

Kyoto Protocol to the United Nations Framework Convention on Climate Change:

A Guide to the Protocol and Analysis of its Effectiveness

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THE KYOTO PROTOCOL

In December 1997, negotiators from all the Parties to the *Framework Convention on Climate Change* meeting at the Third Conference of the Parties to the Convention in Kyoto, Japan, successfully negotiated legally binding emission reduction commitments for nations the developed nations that are included in Annex 1 to the *Framework Convention on Climate Change* (the Annex 1 nations). While the *Kyoto Protocol to the United Nations Framework Convention on Climate Change* (the "*Kyoto Protocol*") represents an important step forward, it will not by itself appreciably reduce the rate of climate change, and its effectiveness will depend on the resolution of a number of important issues.

This brief begins with an outline of the key elements of the *Protocol*. It then considers the projected impact of the *Protocol* on climate change. Then it reviews in more detail a number of interpretative difficulties, provisions in the *Protocol* that reduce its effectiveness and potential loopholes that result from questions of interpretation. These issues include:

- the potential for countries meeting international commitments through projects in the developing world that would have occurred in any event;
- the potential for Russia, the Ukraine and other states to sell portions of their allowed emissions ("international emission allowances") that exceed their likely emission levels under "business as usual";
- the potential for nations to buy emission rights that are not surplus to the needs of the nation selling them;
- the treatment of carbon forest and soil reservoirs and the potential for interpretations that could either give Australia a large surplus of excess emission rights or allow nations to count growth in forests while not counting emissions from harvesting;
- the ability of nations to use higher baseline years for some emissions.

Finally, this brief concludes with recommendations regarding how Canada can play a role in ensuring the effectiveness of the *Protocol*.

Key Elements of Kyoto Protocol

Commitment Periods and Assigned Amounts

The *Kyoto Protocol* establishes a commitment period between 2008 and 2012 in which average emissions for Annex 1 Nations are to be 94.8% of 1990 levels. Individual allowable emissions targets or "assigned amounts" are set for different nations. Although proposals had been made for differentiation of allowed emissions on the basis of criteria such as population, GNP, or carbon intensity of the economy, the differentiations agreed to at Kyoto were purely political. 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 stabilize emissions. Iceland is allowed to increase emissions by up to ten percent.

Legally Binding

The commitments included in the *Kyoto Protocol* are legally binding under international law. In comparison, the *Framework Convention on Climate Change*, signed in 1992, only committed nations to "aim" to stabilize emissions at 1990 levels by 2000.

Exclusion of Most Forest and Soil Sinks

For most nations, their assigned amount (i.e. allowable emissions) in the first commitment period is a percentage of gross emissions in 1990. Gross emissions are anthropogenic emissions of greenhouse gas emissions from energy, industrial processes, agriculture and waste. They do not include carbon fluxes from forests, soils and other carbon reservoirs. However, when calculating whether they are in compliance with allowable emissions, nations count some but not all carbon fluxes from forests. They are required to count emissions and removals resulting from afforestation, reforestation, and deforestation since 1990. Also, by some interpretations of the *Kyoto Protocol*, Canada may be able to count loss of carbon from agricultural soils. Also, an exception exists in relation to the rule that gross 1990 emissions are the basis for calculating allowable emissions in the commitment period. For Australia, the UK and Estonia - the three Annex 1 Nations that had positive net emissions from land use change and forestry in 1990 - allowable emissions in the commitment period are based on 1990 gross emissions plus net emissions from land use change and forestry. The details of what emissions and removals from land use change, soils and forests are included is discussed further below.

Six Gases

The *Kyoto Protocol* applies to six greenhouse gases: the three main greenhouse gases released by human activity (carbon dioxide, nitrous oxide and methane) and, to three gases that are released in small quantities but are both long lasting and extremely powerful (hydrofluorocarbons, perfluorocarbons and sulphur hexafluoride). In calculating their assigned amounts, nations are allowed to use 1995 rather than 1990 emissions of hydrofluorocarbons, perfluorocarbons and sulphur hexafluoride.

Clean Development Mechanism.

The *Kyoto Protocol* allows Canada and other Annex 1 Nations to fulfill their emission reduction commitments through a clean development mechanism defined by the *Kyoto Protocol*. Essentially the clean development mechanism establishes a process for generating credits in non-Annex 1 Nations for use by Annex 1 Nations. Emission reductions accruing from projects in non-Annex 1 Nations can be used if they are certified under the clean development mechanism. The *Protocol* states that reductions will be certified on the basis of:

- Voluntary participation of each Party [to the *Protocol*] involved;
- real, measurable, and have long-term benefits related to mitigation of climate change; and
- emission reductions that are additional to any that would occur in the absence of the project.

