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Sinks mtg

Wyden letter on sinks

Oversight

Pacific Trust "proposal" (a paper)

Bonn-IPCC issue

brief

workplan on expanding state of knowledge

britton a survey



United States Department of State

Under Secretary of State
for Global Affairs

Washington, D.C. 20520-7250

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LB

July 25, 2000

MEMORANDUM

TO: Distribution Below

FROM: Frank Loy *FL*

Attached is a revised version of the portion of our August submission on Sinks that we discussed today. Please direct comments to the State/OES front office (David Sandalow or Dan Bodansky) or, if you prefer, to me directly.

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B. Reforestation

- The IPCC Special Report on Land Use, Land Use Change and Forestry features several definitions of the term "reforestation", including one based on the 1996 IPCC Reporting Guidelines. Under this "IPCC definition," reforestation is defined in terms of land-use change. Specifically, reforestation is defined as forest establishment on land that has a history of forest cover but has been deforested for some extended period of time.
- The United States believes that the IPCC definition has several important strengths:
 - It clearly separates land-use changes into and out of forest use from other activities that affect emissions and removals from forests.
 - Combined with a land-based accounting system, it should accurately reflect, for land undergoing a land-use change, exchanges of greenhouse gases between the converted forest (including its above- and below-ground biomass, soils, and products) and the atmosphere.
 - It provides consistent incentives for Annex I Parties to reduce deforestation and promote afforestation and reforestation to mitigate climate change.
- However, the IPCC definition of reforestation leaves the vast majority of anthropogenic emissions and removals of greenhouse gases from forestry activities unaccounted for. Under the IPCC definition, only about 6% of U.S. managed forests would be included in the Kyoto Protocol accounting system under Article 3.3.
- Moreover, under the IPCC definition, a number of Annex I countries, including the United States, would likely not receive any credits for Article 3.3 activities, even though their managed forests as a whole remove large amounts of carbon from the atmosphere.
- As Table One indicates, under the IPCC definition, the U.S. would have a net debit of between 0 and 17 MMTCE. Under other definitional approaches, the United States would receive significant net credits during the first commitment period towards their Article 3 targets. For example, the U.S. would receive net credits of 137-185 MMTCE under the FAO Activity Based Approach, and 66-102 MMTCE under the FAO Land-Based II approach.¹

¹ FAO-Activity Based Approach: Forest establishment of any type, including re-establishment of forest cover on forest lands that have recently been harvested. Under this approach, the effects of prior activities on emissions are not counted (including emissions from harvesting). FAO-Land Based II Approach: Same as FAO-Activity Based approach except that all emissions and removals count that occurred during the relevant time period on the land area that has been reforested (in particular, emissions due to continued decomposition of the harvest slash).

- The United States believes that the negotiating history of the Kyoto Protocol strongly supports the view that Article 3.3 and 3.4 were intended to provide significant credits for Annex I countries whose forests are sequestering carbon. Indeed, credits from Articles 3.3 and 3.4 were a central part of the overall package that allowed some countries, including the United States, to take the targets set forth in Annex B of the Protocol.
 - For these reasons it is the strong view of the United States that, if the IPCC approach to Article 3.3 is adopted, then forestry activities must be included in the Protocol in a comprehensive manner pursuant to Article 3.4. As outlined in section xx below, the United States strongly supports an approach to Article 3.4 of the Protocol that would count both emissions and removals associated with forest, rangeland and agricultural management activities in a comprehensive and symmetric manner, and would give Annex I parties whose managed lands as a whole are removing carbon from the atmosphere significant credit for this sequestration, as intended under the Kyoto Protocol.
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The FAO Definitional Approach

