen in the last 10,000 years. Warming is uneven with some areas warming far more than the global average and some areas cooling. The warmer temperatures will also cause sea level rise and intensify the earth's hydrological cycle, with more severe droughts in some places and floods in other places.

The warnings included in the IPCC Second Assessment Report were crucial to negotiation of the *Kyoto Protocol* – often being compared to the Surgeon General's 1960 warning about health effects of smoking. Several factors suggest that the pressure for emission reductions will grow over the next decade:

- It has long been recognised that stabilising atmospheric concentrations will require emission reductions of fifty percent or more,<sup>9</sup> but in the last few years there has been increasing attention to the risk of climatic surprises. Climatologists involved in drafting the IPCC's Third Assessment Report (TAR) to be released in 2000 have stated that the TAR will pay more attention to the risk of surprise events. Recent evidence of rapid, dramatic climate changes in the past suggests that climate change in the future could be more far more abrupt than projected by the IPCC in 1995, leaving little chance for "adaptive management." One of the TAR's lead authors has

warned that our decisions now will determine global emission patterns over the next few decades and could inexorably lead to catastrophic breakdowns in climate systems.<sup>10</sup>

- The argument most often used by climate sceptics was debunked in 1998. A relatively small number of scientists around the world have been fairly effective in raising doubts in politicians' minds as to the veracity of climate science. The argument most often relied on was that satellite data showed a cooling of the earth's upper troposphere. In 1998 it was shown that satellite data was inaccurate because of failure to consider satellite altitude's effect on temperature.

## B. Geopolitics

Unfortunately, science is often forgotten in the development of emission reduction *Protocols*. Negotiations over emission reduction commitments have economic implications for all nations and climate negotiations are often slowed by the difficulty of resolving differences between the major negotiation blocks. Although these differences are far from resolved, several events in 1998 indicate progress.

Climate change negotiations are dominated by three blocks: the Umbrella Group, (consisting of the US and most industrialised nations outside the EU); the EU, and the Group of 77/China (the developing country block). Two developments at the Fourth Conference of the Parties (COP-4) in Buenos Aires bode well for the likelihood that these schisms will be sufficiently overcome to ensure the *Kyoto Protocol's* coming into force.

First, a timetable was agreed to for resolving issues relating to the Kyoto Mechanisms. Historically, this self-imposed discipline has proved essential to overcoming difficult issues. The EU and Umbrella Group have been at odds over issues like emissions trading, with the EU generally taking a more pro-environment stance, by calling for deeper reductions and less reliance on the Kyoto Mechanisms. Progress on these issues will be important in allowing all nations to ratify.

Second, there was some narrowing of the deep schism between the Umbrella Group and the G-77/China. The split has been most pronounced between the US and developing countries. US ratification is likely to be essential for the coming into force of the *Kyoto Protocol*; the *Protocol* does not come into force unless ratified by Annex 1 (i.e. developed) nations that account for 55% of 1990 carbon dioxide emissions,<sup>11</sup> and US trade partners are reluctant to ratify without US ratification. Under the US constitution, the Senate is responsible for ratification. In 1997 the Senate passed the Byrd-Hagel Resolution by 95-0. That resolution stated that the United States should not be a signatory to any protocol that excludes developing countries from legally binding commitments. Although the Byrd-Hagel Resolution can be seen as posturing, it is clear that the US administration will have a harder time getting Senate ratification without meaningful developing country participation.

The other side of the schism is dominated by China and India who have opposed both voluntary emission caps for developing countries and any process for negotiating developing country commitments. China, India and most developing countries have focused on several facts: the US, Canada and a number of other industrialised nations have done very little to fulfill their FCCC commitments; at present about eighty percent of the enhanced greenhouse effect is the result of emissions from the developed world; and, per capita emissions are far higher in the industrialised world. (US per capita emissions are over four times the world average; over seven times higher than China's emissions, and seventeen times higher than those of India).

Although this fault line is likely to remain until such time as principles for equitable allocation of emission rights are developed, a breakthrough at COP-4 significantly increased the likelihood of US ratification and the coming into force of the *Protocol*. Argentina's President Carlos Menem broke with the G-77/China and announced at COP-5, that Argentina would undertake a voluntary commitment to abate its emissions. This was a significant step towards meeting Washington's requirements. At a press briefing following Menem's announcement, chief US negotiator Stuart Eizenstat called President Menem's decision "historic" and signaled that Argentina's undertaking constituted the kind of "meaningful participation" by a developing country that was a precondition for US ratification of the *Protocol*. In the following days, there were informal indications that various other developing countries, including Kazakhstan (historically, the developing world's third largest greenhouse gas emitter<sup>12</sup>), would also make commitments at COP-5.

Although the mechanics of both the Kyoto Mechanisms and developing country accession to the *Kyoto Protocol* remain unclear, the developments at Buenos Aires mark a significant step forward.

#### **IV. The Kyoto Mechanisms and Sinks**

In order to understand the opportunities and liabilities associated with greenhouse gas emission reductions and emissions, it is important to understand the developing international law which will be a major factor in determining both domestic opportunities and liabilities associated with foreign transactions.

##### **A. Kyoto Mechanisms**

The overarching rationale for the Kyoto Mechanisms is to reduce the cost of achieving a given emission reduction. Because less developed countries are often relatively inefficient energy users, the costs of avoiding a tonne of carbon dioxide emissions in less developed nations has been estimated as up to a quarter or even a twentieth of the cost of developed nations.<sup>13</sup> Wide emission control cost differentials may also exist among Annex 1 Parties; in particular, the profits from reducing emissions in the nations of Eastern Europe are substantial.<sup>14</sup> Allowing, an emission reduction to occur at lower cost in another locale can reduce the overall cost of



achieving emission reductions.