Clean development projects are also to be approved by both the Annex 1 Nation using them and the host nation, and are supposed to benefit the host nation. The entities responsible for certification of emission

reductions and the process for certification are to be determined by future Conferences of the Parties to the *FCCC*. The *Kyoto Protocol* allows nations to meet their emission reduction commitments for the period 2008 to 2012 by using certified clean development emission reductions generated between 2000 and 2007.

Emissions Trading

Under article 6 of the *Kyoto Protocol*, for the purposes of meeting their emission reduction commitments, Annex 1 Nations can transfer and acquire from one another "emission reduction units resulting from projects" if the projects provide "a reduction in emissions or enhancement of sinks that is additional to what would otherwise occur." When emission reduction units are purchased by a nation they are added to that nation's allowable emissions and subtracted from the allowable emissions of the nation transferring them.

In addition to article 6, Article 16 bis [sic] states that the nations with binding emission reduction commitments can participate in emissions trading for the purposes of fulfilling those commitments. The Conference of Parties to the *FCCC* will define the "principles, modalities, rules and guidelines" for emissions trading. This seems to contemplate a separate process from Article 6, not simply an elaboration of Article 6 rules.

Extension of Emission Limitations to Developing Countries

A final notable aspect of the *Kyoto Protocol* is what is not in it: there is no means for non-Annex 1 Nations to agree to emission limitations. The EU and the developing world had opposed anything aimed at including the developing world. While recognizing that successfully limiting climate change would eventually require placement of emission limitations on developing countries, these countries believed that it was appropriate for the wealthy nations that are responsible for increased atmospheric concentrations the Annex 1 Nations to prove their willingness to curb emissions.

The US and most other non-EU developed nations supported a mandate to negotiate post 2012 emission limitations for developing countries that reach a minimum level of economic development. Proposals were also made for a mechanism whereby developing countries could voluntarily agree to emission limitations. (This would be potentially attractive for countries that have low cost emission reduction opportunities and might be in a position to sell allowances). Even though a number of developing countries supported a mechanism that would allow them to voluntarily accede to emission limitations, both these proposals were defeated by the main developing country bloc. It is not clear how the US will respond to this defeat. The US Senate has been unequivocal in its demand for developing country commitments. Likely, the US will attempt to achieve some developing country commitment prior to seeking ratification of the Protocol. If US fails to get such a commitment ratification will be politically much more difficult.

Adequacy of the Commitments and Further Reductions

The emission limitations contained in the *Kyoto Protocol* are significant - especially when simply expressed as emission reductions from 1990 levels - commitments for many nations with rapidly increasing emissions. However, the *Kyoto Protocol* will not, by itself, reduce atmospheric warming appreciably. Further emission reductions will need to take place after the first commitment period.

Prior to Kyoto, English researchers projected the effects of the EU's proposal for a fifteen percent emission cut by 2010. The EU proposal, although significantly stronger than what was agreed to at Kyoto, only limited warming to 1.1C by 2050 and 1.7C by 2100. By comparison, under the researchers' baseline scenario, global mean temperature would increase by about 1.2°C by 2050 and 1.9°C by 2100 if emissions remain uncontrolled.⁴

During the Berlin Mandate negotiations, Dutch researchers calculated various "safe landing" corridors of emissions that would avoid both changes in climate that are too extreme and unrealistically rapid emission

reductions in the future. The most conservative definition of a safe landing involved avoiding, over the next century:

- global temperature increases of more than 1C because of human interference,
- rates of change more than 0.1C per decade,
- sea level increases of more than 0.2 metres, and
- the need for emission reductions of greater than two percent in any year,

This "safe landing" corridor still allows faster increases in temperature than seen in the last 10 000 years, projects that eleven percent of world nature reserves will be at risk, and predicts decreased yields in thirteen percent of the world's maize growing areas.² The Dutch researchers also defined a safe landing corridor with parameters that were half as stringent (temperature increase less than 2C; rate of change less than 0.2C per decade; sea level change less than 0.4 metres over the next century and rates of reduction less than four percent per year) as well as an intermediate scenario.

To reach the most conservative safe landing corridor, emissions from Annex 1 Nations would need to be reduced by between 37% and 64% of 1990 levels by 2010. Although emissions from Annex 1 Nations could increase to stay within the less stringent safe landing corridors, doing so would necessitate faster, deeper emission reductions in the long term. To reach the middle of the least stringent safe landing emission corridor³ would require nineteen percent cuts by Annex 1 Nations by 2010.

Thus, it is clear that further emission reductions will be necessary after the first commitment period. Given the size of the emission reductions needed to mitigate climate change, further emission reduction commitments from both Annex 1 Nations and rapidly developing non-Annex 1 Nations will be necessary.

Interpreting Kyoto: Loopholes and Potential Loopholes.