- The negotiating history of Article 3.3 provides support for the view that "reforestation" was intended to include regeneration after harvests.
- As Table One indicates, under the FAO definitional approach, the United States would receive significant net credits during the first commitment period, in contrast to net debits of between 0 and 17 MMTCE under the IPCC definitional approach.
- Table One includes both the FAO Land-Based II approach and the FAO Activity-Based Approach (Table One, Parts B and C). Under the FAO Land-Based II approach, the United States would receive credits of between 66 and 102 MMTCE during the first commitment period. Under the FAO Activity-Based approach, the U.S. would receive credits of between 137 and 185 MMTCE during the first commitment period. For the reasons explained in section xx above/below, the United States does not support activity-based accounting under either Article 3.3 or 3.4.
- The United States recognizes that the FAO definitional approach raises significant issues - in particular, it could allow countries to receive credits from a forest area that experiences a loss of carbon during the commitment period (as a result of harvesting). Because of the problems raised by the FAO definition, the United States strongly supports the broader inclusion of forestry activities under Article 3.4 of the Protocol, so that both emissions and removals resulting from forestry activities are counted in a comprehensive and symmetric manner.

Perverse incentives

- The United States also recognizes that concerns have been raised about possible "perverse incentives" resulting from Articles 3.3 and 3.4. The United States opposes proposals that would lead to "perverse incentives," especially proposals that would promote the logging of old growth forests. Moreover, the United States believes that Parties should ensure that, through their domestic implementation, no such incentives are created.

Conclusion

- Given the negotiating history of the Kyoto Protocol, which supports a broader inclusion of forestry activities - in particular, reforestation after harvest - the U.S. believes that there is an important connection between the decisions regarding forests under Articles 3.3 and 3.4. Thus, if the more limited IPCC definitional approach is adopted for Article 3.3, it would be necessary to include ~~forest~~ management activities more broadly under Article 3.4.

land use

THE WHITE HOUSE
WASHINGTON

July 21, 2000

MEMORANDUM FOR DISTRIBUTION

FROM: ROGER BALLENTINE 
Deputy Assistant to the President

RE: Decisional COP-6 Meeting -- Sinks

We will hold a decisional COP-6 strategy meeting on Tuesday, July 25 at 10:00 a.m. in Room 180. At this meeting we will give necessary guidance to our negotiators on the subject of sinks. The U.S. must make a submission on this highly complicated and politically challenging issue by August 1st.

If we begin promptly at 10, I expect that we can conclude this meeting by 11.

I enclose a decision memo for your review prior to the meeting.

Distribution:

Martin Baily (CEA)
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cc:

John Podesta

Climate Change:

Decision on Definition of Reforestation

1. Issue for Decision

In our August 1 submission on carbon sinks, should the United States:

- continue to hold open the possibility of supporting the *FAO definition* of “reforestation” under Article 3.3 of the Kyoto Protocol in order to gain negotiating leverage vis a vis Article 3.4, or
- endorse the *IPCC definition* of “reforestation”?

2. Background

Our proposals to the Parties regarding carbon sinks under the Kyoto Protocol are due on August 1, and must address two key issues:

- the definitions of afforestation, reforestation and deforestation under Article 3.3, and
- whether to include additional sink activities under Article 3.4 and, if so, which ones.

(a) Article 3.4 Additional Activities

It is the consensus of the Assistant Secretaries-level group that in our August 1 submission we should propose:

- the inclusion of a broad array of sink activities under Article 3.4, including forest management, cropland management, and grazing land management. Under business-as-usual, the carbon stock changes resulting from these activities during the first commitment period are projected to be about 300 million metric tons of carbon equivalent (MMTCE) per year (approximately one-half of our overall target reduction), virtually all from forests.
- However, we would also offer support for a phase-in or limitation of the eligibility of these various activities during the first commitment period, to counter arguments that comprehensive carbon stock accounting would undermine the emissions reduction targets in the Protocol. Possible phase-in approaches include: (a) counting changes in carbon stocks only above a pre-defined threshold, (b) applying a discount rate to these sequestration credits, or (c) accepting a temporal or some other type of limitation. We plan to leave

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the choice of approach as well as the specific number for the threshold or discount rate to the negotiations.

At the recent workshop on sinks in Poland, the U.S. presentation on Article 3.4 along the above lines was favorably received. However, many delegations (including the EU, China, and the small island developing states) have questioned whether there should be any additional sink activities allowed in the first budget period. Thus, we will have a very difficult time reaching any agreement, let alone acceptance of the broad approach we are advocating.