## 1. International Emissions Trading

Article 17 of the *Kyoto Protocol* states that the Conference of Parties to the *FCCC* will define the "principles, modalities, rules and guidelines" for emissions trading. It then states that the Annex 1 Parties — nations with binding emission reduction commitments — can participate in emissions trading for the purposes of fulfilling those commitments, and Article 3 states that nations' assigned amounts of allowable emissions will be adjusted up and down to reflect trades in International Emission Allowances.

Although the mechanics of trading have not been defined beyond the above, it is likely that the eventual system will include:

- Trading between sub-national entities. The international trading system will likely enable Canada to allow domestic emitters to purchase International Emission Allowances directly from other governments or from entities within other Annex 1 Parties (assuming that those other governments have allocated a portion of their International Emission Allowances to the sub-national entities). These emission allowances would be deducted from the allowable emissions of the seller nation and added to the allowable emissions of Canada.
- Buyers will bear some risk of non-compliance by nations. Emissions trading only works if nations comply with emission limits and reporting requirements. Under all proposals for International Emissions Trading to date, a nation buying International Emission Allowances in some circumstances bears some risk that the nation selling International Emission Allowances will be out of compliance. At the very least, international emissions trading proposals suggest that a nation purchasing emission allowances bears the risk that those emission rights will be invalidated if the allowances are purchased after a question has been raised regarding the seller nation's compliance with reporting requirements.<sup>15</sup> More recent proposals place considerably more risk of invalidation on the buyer, and environmentalists are continuing to lobby for emission allowances held by a buyer nation to be invalidated in any situation where the seller is out of compliance with reporting requirements or emission limitations.

## 2. Joint Implementation

Article 6 of the *Kyoto Protocol* establishes the Joint Implementation or JI mechanism. It states that Annex 1 Parties can transfer and acquire from one another "emission reduction units (ERUs) resulting from projects." When ERUs are acquired by a nation — either directly or by the private sector within that nation — they are added to that nation's assigned amount of allowable emissions and subtracted from the assigned amount of the nation transferring them. Annex I Parties can authorize

legal entities in the private sector to participate, under their responsibility, in actions leading to the generation, transfer and acquisition of ERUs. The mechanisms for measuring emission reductions from projects and certifying or verifying the resulting ERUs remain undetermined.

Currently, under Article 6 it is unclear when emission reduction projects and the resulting emission reductions have to occur. Several nations have proposed allowing JI crediting to begin prior to 2008. The emission reductions would be generated prior to 2008 but the ERUs would be deducted from a host nation's 2008-2012 emissions budget. This has both economic and environmental benefits and it is possible the JI process could allow credit from emission reductions that occur prior to 2008.<sup>16</sup>

### 3. Clean Development Mechanism

The *Kyoto Protocol* allows Canada and other Annex 1 Parties (developed nations subject to emission limits) to fulfil their emission reduction commitments through a clean development mechanism (CDM) defined by Article 12 of the *Kyoto Protocol*. Essentially the CDM establishes a process for generating credits or "certified emission reductions" (CERs) in non-Annex 1 Parties (developing countries) for use by Annex 1 Parties. CERs acquired by an Annex 1 Party are added to that nation's allowable emissions.<sup>17</sup> The purpose of the CDM is not only to help Annex I Parties meet their reduction commitments, but also to help the non-Annex 1 Parties achieve sustainable development and contribute to the long-term avoidance of dangerous climate change. Emission reductions resulting from project activities will be certified on the basis of:

- a. Voluntary participation of each Party [to the *Protocol*] involved;
- b. Real, measurable, and long-term benefits related to mitigation of climate change; and,
- c. Emission reductions that are additional to any that would occur in the absence of the certified project activity.<sup>19</sup>

Clean development projects are also supposed to benefit the host nation.

The *Kyoto Protocol* allows nations to meet their emission reduction commitments for the period 2008 to 2012 by using CERs generated between 2000 and 2012. Because of this early starting date, the international community has identified CDM as requiring priority resolution of outstanding issues.

Although the CDM clearly establishes a process for generating internationally recognized emission reduction credits from emission reduction projects in developing nations, much remains uncertain. At the most basic level, it is not clear whether the CDM is essentially a bilateral credit generation process or a multilateral process. In a bilateral process a company in an Annex 1 Party can invest directly in a project in a non-Annex 1 Party and have the resulting emission reductions certified. Alternatively, in a multilateral process, a company in an Annex 1 Party can purchase

CERs from a multilateral organisation which has invested in emission reductions projects in developing countries. Although Canadian industry tends to assume that the CDM is either a bilateral mechanism or that it allows either bilateral or multilateral approaches, this is not a foregone conclusion.

Similarly, how emission reductions will be calculated is completely unresolved. Emission reductions can only be determined by comparison to a reference case, and determining such reference cases is extremely difficult.

#### **4. Joint Fulfilment**

Finally, Article 4 of the *Kyoto Protocol* provides a process whereby nations can re-allocate their allowable emissions among themselves. Under this provision, if one country is out of compliance with the re-allocated emission limits all countries involved in the re-allocation are out of compliance. This is likely to be used by the European Union, but is unlikely to be used by other Annex 1 Parties unless international trading rules prove to be too onerous.