The effectiveness and significance of the *Kyoto Protocol* are not simply products of the emission reductions targets set for different nations. As noted above, a six percent emission reduction for Canada is a significant - albeit environmentally inadequate - target. However, a number of loopholes reduce the impact of that target. This section identifies a number of loopholes, and potential loopholes that could vitiate the *Kyoto Protocol*.

Clean Development Mechanism and Credit for Business as Usual

One of the main weaknesses of the *Protocol* is the likelihood that under the clean development mechanism credit will be given for projects which would have occurred in the absence of the mechanism. The *Kyoto Protocol* requires "reductions in emissions that are additional to any that would occur in the absence of the certified project activity." This is a requirement for "emissions additionality." It does not require the project to be something that would not have occurred in the absence of the mechanism, i.e., it does not require "project additionality." Therefore, credit could potentially flow from a project that reduces emissions but would have occurred anyway. If credit is given for such a project, and is used to avoid making an emission reduction in Canada, the net effect is to undermine the significance of Canada's emission reduction commitments. Because non-Annex 1 Nations are not subject to emission caps, there is no safeguard to ensure the realization of true reductions in emissions from business as usual.

The problem of credit being given for projects that are not additional is inherent in any system for generating credit outside of nations subject to binding limits. It is acute because many of the emission reduction projects for which credit is given are profitable or worth doing for reasons such as reducing local air pollution. Projects which reduce emissions occur all the time; they simply do not occur in the numbers to counteract the general trend to higher emissions. Although the *Kyoto Protocol* could have specified that credit should only be given for projects which are not profitable, or not worth doing for other reasons, this would defeat the purpose of the clean development mechanism. It would no longer serve the function of

achieving emission reductions that are worth doing for reasons unrelated to climate change. In the absence of such a requirement, it is also impossible to determine what would have occurred in the absence of the incentive offered by the clean development mechanism.

The best way to mitigate the problem of credit being given for projects that would have occurred anyway is to establish stringent criteria for setting the baselines against which emissions additionality is measured. Baselines should be set so that they reflect:

- standard good practices, with credit only given for emission reductions that go beyond standard practices;
- the probability that a technology against which emission reductions are measured would have been improved;
- any legal requirements, with credit only being given for reductions that go beyond legal requirements; and,
- the estimated lifetime of an emission source in the absence of the project.

For instance, if a utility boiler is retrofitted, the baseline against which emission reductions are measured should not simply reflect pre-retrofit emission levels, but also the extent to which continuing retrofits are normal good practice in developing countries, and the extent to which the retrofit goes beyond normal good practice. They should also consider whether the retrofit extends the life of an emitting facility. A stringent approach to baseline setting will not cure the problem of credit being given for projects that are not additional, but it can make this problem less acute.

There are a number of other issues that must be dealt with in any system in which credit is given for projects in developing countries so the credits accurately reflect those projects' impact on emissions. For instance, credit should reflect the impacts of a project on global emissions, factoring in effects on emissions at other locations (e.g. a project to switch a boiler from oil to natural gas should consider methane leakage from natural gas distribution and production). Credits should reflect uncertainty in the level of emission reductions. These methodological issues must be dealt with prior to the period in which credits are generated.

A final loophole related to the Clean Development Mechanism should be noted: nations can bank credits for emission reductions that occur from clean development projects between 2000 and 2007. Although this will help spur some early action, it will also create a stockpile of banked credits - many of them likely derived from projects that would have occurred anyway - that can be used to avoid greater emission reductions in the period after 2007. If there was no mechanism for banking credits, many emission reductions would have still occurred prior to 2008,⁴ but the banked credits will mean that global emissions during the compliance period will be higher than would occur in the absence of banking. The net effect of non-additionality and the ability to bank credits is uncertain but likely to be very substantial.

Emissions Trading and Hot Air

As noted above, there are two provisions in the *Kyoto Protocol* allowing nations to transfer portions of their assigned amounts (i.e. the emissions they are allowed to emit during the compliance period). In theory, trading allows nations who can reduce emissions at low costs to reduce their emissions below their allowable emissions and sell their surplus international emission allowances to other parties, thus reducing the overall cost of compliance but achieving the same end. In practice, depending on the rules that are eventually established for trading, trading could severely reduce the effectiveness of the *Protocol*.