(b) Article 3.3 Definitions

The key open issue for our August 1 submission relates to Article 3.3, and in particular, whether or not to endorse the IPCC definition of reforestation.

Article 3.3 of the Kyoto Protocol requires that Parties, in meeting their targets, count emissions and removals from three specified land-use change and forestry activities: afforestation, reforestation and deforestation since 1990. The definitions of “afforestation” and “deforestation” raise important technical considerations, but are not controversial from a political standpoint. In contrast, the definition of “reforestation” is quite controversial, with different definitions having very different implications for the United States (see Table 1 below).

International and domestic discussions have focused on two possible definitions of reforestation, referred to as the IPCC and FAO definitions.

- The *IPCC definition* defines reforestation as a land-use change from a non-forest use to a forest use.
- In contrast, the *FAO definition* also includes replanting after harvest (arguably two stages of “forest use”) within the definition of reforestation – without counting the harvest as an emission.

Table 1 sets forth the implications for the U.S. of the IPCC vs. FAO definitions, assuming business-as-usual. Under the IPCC definition, the U.S. would likely have a small debit (an addition to our target) from Article 3.3. In contrast, the U.S. would gain a

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Table One

Estimated U.S. Emissions and Removals from Afforestation, Reforestation, and Deforestation since 1990 under Business-as-Usual

Note: The three numbers in each category represent the low, most likely, and high estimates of tons that would apply toward (+) meeting our target or against (-). For reference, 100 is one-sixth of our target. Estimates are derived from 1997 US Forest Statistics.

IPCC definition of reforestation

U.S. Sink/Source	Estimated Annual MMTCE Carbon Sequestration (+) or Emissions (-) during the budget period (BAU Case) for the U.S.		
	2008-2012	2013-2017	2018-2022
Afforestation/ reforestation	(26) 40 (54)	(29) 45 (61)	(30) 48 (66)
Deforestation	(-61) -47 (-33)	(-54) -39 (-24)	(-49) -31 (-13)
Total of ARD	(-16) -7 (0)	(-7) 6 (13)	(3) 17 (31)

FAO definition of reforestation

U.S. Sink/Source	Estimated Annual MMTCE Carbon Sequestration (+) or Emissions (-) during the budget period (BAU Case) for the U.S.		
	2008-2012	2013-2017	2018-2022
Afforestation	(26) 40 (54)	(29) 45 (61)	(30) 48 (66)
Reforestation	(73) 91 (109)	(106) 129 (152)	(137) 163 (189)
Deforestation	(-61) -47 (-33)	(-54) -39 (-24)	(-49) -31 (-13)
Total of ARD	(66) 84 (102)	(111) 135 (159)	(151) 180 (209)

The negotiating history of the Kyoto Protocol is hotly disputed among Parties, although we have argued that it provides some support for the FAO definition. However, several arguments have been voiced against the FAO definition:

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- First, the FAO definition credits regrowth without debiting the first harvest (this is sometimes referred to as “asymmetrical” accounting). Thus it selectively brings land into the system as it is about to start sequestering carbon, without counting the substantial emissions occurring earlier in the commitment period resulting from harvests. This is a legitimate environmental concern (even though it may be consistent with what Kyoto intended).
- Second, the FAO definition could create a perverse incentive to harvest existing forests early, since Parties would be able to count the sequestrations from replanting without being debited for the emissions from harvesting. In practice, however, this effect may be unlikely, since the value of carbon credits would in most circumstances be small relative to other factors in timber management decisions. Nevertheless, this concern has become a rallying cry for the environmental community.
- Finally, by giving some parties significant credits, the FAO definition would weaken the Kyoto targets (although, again, one could argue that to the extent that the FAO definition is supported by the negotiating history, it is by definition consistent with the Kyoto package, not a weakening of it).

Most Parties, including a number of Umbrella Group countries such as Australia and Norway, support the IPCC definition. Japan is one of the few countries to publicly support the FAO definition.