#### **B. Sinks and Sequestration**

Carbon dioxide and other greenhouse gases are naturally released into the atmosphere from a variety of processes such as forest fires, respiration and the decay of organic matter. These greenhouse gases remain in the atmosphere for periods ranging from decades to hundreds of years before they are naturally removed from the atmosphere and stored in reservoirs such as forests and soils. Increasing the rate at which greenhouse gases are removed from the atmosphere and stored or sequestered in reservoirs is a means of mitigating climate change.

Under the *Kyoto Protocol* net emissions from a limited number of land use change and forestry categories are considered when determining if a nation is in compliance with its international emission limits. Article 3.3 of the *Kyoto Protocol* states that:

The net changes in greenhouse gas emissions from sources and removals by sinks resulting from direct human-induced land use change and forestry activities, limited to afforestation, reforestation, and deforestation since 1990, measured as verifiable changes in stocks in each commitment period shall be used to meet the commitments in this Article [i.e. emission limits for the 2008-2012 commitment period] of each Party included in Annex 1.

Article 3.4 establishes a process for potentially including emissions and removals from other land and forest categories:

The Conference of the Parties ... shall ... decide upon modalities, rules and guidelines as to how and which additional human-induced activities related to greenhouse gas emissions and removals in the agricultural soil and land use change and forestry categories shall be [included in determining whether

a party is in compliance with emission limitations].... Such a decision shall apply in the second and subsequent commitment periods. A Party may choose to apply such a decision on these additional human-induced activities for its first commitment period, provided that these activities have taken place since 1990.

The language of the *Kyoto Protocol* is ambiguous. At the Eighth Session of the FCCC Subsidiary Body for Scientific and Technological Advice (SBSTA) in June 1998, SBSTA affirmed its understanding of article 3.3:

The adjustment to a Party's assigned amount shall be equal to verifiable changes in carbon stocks during the period 2008 to 2012 resulting from direct human induced activities of afforestation, reforestation and deforestation since 1 January 1990. Where the result of this calculation is a net sink, this value shall be added to the party's assigned amount. Where the result of this calculation is a net emission, this value shall be subtracted from the party's assigned amount.<sup>20</sup>

This interpretation was affirmed by the Conference of the Parties in November 1998.<sup>21</sup> The definitions of reforestation, afforestation and deforestation and what sinks will be added under Article 3.4 remain uncertain. As discussed below, these terms are likely to be narrowly defined and additional activities are not likely to be added under Article 3.4.

## V. Domestic Responses to the *Kyoto Protocol*

In order to implement the significant emission reductions called for by the *Kyoto Protocol*, Canada will need to develop a number of different regulatory and fiscal instruments to reduce greenhouse gas emissions. These instruments will create opportunities and liabilities for emitters and persons undertaking emission reduction projects.

### A. The Nature of Economic and Fiscal Instruments to Reduce Emissions

The opportunities and liabilities created by domestic instruments to reduce greenhouse gas emissions will depend on the type and design of the instrument. Under some instruments, large emitters face significant liabilities related to the cost of carbon taxes, increased prices for fossil fuels or emission allowances. Under these same scenarios, low emitters benefit by the use of revenue to reduce overall taxation. Under other scenarios, large emitters could be allocated emission rights based on their past emissions. If these emitters can reduce emissions at low cost, they have the potential to make windfall profits from selling excess emission allowances. This section briefly describes the various instruments that could form the central pillar of

a comprehensive greenhouse gas emission reduction strategy.<sup>22</sup>

## **1. Cap and Emission Allowance Trading System**

One of the leading options for reducing both Canadian and US domestic greenhouse gas emissions is to establish a cap and emission allowance trading system. In its simplest form, the government establishes a limit, or cap, on total allowable emissions during a time period. It then allocates allowances to release that pollutant, with the total emissions allowed by all allowances being equal to the cap set by government. All sources of a specified class (e.g., all point sources with emissions greater than y) must hold sufficient allowances for their emissions.

Those sources that emit less than their allocation may sell surplus allowances to other sources whose emissions would otherwise exceed their allocated allowances. Those with the lowest abatement costs reduce emissions and sell their allowances. Those with high abatement costs buy allowances. Over time, the number of allowances in circulation can be reduced.

Allowances can be allocated by auction or can be allocated free of charge according to some formula. Auctions are not popular among emitters even though they can be used to raise revenues to reduce other taxes (e.g. corporate investment taxes) or to assist firms needing financial assistance to lower their emissions. Revenue can also be used to assist communities impacted by climate policy (e.g. coal mining communities) or to invest directly in energy efficiency (e.g. to fund investments in efficient transit).

## **2. Cap and Carbon Coupon Trading**

This program is similar to cap and emission allowance trading; however, rather than trading an allowance to emit a given unit of greenhouse gases, coupons represent licences to produce or import carbon in fossil fuels. Since carbon in fossil fuels is a very close proxy for the carbon dioxide emitted by burning those fossil fuels, the limitations on carbon in fossil fuels effectively caps most greenhouse gas emissions. The limited supply of carbon coupons would allow producers and importers to charge a premium to their customers so that demand for fossil fuels does not exceed the limited supply. The premium will be higher for more carbon intensive fuels. To be socially acceptable, most or all of the revenue from the premium would need to be captured by government (otherwise, fossil fuel producers and importers would be able to expropriate a huge economic rent even though the costs of compliance are borne by consumers). Government can capture the premium by auctioning allowances or taxing allowance holders. A carbon coupon trading program should have the exact same effect as requiring all persons and companies to purchase allowances for their energy related greenhouse gas emissions. As compared to a carbon tax, it has the advantage of avoiding a series of politically difficult adjustments to carbon taxes.