From an environmental perspective, the biggest problem with trading is the trading in "hot air." Eastern European nations have emission allowances for the 2008 to 2012 compliance period that exceed their likely emissions under a business as usual scenario. For instance, Russia and the Ukraine are both allowed to emit at 1990 levels in the compliance period. However, due to the collapse of their economies emissions are currently far below 1990 levels. Russian carbon dioxide emissions are currently only 74% of 1990

emissions. This is only projected to increase to between about 80% and 90% of 1990 levels by 2010.⁵ Under trading rules supported by most non-EU developed nations, eastern European nations would be able to sell these surplus allowable emission rights. Allowable emission rights that are surplus to business as usual emissions (or hot air as they are colloquially referred to) will allow nations buying the rights to increase their emissions while the nations selling them do nothing to reduce emissions. Russian hot air alone will allow other Annex 1 nations to increase their collective emissions by roughly two to four percent above commitments.⁶

Due to these concerns, as well as concern that the US would achieve all its emission reductions by buying Russian hot air, a number of developing countries blocked adoption of the trading rules supported by most non-EU Annex 1 Nations. The issue of trading rules beyond those included in Article 6 has been deferred to the next Conference of Parties some nations, including Canada, believe trading of emission rights can begin in the absence of rules.

Hot air has often been justified on the basis that it would help Russian, the Ukraine and other struggling eastern European economies with their difficult transitions to a market economy. However, it is likely that removing hot air would lead to many investments in the Russian economy that would both make it more efficient while at the same time reducing emissions. Hot air will encourage a flow of cash to Russia, but it does not encourage changes that will help the Russian economy and reduce emissions. Without hot air there is an incentive to invest in the profitable emission reduction measures that abound in the inefficient Russian economy.

The problem of hot air could be largely removed by either using Article 6 of the *Kyoto Protocol* as the basis for international trading. In that situation, emission trading would be supplemented by requirements to tie trades to investment in projects that reduce emissions. Under Article 6, stringent criteria could be developed for measuring the emission reductions from projects, and these criteria would reduce the extent to which credit is given for projects that would have occurred anyway. Both Russia and the environment would benefit.

Emissions Trading and Buyer Beware

Another concern with trading is that the trading mechanisms that have evolved or are evolving - both those under article 6 and article 16 bis - are seller beware systems.⁷ Under a seller beware trading system, a country purchasing international allowable emission rights need not be concerned whether or not the nation selling its rights is likely to be in compliance with its emission limitations. A nation could potentially continue emitting at well over 1990 levels but sell all of its quota of international emission rights. A nation buying the rights would then be able to increase emissions and maintain compliance. The net effect is to allow the environmental effects of one nation's breach of international law to multiply and undermine the whole system.

Seller beware works well in domestic trading programs where there are mechanisms that guarantee that non-compliance will be expensive, but it is problematic in an international agreement without any enforcement mechanisms other than international reputation. Unfortunately, international law is often honoured more in the breach than in compliance. Canada and many other Annex 1 Nations emission reduction programs have not realistically been aimed at stabilizing emissions at 1990 levels. It is not unusual for only one-third of signatories to major environmental agreements to comply with simple enforcement requirements such as submitting reports.⁸

Although compliance may be greater among the Annex 1 Nations that are committed to emission reductions, the *Kyoto Protocol* does not establish mechanisms to address non-compliance. This is deferred to later negotiations. There is a risk that countries may ignore their legally binding commitments. Canada's position is that there should be no trade or financial sanctions for non-compliance. However, weak compliance mechanisms combined with seller beware emissions trading encourages non-compliance that could undermine the trading mechanism.

Graduated sanctions for non-compliance including trade sanctions in cases of on-going cases of significant non-compliance would help create effective incentives to compliance that would make seller beware trading less of a problem. In the absence of such mechanisms emissions trading will have little legitimacy unless it is on a buyer beware basis.

The Treatment of Forest and Soil Sinks

As noted above, 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. During the negotiation of the *Kyoto Protocol* a number of nations objected to the inclusion of net emissions from the forestry and land use change because of uncertainty and unresolved methodological issues in measuring these emissions. Although uncertainty and methodological issues exist with other emissions (e.g. nitrous oxide from agricultural soils) the significance of the emissions are much lower so that uncertainty is unlikely to provide a mask for significant non-compliance. Finally, many nations were concerned that inclusion of all land use change and forestry sources would reduce the impact of any given emission limitation by eight percent or more.⁹ Other nations insisted on inclusion of emissions from land use change and forestry, because it would give them greater flexibility and possibly reduce costs of emission reduction.

The end result of negotiations was a problematic compromise. The provisions are nothing if not ambiguous. Loopholes could arise if Parties attempt to interpret the *Protocol* in self-serving but illogical ways.

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 first commitment period] of each Party included in Annex 1.

Article 3.4 then goes on to establish 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.