Environmental groups have universally condemned the FAO definition in very strong terms. A coalition of groups has launched a postcard campaign targeting administration policymakers. Meanwhile, industry groups have not weighed in strongly one way or the other.

3. Analysis of Options

Thus far, the U.S. has not taken a position regarding the FAO vs. IPCC definitions of reforestation. No agency has pressed for the FAO definition, but we have been reluctant to endorse the IPCC definition, since it would result in a small debit, rather than any credits.

Instead of supporting either definition, we have attempted to treat Articles 3.3 and 3.4 as a

Instead of endorsing either definition, we have argued for addressing forestry (and other sink activities) in a more rational manner, through comprehensive carbon accounting under Article 3.4. In doing so, we have signaled that we would be willing to give up the FAO definition in return for a good (i.e. expansive) decision regarding additional sink activities under Article 3.4. What would count as a “good” or “acceptable” outcome on Article 3.4 will require further elaboration as the negotiations proceed.

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In our August 1 submission, we could:

- (1) remain uncommitted as between the FAO and IPCC definitions, and attempt to use the FAO definition as trade bait to gain a better decision under Article 3.4, or
- (2) endorse the IPCC definition, presenting this conservative position on 3.3 and our more aggressive position on 3.4 as a package.

Option 1: Continue to leave open the FAO definition of reforestation, in order to try to extract a better outcome on Article 3.4 additional activities.

Pros:

- We should not make major concessions prematurely, without gaining something in return;
- If we do not get significant additional sink activities under Article 3.4, then our target will be much tougher to achieve.

Cons:

- It is unlikely that we would actually insist on the FAO definition, given its environmental difficulties. To the extent that other countries realize this, the FAO definition may not be a credible threat and therefore may not gain us much negotiating leverage;
- We will continue to be strongly criticized by environmental NGOs for not clearly repudiating the FAO definition of reforestation.

Option 2: Repudiate FAO definition and indicate our support for the IPCC definition.

Pros:

- This could buy us good will from other countries, and thereby give us greater credibility in the Article 3.4 negotiations.

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Cons:

- Adopting the IPCC as opposed to the FAO definition of reforestation would represent a significant tightening of our target (a difference of approximately 90 MMTCE). Even considering that this may be an unrealistic calculation, given that there is little chance that the FAO definition would ever actually be adopted, our opponents might strongly criticize us for making a major concession with significant cost implications (adding 90 MMTCE to our target could add as much as 30% to our compliance costs, given the marginal costs of reducing the last 90 million tons).

Draft Submission on Sinks for August 1, 2000

Note to interagency reviewers

This is Draft 3, a more complete draft submission for August 1, but still a work in progress. When various issues are resolved, the outcome will be reflected in the next version of the draft submission.

Please note where there are requests for text or other input from your agency. We need your help to get this input ASAP. Call Adele Morris at (202) 736-7444 for clarification if necessary.

Send comments and input to Adele at morrisac@state.gov or fax: (202) 647-3970.

Written Comments to Adele by
COB Tuesday. Policy concerns as
early as possible.