This option is widely seen as the most economically efficient trading option, because it would have relatively low administrative costs while capturing the great majority of Canada's emissions. While it avoids the politically invidious task of allocating emission allowances, it is often seen as politically difficult because of the unpopularity of measures that affect fuel prices.

### **3. Credit Trading**

Under a credit trading system government would establish hundreds or thousands of performance standards for industry. Performance standards are regulations allowing a maximum amount of emissions per unit of output (e.g. pulpmills are allowed to emit y tonnes of carbon dioxide per tonne of kraft pulp). If a performance standard requires the owner of Source A to reduce emissions from that source by x tonnes/day, the owner can instead use credits generated by having Source B reduce its emissions below the performance standard applicable to B, or if Source B is not subject to a performance standard, below a projected emissions baseline. Sources A and B may be different emission stacks within the same firm or completely different facilities with different owners.

Credit trading is widely supported among emitters (most likely because it is inconsistent with having to buy emission allowances through auctions or pay for carbon coupons through fuel prices). However, it has also been criticised as administratively cumbersome and economically inefficient.

### **4. Carbon Tax**

A carbon tax is relatively simple. It involves placing a tax on fossil carbon to encourage reductions in emissions. This would encourage greenhouse gas emissions in much the same manner as carbon coupon trading. It would be administratively straightforward and, as with carbon coupon trading or auction emission allowances, it would create revenue to reduce other taxes; it would assist firms needing financial assistance to lower their emissions; it would assist communities impacted by climate policy; or it could be invested directly in energy efficiency. Like carbon coupon trading, it is politically difficult because it impacts fuel prices.

### **5. The Tie to International Trading**

All of these systems would likely be integrated into the International Emissions Trading system. For instance, under any of the trading schemes a one tonne International Emission Allowance, a CER, or an ERU would likely be usable as an alternative to a credit, an emission allowance or a carbon coupon. Under a carbon tax or a carbon coupon system, government would likely provide tax credits or refunds for persons providing CERs, ERUs or International Emission Allowances.

### **B. Credit for Early Action**

Currently there is a lack of political will to implement measures such as emissions trading or carbon taxes, and in the case of instruments like credit trading or cap and emission allowance trading, it would take a long time to develop such systems. In the meantime there is value in shifting Canada's short term emission trajectory downwards, i.e. there is a value to early actions that reduce emissions because they will make future emission reductions less drastic.

At the 1998 meeting of Canada's federal, provincial and territorial Ministers of Energy and Environment, the Ministers tasked the National Climate Change Process with developing a Credit for Early Action (CEA) system by the spring of 1999. This date will not be met, but work is underway in developing a system to reward early greenhouse gas emissions. CEA is intended to begin shifting Canada's emission trajectory downward in the interim period prior to implementation of mandatory greenhouse gas emission requirements.

Although no decisions have been made on the form of credit, the most likely scenario is that the federal government will commit to giving early actors a portion of the International Emission Allowances allocated to Canada under the *Kyoto Protocol*. One of the most common suggestions is that five percent of Canada's carbon budget — 140 million tonnes of allowable carbon dioxide emissions — will be allocated to Credit for Early Action. With an estimated value of twenty to thirty dollars per tonne this means that an asset worth three to five billion dollars may be allocated for early action.

Two elements of Credit for Early Action are being discussed: baseline protection and credit creation.

## **1. Baseline Protection**

Baseline protection means that if, in the future, emission allowances are allocated based on a firm's emissions in a historic "baseline year," that firm will not receive a smaller allocation of emission allowances as result of having taken emission reduction actions in an earlier year. For instance, if in the future, Canada develops a cap and emission allowance trading program to reduce its greenhouse gas emissions, it is possible that emission allowances would be allocated in proportion to a firm's emission in some "baseline year" e.g. 2001. Without baseline protection, a firm might be prejudiced if it undertook emission reduction projects in 2000. This possibility creates a disincentive for immediate emission reductions. Baseline protection removes that disincentive by allowing a firm which has undertaken emission reductions to "reconstruct" (inflate) its 2001 baseline so that it reflects what emissions would have been had it not undertaken emission reduction activities in 1999.

Canada's Ministers of Energy and Environment are expected to make an announcement guaranteeing baseline protection in the period after 1998 sometime in

the near future.

## 2. Credit

Baseline protection is intended to remove a disincentive created by one possible regulatory future. Credit creation is intended to create new incentives to reduce greenhouse gas emissions. Credits are likely to be created by reducing emission reductions below an emissions baseline set by law or negotiated with government on a case by case basis. Although the Joint Ministers of Energy and Environment called for a system being in place by the spring of 1999, the design of a Credit for Early Action system remains highly uncertain. Extant US proposals are likely the best guide as to what will evolve in Canada. Among the things that remain unresolved:

- Will companies only get credit if they succeed in reducing emissions from their entire operations or will they get credit for individual projects? US proposals call for firms only getting credit where a company's emissions are reduced throughout its operations.
- Will companies only get credit if they reduce absolute emissions, or will a growing company get credit for reducing their emissions per unit of production? US proposals vary in this regard.
- Will companies get credit for any emission reduction relative to a business as usual baseline; or will the baselines from which creditable emission reductions are calculated reflect the level of effort needed to stabilize emissions or reduce emissions by six percent below 1990 levels by 2008 (e.g. on track to Kyoto compliance)?
- What will be the form of credit? Will it be a direct government payment or a credit against future regulatory requirements?
- How will it cover indirect emission reductions, e.g. the generation of electricity by a independent renewable power producer that displaces emissions at a fossil fuel fired plant, or avoided emissions, e.g. energy efficiency projects that avoid the need to produce more fossil fuel fired electricity?