Although the language of the *Kyoto Protocol* is unclear, the most likely interpretation is that, until there is agreement to include more categories, a nation's emission during the first commitment period will be determined by:

gross emissions (i.e. all emissions not related to carbon reservoirs);

minus

removals during the period 2008 to 2012 if these removals result from reforestation or afforestation since 1990;

plus

emissions during the period 2008 to 2012 if these emissions result from deforestation since 1990.¹⁰

In Canada, reforestation is often used to refer to replanting and natural regeneration after logging, and afforestation is often used to refer to planting trees on areas that were historically forests. However, the IPCC defines afforestation as "planting of new forests on lands which, historically, have not contained forests" and reforestation as "planting of forests on lands which have, historically, previously contained forests but which have been converted to some other use."¹¹ In practice, afforestation is usually used to refer to lands that have not been covered by forests for over 50 years, while reforestation refers to land cleared in the last 50 years. Deforestation is not defined, but it is likely to include the category of emission the IPCC calls forest conversion. It will likely exclude harvesting followed by replanting or natural regeneration of forests.¹²

It is essential that this interpretation be abided by. There are a number of interpretations that could gut the effectiveness of the protocol. For instance, if reforestation were interpreted to include planting trees after harvesting, a huge imbalance would be created. Because emissions from harvesting are not counted, this would amount to only counting the credit side of the carbon reservoir ledger.

It is also essential that article 3.3 be replaced prior to the end of the first commitment period. Otherwise, carbon stored in plantations on afforested or reforested land during the first commitment period would be counted as a credit (because it would be a "verifiable change in stock") but its emissions during harvesting in the second commitment period would not be counted.

Also, under Article 3.1 emissions from "agricultural soils" are included in calculations of gross emissions. Canada takes the position that this it allows it to claim credit for reductions of carbon dioxide emissions from agricultural soil. Although this is supported by the wording of article 3.1 in isolation, it is contrary to article 3.4 which refers to development of methodologies to count emissions and removals in the agricultural soil category. The development of such methodologies is essential because of extremely high levels of uncertainty in calculating soil emissions. Although reductions in carbon dioxide emissions from agricultural soil may be an important mitigation measure Canada should not count such emission reductions until acceptable methodologies for accurately calculating reductions are developed. Canada should use the process established under article 3.4 to develop such methodologies.

Hot Air from Australia

As noted above, Australia, the UK and Estonia¹³ are allowed to base their 1990 baseline on net emissions i.e. the baseline will include net emissions from land use change and forestry. From Australia's perspective, this was necessary so that it could continue with its high level of deforestation. For Australia, in 1990 the total of gross emissions plus net emissions from land use change and forestry was 23% higher than gross emissions.¹⁴

While Australia counts all of its land use change and forestry emissions in determining allowable emission limits, only emissions from deforestation will be counted in determining whether or not Australia is in compliance. If all of Australia's 1990 emissions were from deforestation, Australia gets a small advantage on top of its relatively high emission limits (108% of 1990 levels). Since 1990, Australia's net emissions from land use change and forestry have declined and continuing decline is projected.¹⁵ This advantage is relatively small - about a 3% boost¹⁶ over the 108% increase already allowed.

However, if Australia's 1990 land use change and forestry emissions were not all from deforestation the boost becomes even greater. Based on the in-depth review of Australia's national communication, it is not clear that all Australia's 1990 land use change and forestry emissions fall within the IPCC's deforestation category. It could also come from changes in levels of carbon stored in forests, conversion of grasslands to

agriculture and soil erosion. If half of Australia's emissions in 1990 came from sources other than deforestation, Australia would be able to increase gross emissions by 121% while doing nothing to reduce rates of deforestation. There is thus potential for Australian hot air. Estonia and the United Kingdom may also receive a windfall of allowed emissions, but the effect is much less significant.

It is essential that this loophole be closed. To some extent this may be possible by defining deforestation as broadly as possible, but other steps will also be necessary.

1995 Baseline for 3 Gases

As noted above, countries are allowed to use 1995 as a baseline for emissions of hydrofluorocarbons, perfluorocarbons and sulphur hexafluoride. This was in part necessary because of lack of data for 1990. However, because hydrofluorocarbons were used as a replacement for ozone depleting chemicals that were being phased out in the early 1990s, emissions of these gases during the period 1990 to 1995 skyrocketed.¹²

Although a 1995 baseline was preferable to the exclusion of the three trace gases, it reduces the effectiveness of the emission limitations. The use of a 1995 baseline will allow Annex 1 nations to increase total emissions.¹³

Recommendations for Canada's Position Post Kyoto

As result of the loopholes identified above Canada should work to:

- establish stringent baseline setting and measurement rules under the clean development mechanism and article 6.
- establish rules that will restrict hot air trading and the possibility of non-compliance by one party multiplying and spreading through all parties. Possible measures include: restricting the ability of nations to sell emission rights when they are clearly not on a path to compliance; use of article 6 as the primary vehicle for trading; establishing strong incentives to compliance; establishing a buyer beware system.
- ensuring that the rules for counting forest related removals are balanced and that any agreements to add additional land use change and forestry emissions do not reduce the effectiveness of the *Protocol* or introduce unacceptable levels uncertainty into determinations of compliance.
- ensuring that Australia does not benefit unfairly from the likelihood that its emissions from deforestation in 2010 are likely to be far lower than net emissions from all land use change and forestry categories in 1990.
- developing acceptable methodologies for accurately calculating fluxes in emissions of carbon from agricultural soils. Until such methodologies are developed Canada should not count such emission reductions.