Tuesday at 10-11
Department Meeting

3.3

~~Statutory support~~

Discussion of which definition

IPCC

or

FAO

**LULUCF-Related Issues:
Draft Submission of the United States (8/1/00)**

Outline

- I. Executive Summary of U.S. Views
- II. Introduction
 - A. Purpose of the COP-6 decision on LULUCF
 - B. Background
 - C. Advantages of a broad and comprehensive approach to LULUCF
- III. Proposed definitions and accounting approaches related to afforestation, reforestation, and deforestation under Article 3.3
 - A. Afforestation and deforestation
 - B. Reforestation
- IV. How and which additional human-induced activities should be included under Article 3.4, including modalities, rules, and guidelines related to these activities and their accounting
 - A. Forest management
 - B. Cropland management
 - C. Grazing land management
- V. Methodologies for measuring and reporting in relation to Article 3.3 and 3.4 activities
 - A. Monitoring and measuring GHGs
 - B. Accounting for non-CO₂ GHG emissions and removals
- VI. Overall accounting approaches in relation to requirements of Article 3.3, 3.4 and 3.7, and regarding, inter alia, reversibility, natural effects, and accounting interlinkages.
 - A. General accounting for LULUCF activities
 - B. Accounting for carbon pools
 - C. Incentives for land management
 - D. Accounting for changes in land use and approaches to address double counting
 - E. Phase-in Approaches for the first commitment period
 - F. How additional activities should be included in the first and subsequent commitment periods
 - G. Impermanence and leakage
 - H. LULUCF accounting and natural and indirect effects
 - I. Relationships between Articles 3.3 and 3.4 and other Articles of the Protocol
 - J. Views on Article 3.7
- VII. Country-specific Data: Tables and Explanatory Text
- VIII. Textual proposals

I. Executive Summary

[Insert Executive Summary here.]

[Add references throughout to relevant paragraphs of text in section VIII.]

II. Introduction

- The U.S. welcomes this opportunity to submit views, data, and textual proposals for elements of COP 6 decisions on land use, land use change and forestry (LULUCF). This submission addresses definitions and accounting for afforestation, reforestation, and deforestation (ARD) activities under Article 3.3 and additional activities under Article 3.4, as well as accounting approaches under Article 3.7. It also examines inter-linkages between Articles 3.3, 3.4 and 3.7 and other relevant articles of the Kyoto Protocol.
- The submission contains data tables and explanatory text for U.S. proposals under Article 3.3 and 3.4 and for the first sentence of Article 3.4 (see Section VII). The data and explanatory material generally follow the formats set forth in the conclusions of SBSTA 12.
- The submission contains textual proposals for the elements of a COP-6 decision regarding LULUCF (see Section VIII). The text generally follows the topic headings for the synthesis of textual proposals provided in the conclusions of SBSTA 12.
- In working toward the adoption of the COP-6 decision on LULUCF, Parties should give priority to the critical elements of the decision, including, inter alia, basic definitional approaches to afforestation, reforestation, and deforestation under Article 3.3 and the inclusion of additional activities under Article 3.4. The Parties should consider whether any of the more technical issues (such as details regarding how the definition of forest may vary by biome) could appropriately be decided at a later time.
- The U.S. notes its support for the inclusion of LULUCF projects in the Clean Development Mechanism under Article 12. We believe that such projects, properly designed and implemented, can both contribute to the sustainable development goals of their host countries and help Annex I Parties cost effectively achieve their commitments under the Kyoto Protocol.

A. Purpose of the COP-6 decision on LULUCF

- In 16/CP.5, the Parties agreed to [quote or paraphrase language from COP-5 decision]
- Regarding Articles 3.3, 3.4, and 3.7 of the Kyoto Protocol, Parties may ...[take language from SBSTA 11 and COP5 – Sue and Evan: please help here.]
- The U.S. believes the elements for decisions on LULUCF taken at COP-6 should be considered together as a unified package. As the IPCC Special Report on LULUCF recognizes, Article 3.3 includes only some forest activities that affect carbon stocks, and therefore inevitably leads to discrepancies between the accounted changes in carbon stocks and the actual changes in carbon stocks in the managed forest estate during the commitment period. The U.S. strongly believes that Article 3.4 can and should be used to remedy the deficiencies in Article 3.3 by including LULUCF activities in a more comprehensive approach. This will further the ultimate objective of the

UNFCCC, namely to stabilize atmospheric concentrations of greenhouse gases at safe levels, by taking into account the entire contribution – both positive and negative – of LULUCF to climate change.

B. Background

Land Use in the U.S.

- The U.S. has a land area of about 930 million hectares (see Figure 1 below), of which 97.4 percent is rural and 2.6 percent is urban. Rural land includes agricultural (range, cropland and pasture, farmsteads and roads), forest, and other rural land. The relatively large rural land base in the U.S. suggests that it could have many options to improve land management practices and cost-effectively mitigate its greenhouse gas emissions.