## C. GERT and PERT

Two pilot programs have been developed in Canada to promote emission reduction trading. These include the Greenhouse Gas Emission Reduction Trading Pilot Project, lead by the BC government, and the Pilot Emission Reduction Trading Pilot, led by the Ontario government. Both programs allow participants to subject emission reductions to a multi-stakeholder review process and register emission reductions which meet minimum criteria. The Joint Ministers of Energy and Environment have stated that government will "recognise" emission reductions registered under GERT and PERT; however, there is clearly no commitment to recognise registered emission reductions as creditable under a Credit for Early Action system. For this reason, these pilots give companies an opportunity to experiment in emission reduction trading and to test whether emission reductions meet certain *de minimus*



criteria. Beyond this, GERT and PERT add little direct value to participation.

## **VI. Opportunities and Liabilities**

As noted above, the opportunities and liabilities associated with greenhouse gas emissions are speculative, depending on the, so-far, unresolved details of Credit for Early Action programs, future domestic economic instruments, and the Kyoto Mechanisms. However, a number of lessons can be drawn from what is known.

### **A. Opportunities and Liabilities from Emission Reductions**

There are numerous potential opportunities associated with emission reductions. Domestically, the Credit for Early Action System may, in the next few years, allocate a highly valuable asset — possibly worth three to five billion dollars assuming Canada ratifies the *Kyoto Protocol* — to firms that reduce emissions in the post-Kyoto world. The types of emission reductions that are likely to have the greatest value are discussed below. Credit for Early Action provides a potential opportunity to generate valuable credits for companies that can reduce their own emissions, or for municipalities that capture landfill gas and use it to create energy. It could provide an opportunity for clean electricity producers to generate credits by displacing dirty electricity generation at other locations. And it could provide an opportunity to generate credits for firms that are able to reduce demand for electricity and thus avoid emissions at a fossil fuel plant. The list of possible opportunities goes on.

Combined with these opportunities, a commitment to provide baseline protection in the post-1998 period appears imminent. This will remove the one downside to making emission reductions now.

Internationally, emission reductions in developing, non-Annex 1, Parties may be creditable under the Clean Development Mechanism starting in 2000. As noted above, there is also a possibility of generating Emission Reduction Units under Joint Implementation starting earlier than 2008.

### **B. Realizing the Opportunity: Ownership and Contractual Arrangements**

In each of these scenarios there are issues as to who owns the emission reductions. It is possible that the emission reductions achieved by increasing the energy efficiency of a home could be claimed by the homeowner, by the company selling energy efficient appliances or by the company undertaking the retrofit. While this broadens the list of companies with the potential to profit from emission reduction activities, it increases the uncertainty for companies investing in emission reductions. Although common law or statute law will eventually define rules for determining the ownership of emission reductions, in the meantime it is essential that those investing in emission reductions consider insertion of appropriate contractual language

regarding ownership of emission reductions.

A firm investing in a project which reduces emissions domestically or in another country is well advised to consider inserting contractual language which gives it ownership over some or all of the CERs, ERUs or early action credits which flow from the project. Since host government approval is necessary for JI or CDM projects, the host government would need to be a party to any such contract. Alternatively, a company investing either domestically or internationally in an emission reduction project outside its operations may want to include a provision committing the emitter to supply it with a share of the international or domestic emission allowances that are made available as a result of the emission reduction investment.

### **C. Liabilities Associated with Emissions**

While there are a number of potential opportunities associated with investments in emission reduction projects, there are also a number of potential liabilities associated with investing in firms or projects that have high emissions. Under many of the future regulatory scenarios described above there is a substantial price associated with being an emitter. Emitters will pay carbon taxes, have to buy allowances or credits, or pay more for fossil fuels. Investors in capital projects which involve high emissions should recognise that the emitter will possibly pay a very high price for such emissions.

Where long-term fixed price contracts commit an emitter to production of greenhouse gas intensive products, the emitter should consider trying to control its potential liability. A producer of greenhouse gas intensive products (e.g. pulp, aluminium or cement) may want the purchaser of their products to indemnify them for possible future costs associated with greenhouse gas emission reduction requirements and incurred as a result of supplying the buyer with the emitter's product. For instance, a cement company committing itself to a long term supply contract may want the purchaser to cover the cost of any carbon taxes, emission allowance purchases or increased fuel prices associated with emissions trading and necessarily incurred in order to produce the product.

### **D. What Makes A Good Emission Reduction**

Not all emission reductions are created alike, and the characteristics of an emission reduction will determine whether it is eligible for early action credit, CERs or ERUs. This in turn will determine its value.

#### **1. Real, Measurable, Verifiable and Surplus**

Under any system that gives credit for emission reductions – Credit for Early Action, the Clean Development Mechanism or Joint Implementation – the *sine qua non* of

emission reductions are that they are real, measurable, verifiable and surplus.

Real simply means that they are an emission reduction in fact, not a paper reduction from some allowable emission limit.

Measurable means that the emission reduction can be measured. Emission reductions which can be measured, but only with great uncertainty, are likely to be discounted.

Verifiable means that it is possible for a third party to verify that the emission reduction occurred. Verifiability assumes that credit is only given for emission reductions which have in fact occurred (as opposed to giving credit based on the projected emission reductions from a project). Although not all credit trading systems involve retrospective emission reduction verification, it is likely that JI, CDM and Credit for Early Action will involve awarding credit for emission reductions only after the emission reductions have occurred.