ENDNOTES

- http://old.wcel.local/wcelpub/wrapper.cfm?docURL=http://www.wcel.org/wcelpub/1998/12152.html - fn_1_up
1. http://old.wcel.local/wcelpub/wrapper.cfm?docURL=http://www.wcel.org/wcelpub/1998/12152.html - fn_1_upSuzanne Subak, *et al.*, "The Implications of the 1997 FCCC Protocol Proposals for Future Temperature" (Centre for Social and Economic Research on the Global Environment and the Climate Research Unit, University of East Anglia, August 1, 1997 policy briefing) [unpublished].

http://old.wcel.local/wcelpub/wrapper.cfm?docURL=http://www.wcel.org/wcelpub/1998/12152.html - fn_2_up

http://old.wcel.local/wcelpub/wrapper.cfm?docURL=http://www.wcel.org/wcelpub/1998/12152.html - fn_2_up

2. http://old.wcel.local/wcelpub/wrapper.cfm?docURL=http://www.wcel.org/wcelpub/1998/12152.html - fn_2_up Joseph Alcamo and Eric Kreileman, *The Global Climate System: Near Term Action for Long Term Protection* (Netherlands: National Institute of Public Health and the Environment, February 1996).

http://old.wcel.local/wcelpub/wrapper.cfm?docURL=http://www.wcel.org/wcelpub/1998/12152.html - fn_3_up

http://old.wcel.local/wcelpub/wrapper.cfm?docURL=http://www.wcel.org/wcelpub/1998/12152.html - fn_3_up

3. http://old.wcel.local/wcelpub/wrapper.cfm?docURL=http://www.wcel.org/wcelpub/1998/12152.html - fn_3_up Aiming for the middle of the safe landing corridor avoids imposing on future generations the need for more drastic emission controls, and provides a safety buffer to reflect uncertainty as to climate sensitivity. The safe landing analysis is based on the IMAGE 2 Global Climate Model. Other models predict greater sensitivity to increases in greenhouse gas concentrations. Aiming for the middle of the corridor gives future generations the flexibility to choose more stringent climate protection goals in light of increased understanding of climate change impacts.

http://old.wcel.local/wcelpub/wrapper.cfm?docURL=http://www.wcel.org/wcelpub/1998/12152.html - fn_4_up

http://old.wcel.local/wcelpub/wrapper.cfm?docURL=http://www.wcel.org/wcelpub/1998/12152.html - fn_4_up

4. http://old.wcel.local/wcelpub/wrapper.cfm?docURL=http://www.wcel.org/wcelpub/1998/12152.html - fn_4_up This is true simply because the best opportunities for implementing an emission reduction project are often short lived, and investors would invest in them anyway in anticipation of credits being generated from emission reductions occurring in the compliance period.

http://old.wcel.local/wcelpub/wrapper.cfm?docURL=http://www.wcel.org/wcelpub/1998/12152.html - fn_5_up

http://old.wcel.local/wcelpub/wrapper.cfm?docURL=http://www.wcel.org/wcelpub/1998/12152.html - fn_5_up

5. http://old.wcel.local/wcelpub/wrapper.cfm?docURL=http://www.wcel.org/wcelpub/1998/12152.html - fn_5_up Izrael, Yu *et al.*, "Mitigation Analysis for Energy System and Forestry Sector of the Russian Federation" in *Global Climate Change Mitigation Assessment: Results for 14 Transitioning and Developing Countries* (Washington, D.C.: US Country Studies Program, August 1997) at 139, project emissions to be 81.2% in 2010, or 87.9% under an optimistic scenario for economic growth. The in-depth review of Russia's national communication projects these emissions to increase to between 80 and 90% of 1990 levels by 2010: UNFCCC Secretariat, *Summary of the Report of the In-Depth Review of the National Communication of the*

Russian Federation (Geneva: FCCC Secretariat, 1997). Note the emissions referred to are for CO₂ from energy use only; however, this represents 72% of Russian greenhouse gas emissions in 1990 and is closely tied to methane emissions from energy production and transport which represents 20% of total Russian emissions. No projections for total emissions were available.

http://old.wcel.local/wcelpub/wrapper.cfm?docURL=http://www.wcel.org/wcelpub/1998/12152.html - fn_6_up

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6. http://old.wcel.local/wcelpub/wrapper.cfm?docURL=http://www.wcel.org/wcelpub/1998/12152.html - fn_6_upAs noted in footnote 5, data is not available on projected emissions of total greenhouse gases for Russian. However, Russian emissions of CO₂ from fuel combustion in 1990 were roughly 2,330 kilotonnes of CO₂: Framework Convention on Climate Change Secretariat, "Anthropogenic CO₂ emissions from fuel combustion, 1990" (Geneva: UNFCCC Secretariat, 1996). This is approximately 19.8% of total Annex 1 CO₂ emissions from fuel combustion: Jane Ellis and Karen Treanton, International Energy Agency "Recent trends in energy-related CO₂ emissions" (1997) manuscript accepted for publication in *Energy Policy* vol. 26. Since ten to twenty percent of that amount will likely be surplus sold to other Annex 1 Nations, this would allow emissions to increase by 1.98 to 3.96 percent above committed levels.