Specifically, the major uses of land in the U.S. are:

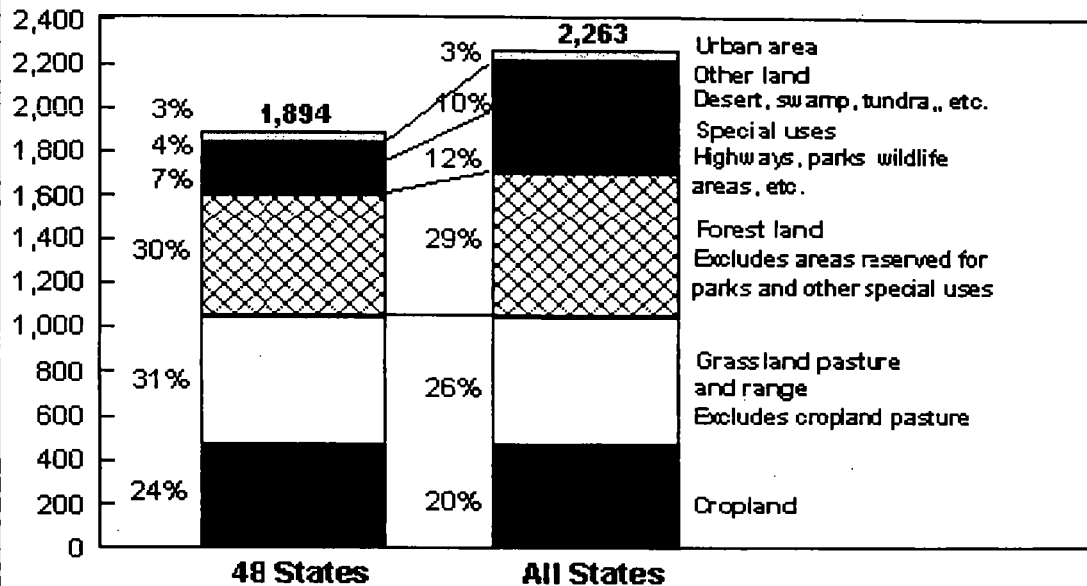
- cropland, 170 million hectares (18 percent of the land area);
- grassland pasture and range, 239 million hectares (26 percent);
- forest-use land, 262 million hectares (28 percent) (exclusive of forested areas in parks and some other special uses);
- special uses, 114 million hectares (12 percent) (includes parks, wilderness, wildlife and related uses);
- urban land, 24 million hectares (2.6 percent); and
- miscellaneous other land, 91 million hectares (10 percent) (includes deserts, wetlands, and barren land).

Overall land use statistics in the U.S. depend significantly on whether or not Alaska is included in the data. Alaska has very little cropland and pasture, but has large areas of forest use, special-use, and miscellaneous other land.

Figure 1

Major uses of land, 1992

Million acres



Source: USDA/ERS estimates are based primarily on reports and records of the Bureau of the Census and Federal and State land management and conservation agencies.

- The U.S. believes that properly managing these lands is critical for the long-term sustainability of food, fiber, and timber production. Proper management includes enhancing the carbon that can be sequestered on these lands. The U.S. also believes that the co-benefits of improved land management practices such as improved soil, water, and air quality may add significantly to their overall cost-effectiveness in meeting our climate change objectives.

U.S. Forests Now and in the Future

- The total forest land base of the U.S. is currently about 250 million hectares, excluding Alaska. Privately owned (non-industrial and industrial) forest land in the U. S. accounts for 159 million hectares of the forest land base. Public forest lands are owned by the federal, state, and local governments, and account for 91 million hectares with approximately 80% of that being Federal lands and the remainder being held by state and local governments.
- Forest management includes the regeneration (natural or planting), tending, protection, harvest, and utilization of forest resources to meet goals defined by the forest landowner. The most actively managed forest lands are those lands which are capable of producing at least $1.4 \text{ m}^3 \text{ ha}^{-1} \text{ yr}^{-1}$ under natural conditions and are not reserved for purposes other than forest management. The U.S. managed forest land base is about 199 million hectares. Approximately 143 million hectares of the actively managed forest land is privately owned, with about 60% held by non-industrial private landowners, about 15% held by forest industry and the remainder held by the federal, state, and local governments.
- Managed forests in the U. S. currently sequester between x and y, with a medium estimate of 311 MMTCE per year. Much of the carbon uptake occurs in the Southeastern, Pacific Northwest, and

Northeastern regions of the U.S. The removals derive from a number of factors, including growth and harvest rates, management regimes, and forest type.