Surplus means that the emission reduction can not be the result of a legal requirement. An automanufacturer can not get credit for improving fuel efficiency of its cars if the improvements are required by law. Similarly, it is questionable whether an emission reduction which is the indirect effect of a legal requirement will be creditable. For instance, if a greenhouse gas emission reduction occurs as the necessary result of a regulation aimed at reducing local pollution, the resulting greenhouse gas emission reduction may not be surplus.

## **2. Leakage**

Emission reductions must take into account leakage. Leakage refers to the indirect undercutting of emission reductions caused by an emission reduction project. Leakage will result from many different emission reduction measures. For instance, major improvements in vehicle fuel efficiency may, in the absence of fuel price increases, lead to increases in kilometres driven.

Leakage for some projects can exceed 100% of emission reductions. For instance, if a facility switches from oil to electricity for its energy needs, and the marginal source<sup>23</sup> of electricity comes from a coal fired unit, the leakage will be well over 100%.

## **3. Additionality**

An emission reduction project is additional if it would not have occurred in the absence of the program under which credit is being claimed. The importance of additionality depends on the context.

In the case of the Clean Development Mechanism, ensuring the additionality of the vast majority of CDM projects is essential to the integrity of the program. If CERs are awarded to projects that would have occurred without the CDM, and these CERs

are used to fulfil the obligations of developed Annex 1 countries, the Kyoto commitments become ineffective in reducing atmospheric concentrations of greenhouse gases.

Additionality may also be a criteria under Credit for Early Action programs, especially if credit is given on a project-by-project basis. If a large number of non-additional projects are credited and useable to meet future regulatory requirements, in order to achieve a given end, all credits would either need to be discounted and/or there would be a need for more stringent regulatory measures. Moreover, valuable assets would be squandered without achieving any new emission reductions. If the ability to claim credits for non-additional projects is concentrated in a few sectors, other sectors may end up having more stringent or onerous emission reduction requirements.

While the concept of project additionality is fairly simple, most people agree that it is very difficult to operationalize. It is a question of intent. Even if one could read the mind of a decision-maker, decisions are often made with a range of considerations taken into account and no single factor identifiable as paramount.

Nonetheless, investors in emission reductions should consider whether a case can be made for the additionality of a project. A number of ways have been suggested for operationalizing "additionality":

- **Financial test.** Projects which do not meet financial investment criteria tend to be additional.
- **Technological test.** Projects which involve cutting edge technologies that exceed standard best practices for energy efficiency or clean energy are more likely to be additional. For instance, in BC a small scale hydro project is likely to be additional because most new energy needs are being met by natural gas. In China, a combined cycle natural gas turbine using cogeneration would likely be additional given the general reliance on coal-based electricity production.
- **Overcoming project specific barriers.** A project is more likely to be considered additional if it overcomes some barrier to financially viable emission reduction projects. For instance, introducing high efficiency lights into residential buildings may be financially worthwhile given the energy cost savings, but it may be necessary to subsidize the initial purchase price of the lights because of consumers' reluctance to make capital investments in energy efficiency.

None of these tests are perfect. A financial test is difficult to apply in practice (due to the difficulty of assessing profit potential and risk) and would tend to exclude some of the lowest cost additional projects. Technological tests and determining additionality by reference to overcoming project specific barriers also appear to be difficult in practice.

## 4. Timing

Timing is fundamental to the value of an emission reduction. In the context of Credit for Early Action, emission reductions which occur as a result of projects implemented in 1999 or later have more value. There is a possibility that some credit will be given for pre-1999 actions but it is likely to be limited at best. Since these projects have already been implemented, there is clearly no need to give them credit in order to realise the emission reduction.

In the context of the Clean Development Mechanism, projects implemented in 2000 or later are likely to have more value. Although the US has proposed giving credit for emission reductions achieved by projects implemented under the international "Activities Implemented Jointly" pilot program, this has been staunchly resisted by other nations. Again, there is clearly no need to give these projects CERs in order to realise the emission reduction. They are, by definition, non-additional.

There are currently no restrictions on when projects in other Annex 1 Parties would need to begin in order for them to generate ERUs under JI. Article 6 is generally interpreted as only giving credit for emission reductions which occur in the 2008 to 2012 period. Although there are currently no restrictions on when projects occur, it is likely that emission reductions from projects initiated prior to the *Kyoto Protocol* would be untranslatable to ERUs.

## 5. Entity Wide Emission Reductions

Because of the difficulties in determining additionality, many experts have suggested that Credit for Early Action only be given for reductions from a company's overall operations. Combined with strict baselines,<sup>24</sup> whereby credit would only be given for emission reductions which are deeper than most companies' business-as-usual emission scenarios, entity-wide requirements help overcome the additionality problem. Therefore, in the context of Credit for Early Action, credit is more likely to flow from a firm which has significantly reduced all its emissions than simply reduced emissions from a single project.

## 6. Sustainability and Contribution to Climate Mitigation

As noted above, the purposes of the Clean Development Mechanism include helping the non-Annex 1 Parties achieve sustainable development and contribute to the long-term avoidance of dangerous climate change. This suggests that projects which are deemed unsustainable or which lock a nation into a pattern of high emissions may not be eligible for CERs under the CDM. For instance, nuclear electrical generation can clearly displace or avoid emissions from fossil fuel generators, but there is an obvious question as to its sustainability. Similarly, a project to establish a relatively efficient, coal-fired generating power station may involve an incremental improvement over the alternative of a relatively inefficient coal-fired plant, but it locks the host nation into a pattern of high emissions for the life-time of the plant.