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7. http://old.wcel.local/wcelpub/wrapper.cfm?docURL=http://www.wcel.org/wcelpub/1998/12152.html - fn_7_upArticle 6.4 provides that the buyer is only at risk if questions are raised under article 8 regarding compliance with "requirements referred to in this paragraph". Presumably "this paragraph" refers to all of article 6 since there are no requirements in article 6.4. Therefore, it is irrelevant whether or not the seller is in compliance with its emission reduction commitments. Article 16 bis appears to be a seller beware system because article 3 refers to transfers of allowable emissions from one nation to another without anything suggesting that transfers would be invalidated if the seller is out of compliance. It is possible future rules for trading developed under article 16 bis could specify a buyer beware system, but nations supporting trading have consistently supported a seller beware system (the only exception to this is that trading proposals place risk on the buyer if a question is raised regarding the seller's compliance with reporting provisions.)

http://old.wcel.local/wcelpub/wrapper.cfm?docURL=http://www.wcel.org/wcelpub/1998/12152.html - fn_8_up

http://old.wcel.local/wcelpub/wrapper.cfm?docURL=http://www.wcel.org/wcelpub/1998/12152.html - fn_8_up

8. http://old.wcel.local/wcelpub/wrapper.cfm?docURL=http://www.wcel.org/wcelpub/1998/12152.html - fn_8_upUnited Nations Conference on Environment and Development, *The Effectiveness of International Environmental Agreements* (Cambridge, UK: Grotius Publications Limited, 1992).

http://old.wcel.local/wcelpub/wrapper.cfm?docURL=http://www.wcel.org/wcelpub/1998/12152.html - fn_9_up

http://old.wcel.local/wcelpub/wrapper.cfm?docURL=http://www.wcel.org/wcelpub/1998/12152.html - fn_9_up

9. http://old.wcel.local/wcelpub/wrapper.cfm?docURL=http://www.wcel.org/wcelpub/1998/12152.html - fn_9_up Net emissions from Annex 1 Nations in 1990 were eight percent less than gross emissions. Thus, if 1990 gross emissions were compared to net emissions in the compliance period, the end result would be to allow an eight percent increase emissions over the target agreed to for Annex 1 Nations.

http://old.wcel.local/wcelpub/wrapper.cfm?docURL=http://www.wcel.org/wcelpub/1998/12152.html - fn_10_up

http://old.wcel.local/wcelpub/wrapper.cfm?docURL=http://www.wcel.org/wcelpub/1998/12152.html - fn_10_up

10. http://old.wcel.local/wcelpub/wrapper.cfm?docURL=http://www.wcel.org/wcelpub/1998/12152.html - fn_10_up The first problem with the interpretation given is that it is not clear whether "since 1990" qualifies deforestation only, or afforestation, reforestation and deforestation. The comma after the word "reforestation" suggests that "since 1990" qualifies deforestation only. However, the reference at the end of article 3.4 to "provided these activities have taken place since 1990" very strongly suggests that "since 1990" qualifies all three activities. The interpretation given also fails to make sense of the phrase "changes in" at the beginning of article 3.3. "Changes in" suggests that net emissions from the listed forest activities in the commitment period will be compared against net emissions from these activities in the baseline year. However, the reference to "measured as verifiable changes in stock in each commitment period" suggests that change in stock, not the rate of change in stock, is measured.

http://old.wcel.local/wcelpub/wrapper.cfm?docURL=http://www.wcel.org/wcelpub/1998/12152.html - fn_11_up

http://old.wcel.local/wcelpub/wrapper.cfm?docURL=http://www.wcel.org/wcelpub/1998/12152.html - fn_11_up

11. http://old.wcel.local/wcelpub/wrapper.cfm?docURL=http://www.wcel.org/wcelpub/1998/12152.html - fn_11_up Intergovernmental Panel on Climate Change, Working Group I. *Revised 1996 IPCC Guide lines for National Greenhouse Gas Inventories: Reporting Instructions Glossary*. (Geneva: IPCC, 1996).

http://old.wcel.local/wcelpub/wrapper.cfm?docURL=http://www.wcel.org/wcelpub/1998/12152.html - fn_12_up

http://old.wcel.local/wcelpub/wrapper.cfm?docURL=http://www.wcel.org/wcelpub/1998/12152.html - fn_12_up