- The U.S. projections for carbon sequestration in forests, assuming business as usual, are projected to continue the current pattern of a decline in carbon sequestration. A number of factors interact to result in the projected decline in carbon sequestration in standing forests, including maturing forests in some regions and a potential narrowing of the growth to harvest ratio.
- Within the next 50 years, U.S. forest productivity per unit area in some regions is likely to increase due to the development and application of a variety of management and technological tools. The widespread fertilizing effect of CO₂ on the nation's forests is uncertain, with potential positive and negative impacts on growth. Other factors that will affect growth are local environmental conditions and changes in forest fragmentation, atmospheric nutrient deposition, and tropospheric ozone.
- In the U.S., climate change could increase the area and productivity of forests over the next 50-100 years. There is also some possibility that over the next 50 to 100 years, climate change could decrease the area and productivity of some forests. However, we expect that site-specific conditions, human management, air pollution and forest and soil ecology will be much more influential factors on forest productivity, decomposition and carbon balance than climate change or CO₂ fertilization. At the national scale, it is uncertain what the importance of climate change might be relative to other factors. At the local level, site-specific conditions would also include the local effects of natural and human-induced climate change, for example temperature and precipitation trends and variability, and it may be difficult to distinguish those effects from other site-specific factors.

U.S. Emissions and Removals from Managed Forests

- The U.S. assigned amount under the Kyoto Protocol is 7% below its 1990 levels of emissions, or an average of about 1518 MMTCE per year over the first commitment period. Assuming business as usual conditions, the total projected U.S. GHG emissions in 2010 would be around 600 MMTCE higher than the U.S. target.
- In 1997, U.S. total GHG emissions were about 1814 MMTCE and fossil fuel-related emissions were about 1,466 MMTCE. Energy-related CO₂ emissions are projected to be about 1787 MMTCE in 2010, according to the U.S. Energy Information Agency's Annual Energy Outlook for 2000.
- Thus, managed forests in the U.S. currently remove about 17% of its total GHG emissions on carbon equivalent basis, and 21% of its fossil fuel-related CO₂ emissions.

C. Advantages of a broad and comprehensive approach

- **The U.S. believes that the best long run approach to accounting for LULUCF activities under the Kyoto Protocol is full GHG accounting on all managed lands.**
- Including broad activities (e.g., forest, cropland and grazing land management) and using a land-based accounting approach is the best way to provide for full GHG accounting. A Broad Activities/Land-based Accounting approach brings large areas of managed land into the accounting system and captures sources and removals comprehensively. Thus, it bolsters the environmental integrity of the Kyoto Protocol by more accurately reflecting the net GHG exchanges between atmosphere and terrestrial ecosystems and their carbon pools. For example, a broad approach would capture carbon stock changes on lands that are being degraded but are not yet deforested.