This suggests that it may not meet the CDM criteria of contribution to long term avoidance of dangerous climate change.

## 7. International Emission Trading vs. Joint Implementation

JI has often been dismissed as redundant in light of International Emissions Trading. The two mechanisms can be used for similar purposes. An investor in an emission reduction project in another country could, as part of its contractual arrangement to invest in the project, require a stream of International Emission Allowances from the host country (i.e. the country where emission reductions occur) equal to the estimated emission reduction from the project. Alternatively, it could use JI, and have emission reductions from the project measured, certified and verified under JI rules and receive ERUs rather than International Emission Allowances. Both JI and emissions trading involve an amount of allowable emissions (either ERUs or International Allowances) being subtracted from one nation's account and added to another nation's account.

There are several reasons why Canadian companies may prefer JI over International Emission Trading even though JI is likely to involve greater transaction costs. First, under JI it appears that a purchaser does not bear the risk that the seller nation will be out of compliance with reporting requirements. Article 6.1(c) specifically states that a country cannot *acquire* ERUs if it is out of compliance with reporting requirements. It does not say that a nation cannot *sell* ERUs if not in compliance with reporting requirements. This wording appears to be a deliberate attempt to provide nations or corporations who are investing in foreign emission reduction projects, with a shield from the possibility that the ERUs will be invalidated due to the host nation's failure to meet reporting obligations. Depending on how issues of liability and risk are eventually addressed in the international emissions trading system, this could provide a real incentive to use JI over trading. The risk of International Emission Allowances being invalidated because of failure of the seller nation to comply with reporting or emission requirements may be significant in the case of investments in Russia or the Ukraine.

Secondly, JI has the advantage of leaving the purchaser with clean hands. Under International Emissions Trading, some nations, namely Russia, the Ukraine and possibly New Zealand, have emission rights for the 2008 to 2012 period that far exceed their emission levels under any reasonable business-as-usual emissions projection. Canadian companies purchasing these excess emission rights for use to fulfil Canadian emission reduction requirements could quite correctly be accused of "buying out" of their emission reduction responsibilities without ensuring an equal emission reduction elsewhere. It is likely that these purchases of so-called "hot air" will be condemned by some environmental groups.<sup>25</sup> Using JI as an alternative avoids this condemnation.

## 8. Sinks and Sequestration

Under Credit for Early Action and future domestic programs, it is likely that credit will only be given for a narrow scope of sink or carbon sequestration projects. The purpose of Credit for Early Action is to help Canada move into compliance with the *Kyoto Protocol*. It is thus likely that only projects which count under the *Kyoto Protocol* will be credited. There are a number of factors suggesting that the *Kyoto Protocol* will only count a narrow range of projects.

As noted above, the *Kyoto Protocol* currently only gives credit for verified changes in carbon stock resulting from afforestation, reforestation or reductions in deforestation. Only changes in carbon stock resulting from these activities occurring after 1990 will be counted. Definitions of afforestation, deforestation and reforestation will be determined for the purposes of the *Kyoto Protocol* after a special IPCC report due in 2000. However, the IPCC currently defines reforestation and afforestation as meaning planting trees on areas that have never been forested or have been taken out of forest use. It is unlikely that these definitions will change significantly, and it is likely that deforestation will be defined as conversion from forest land to other uses.<sup>26</sup>

Although Article 3.4 allows for the possibility of counting sequestration from activities other than afforestation, reforestation and deforestation, the chances of such recognition are limited. There are a number of technical and political problems in relation to including a broader range of sinks.<sup>27</sup> The largest barrier to including more sinks is that it is likely to amount to a renegotiation of the *Kyoto Protocol*. Including a wide range of sinks can significantly reduce the significance of the *Kyoto Protocol's* emission reduction requirements, as on average, most nations in Annex 1 were net sinks. In other words, broadening the range of forest and land use activities which are included in emissions commitments would, on average, give most nations a significant credit from activities that would have occurred anyway. Including more sinks would allow these countries to increase emissions. Indeed, wholesale inclusion of sinks is the equivalent of shifting the overall Annex 1 target of a 5.2% emission reduction from 1990 levels to a two or three percent increase from 1990 levels.

## 9. Permanence

Investors in sequestration projects should also recognize that there is a potential liability associated with credit from projects which sequester carbon through forest and land use activities. Sequestration projects raise a unique reliability issue that is not a concern for projects which reduce energy use or reduce carbon intensity of energy. A project which reduces use of a tonne of coal has effectively made a permanent emission reduction of carbon dioxide. However, when a tonne of carbon is sequestered in a new forest, or in agricultural soil, there is no guarantee that the carbon will remain sequestered. Future changes in forest management or land use and the effects of climate and other environmental conditions pose a significant risk of reversing the sequestration process. To completely offset the climate impacts of a new emission source, a sequestration project must sequester carbon equivalent to that emitted by the source in perpetuity. A sequestration project which does not

successfully sequester carbon forever is simply buying time.

Credits from sequestration projects — whether they be CERs, ERUs, Credit for Early Action or credit under another domestic trading program — may be invalidated if the sequestration is reversed (for instance, in the case of credits from an afforestation project, credits would likely be invalidated if the trees burn down or die from disease). If the credit has already been used, the user may be responsible for replacing the invalidated credit. Any contracts dealing with credits from sinks should deal with the possibility of sequestration being reversed.