12. http://old.wcel.local/wcelpub/wrapper.cfm?docURL=http://www.wcel.org/wcelpub/1998/12152.html - fn_12_up It is unlikely that the IPCC would include harvesting 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 practicing sustainable forestry.

http://old.wcel.local/wcelpub/wrapper.cfm?docURL=http://www.wcel.org/wcelpub/1998/12152.html - fn_13_up

http://old.wcel.local/wcelpub/wrapper.cfm?docURL=http://www.wcel.org/wcelpub/1998/12152.html - fn_13_up

13. http://old.wcel.local/wcelpub/wrapper.cfm?docURL=http://www.wcel.org/wcelpub/1998/12152.html - fn_13_up These three countries were the only countries to have net emissions from land use change and forestry in 1990: see Framework Convention on Climate Change Secretariat *Compilation and Synthesis of National Communications from Annex 1 Parties*, Doc. No. FCCC/SBI/1997/INF.4 (Geneva: FCCC Secretariat, 1997) at page 16 and Framework Convention on Climate Change Secretariat "CO₂ emissions in land-use change and forestry" (1996) Table B.2 (available at UNFCCC web site).

http://old.wcel.local/wcelpub/wrapper.cfm?docURL=http://www.wcel.org/wcelpub/1998/12152.html - fn_14_up

http://old.wcel.local/wcelpub/wrapper.cfm?docURL=http://www.wcel.org/wcelpub/1998/12152.html - fn_14_up

14. http://old.wcel.local/wcelpub/wrapper.cfm?docURL=http://www.wcel.org/wcelpub/1998/12152.html - fn_14_up Derived from Framework Convention on Climate Change Secretariat documents, *Ibid*, and UNFCCC Secretariat, *Summary of the In-Depth Review of the National Communication of Australia* (Geneva: FCCC Secretariat, 1995).

http://old.wcel.local/wcelpub/wrapper.cfm?docURL=http://www.wcel.org/wcelpub/1998/12152.html - fn_15_up

http://old.wcel.local/wcelpub/wrapper.cfm?docURL=http://www.wcel.org/wcelpub/1998/12152.html - fn_15_up

15. http://old.wcel.local/wcelpub/wrapper.cfm?docURL=http://www.wcel.org/wcelpub/1998/12152.html - fn_15_up Framework Convention on Climate Change Secretariat documents, *Ibid*.

http://old.wcel.local/wcelpub/wrapper.cfm?docURL=http://www.wcel.org/wcelpub/1998/12152.html - fn_16_up

http://old.wcel.local/wcelpub/wrapper.cfm?docURL=http://www.wcel.org/wcelpub/1998/12152.html - fn_16_up

16. http://old.wcel.local/wcelpub/wrapper.cfm?docURL=http://www.wcel.org/wcelpub/1998/12152.html - fn_16_up Australia's projected total emissions from land use change and forestry for 2000 are positive but seven percent less than 1990 levels: *Ibid*. The 3% figure assumes another 7% reduction in emissions from land use change and forestry by 2010.

http://old.wcel.local/wcelpub/wrapper.cfm?docURL=http://www.wcel.org/wcelpub/1998/12152.html - fn_17_up

http://old.wcel.local/wcelpub/wrapper.cfm?docURL=http://www.wcel.org/wcelpub/1998/12152.html - fn_17_up

17. http://old.wcel.local/wcelpub/wrapper.cfm?docURL=http://www.wcel.org/wcelpub/1998/12152.html - fn_17_up Subsidiary Body for Implementation, *First Compilation and Synthesis of Second National Communications from Annex 1 Nations* (Geneva: UNFCCC, 1997) table A-10 shows an increase in emissions of these gases from 130,290 gigagrams CO₂ equivalent in 1990 to 183,434 in 1995 for countries that had tabled second national communications.
http://old.wcel.local/wcelpub/wrapper.cfm?docURL=http://www.wcel.org/wcelpub/1998/12152.html - fn_18_up

http://old.wcel.local/wcelpub/wrapper.cfm?docURL=http://www.wcel.org/wcelpub/1998/12152.html - fn_18_up
18. http://old.wcel.local/wcelpub/wrapper.cfm?docURL=http://www.wcel.org/wcelpub/1998/12152.html - fn_18_up For the eighteen Annex 1 countries for which data was available, the increase in emissions of the three trace gases from 1990 to 1995 is equal to 0.64 % of emissions of carbon dioxide: derived from Subsidiary Body on Implementation, *Ibid*. However, for some nations not included in available data the effect is more profound. For instance, the 1995 baseline may allow Japan to emit several percentage points above what it could in the absence of a 1995 baseline for the three trace gases.