## Appendix 1 – *Kyoto Protocol*

[View the Kyoto Protocol \(PDF format\)](#)

# Endnotes

[1.](#) *United Nations Framework Convention on Climate Change*, [hereinafter the FCCC] (Opened for signature June 1992; entered into force on 21 March 1994; as of mid-1998 ratified or acceded to by 175 States).

[2.](#) Article 2, FCCC.

[3.](#) Article 4.2(a).

[4.](#) Article 4.2(b).

[5.](#) See Chris Rolfe, "Kyoto Protocol to the United Nations Framework Convention on Climate Change: A Guide to the *Protocol* and Analysis of its Effectiveness," West Coast Environmental Law Association, January 22d, 1998. Available on WCEL website <http://www.wcel.org>.

[6.](#) Intergovernmental Panel on Climate Change, *Second Assessment Synthesis of Scientific-Technical Information Relevant to Interpreting Article 2 of the UN Framework Convention on Climate Change* (Geneva: Intergovernmental Panel on Climate Change, 1995) at 4.

[7.](#) Environment Canada, "Climate Change Indicator: Global and Canadian Temperature Variations" (Spring 1996) SOE Bulletin No. 96-4.

[8.](#) National Academy of Sciences, Committee on Science, Engineering, and Public Policy, *Policy Implications of Greenhouse Warming* (Washington, D.C.: National Academy Press, 1991) at 22.

[9.](#) J.T. Houghton, *et al.* *Climate Change, the IPCC Scientific Assessment* (Cambridge:



Intergovernmental Panel on Climate Change, 1990) at xi.

[10.](#) Briefing by Jeff Severinghaus, Stephen Schneider, Michael Molitor and Stefan Rahmstorf, November 4, 1988, Buenos Aires.

[11.](#) Article 25.

[12.](#) After China and India, Kazakhstan has the largest cumulative emissions of carbon dioxide from 1950 to 1955 among the G77/China: Lisa McNeilly, *Equity and Global Climate Change: the complex elements of global fairness*, (Washington, DC: Pew Centre for Climate Change, 1998).

[13.](#) James M. Poterba, "Global Warming Policy: A Public Finance Perspective" (1993) 7:4 *Journal of Economic Perspective* 47, estimates a differential of 1:4. John Palmisano, "How can the Lessons Learned from Joint Implementation Help Construct an International Carbon Offset Regime?" (December 1996) *World Energy Council Journal* 37, estimates a differential of up to 20:1.

[14.](#) Fiona Mullins and Richard Baron, *International GHG Emission Trading, Policies and Measures for Common Action*, Working Paper 9 (Paris: Annex I Expert Group on the UN FCCC, March 1997) at 49.

[15.](#) This *de minimus* buyer liability provision was included in trading proposals issued on behalf of the Umbrella Group at COP-3.

[16.](#) Pre 2008 generation of ERUs could potentially help reduce the "hot air" problem referred to in footnote 15.

[17.](#) Article 3.12.

[18.](#) Article 12.1.

[19.](#) Article 12.5.

[20.](#) See UN document FCCC/SBSTA/1998/CRP.3.

[21.](#) See UN document FCCC/CP/1998/L.5

[22.](#) For more discussion of the various potential designs of emissions trading, see Chris Rolfe, *Turning Down the Heat, Emissions trading and Canadian Implementation of the Kyoto Protocol* (Vancouver, West Coast Environmental Law Research Foundation, 1998), and a series of papers by Erik Haites and Robert Hornung. The latter are to be published by the National Roundtable on the Environment and the Economy in February, 1999, and reflect input from a multistakeholder expert group on emissions trading.

[23.](#) The marginal source is the source whose utilization is increased or decreased to meet

marginal changes in demand for electricity.

[24.](#) Baselines are the emissions reference case from which creditable emission reductions are measured. For instance, a Credit for Early Action system might only give credit for emission reductions beyond a three percent per-annum reduction in emissions.

[25.](#) For more information on this issue of "hot air trading" see Chris Rolfe, "An Environmental Perspective on International Greenhouse Gas Emission Trading," West Coast Environmental Law Association, Speaking Notes for a Presentation to *After Kyoto — Allocating Responsibility for Reducing Canada's Greenhouse Gas Emissions*. (Conference hosted by Conference Board of Canada, Pembina Institute, Pollution Probe, Canadian Energy Research Institute. Toronto, Ontario. April 16-17, 1998, available on WCEL website [www.wcel.org](http://www.wcel.org)).

[26.](#) Defining afforestation, reforestation and deforestation in relation to land use (i.e. changes from pasture to forest, or forest to right of way) is the only approach which ensures some balance between activities counted and those not counted. For instance, if reforestation were interpreted to include planting trees after harvesting, an imbalance would be created. If emissions from harvesting are not counted, this would amount to only counting the credit side of the carbon reservoir ledger. It is unlikely that harvesting would be included in the definition of deforestation because this would result in a huge, unfair penalty to nations with forestry operations and relatively long rotation periods between harvests. Even if managed forests were in a steady state, with no net removals or emissions of carbon dioxide, nations with forests would count all emissions from harvesting in the compliance period, but could only offset this with removals of carbon dioxide on areas reforested since 1990. If rotation periods exceed twenty years, the result would likely be a penalty to a country practising sustainable forestry.

[27.](#) German Advisory Council on Global Change. *The Accounting of Biological Sinks and Sources Under the Kyoto Protocol* (Bramerhaven: 1998).