- The Broad Activities/Land-based Accounting approach would:
 - **Provide the best long term approach.** The broad approach is most consistent with the objective and principles of the Convention and its Kyoto Protocol, including in particular the principles of comprehensiveness and cost-effectiveness.
 - **Better reflect carbon exchanges between the atmosphere and the terrestrial biosphere than the limited approach reflected in Article 3.3.** For example, a broad approach would capture carbon stock changes in forests that are degrading but are not yet deforested, or that are growing and storing additional carbon.
 - **Prevent biased selection of activities.** Defining activities broadly prevents Parties from only selecting activities which sequester carbon or reduce net GHG emissions.
 - **Create more balanced accounting results.** For example, both pasture and no-till cropland generally sequester carbon. However, pasture usually sequesters more carbon than no-till cropland. If land use converts from pasture to no-till cropland, a comprehensive approach would accurately reflect an increase in net GHG emissions. However, if only no-till cropland is a selected activity and land moved from pasture to no-till cropland, the Narrow Practices/Activity-based Accounting approach would inappropriately reflect a decrease in net GHG emissions. The loss of removals from the conversion from pasture to cropland would be missed.
 - **Better allow for appropriate technologies for the differing resource conditions across Parties so as not to inadvertently exclude beneficial practices.**
Given the wide variation in natural resource bases and practices available across Parties and over time, it will be very difficult to identify now the best set of practices for each Party between 2008 to 2012. By defining activities broadly, there is no need to identify specific land use management practices or develop a common definition across Parties for agreed upon practices. For example, if Parties agree to include cropland management, there is no need to develop a universally agreed upon definition of conservation tillage.
 - **Provide incentives to develop new practices and apply them most cost effectively.** A broad approach, without specified practices, provides incentives to develop technologies that reduce net GHG from the land management activities. These reductions can occur where mitigation is most cost effective and/or where ancillary benefits can be maximized.
 - **Improve measurement and monitoring.** In some cases, a Broad Activity/Land-based Accounting approach can reduce some measurement problems. For example, when multiple practices are used on the same land base, it is difficult to separate the effects of each practice. Land-based accounting could also rely more on direct measurements rather than default values, leading to more accurate measures of exchanges with the atmosphere.
 - **Minimize leakage and double counting.**
 - **Better use existing data.**
 - **Address many of the problems created by the limited nature of Article 3.3, even for the accounting of deforestation.** For example, limiting the Kyoto Protocol accounting system to long term changes in land use could make it difficult to ascertain and account for deforestation in the commitment period in which it occurs. To account for the full carbon loss from deforestation,

one would have to look back over previous periods to account for any degradation that eventually leads to deforestation. A broad approach would fully debit degradation as it occurs.

- Given the clear benefits of comprehensive carbon accounting, the U.S. proposes (a) including broad activities under Article 3.4 and (b) using a land-based approach to account for GHGs emissions related to these broad activities.
- The U.S. recognizes the policy issues that arise with adopting a broad approach in the first commitment period, particularly with regard to the stringency of first commitment period targets. We remain convinced that full GHG accounting is the most scientifically and environmentally credible approach for long term, and seek solutions as to how to initiate a broad approach in the first commitment period in a way that is consistent with the commitments that came out of Kyoto. We address this issue below in Section VI.

III. Proposed definitions and accounting approaches related to afforestation, reforestation, and deforestation under Article 3.3

A. Afforestation and deforestation

Regarding the definitions of afforestation and deforestation, the U.S. proposes the following:

- Afforestation and deforestation should be defined as long-term changes in land use:
 - > Afforestation is the conversion of non-forest land to forest land.
 - > Deforestation is the conversion of forest land to non-forest land.

The U.S. recognizes that a land-use change approach to afforestation and deforestation, as opposed to definitions focusing on aggradation and degradation, may leave important anthropogenic emissions and removals unaccounted for. In our view, this is a strong argument for more comprehensive accounting under Article 3.4, through the inclusion of broad activities such as forest management that include changes in carbon stocks due to aggradation and degradation.

U.S. views on general accounting procedures for lands under Article 3.3 and 3.4 are included below in Section VI. Regarding the specific definitions and accounting rules for afforestation and deforestation, the U.S. suggests the following:

- Each Party must specify, in its national communication prior to the start of the first commitment period, a definition of forest to track changes of land use in and out of forest use.
- A Party's definition of "forest" should be used to identify lands subject to afforestation and deforestation since 1990 for purposes of accounting under Article 3.3.
- Parties need not all adopt the same definition of forest.
- A flexible international technical process should ensure that Parties' definitions are technically sound and consistent with a land-use change approach to afforestation and deforestation.
- Parties should avoid adopting a definition of "forest" that is designed simply for maximization of credits under Articles 3.3 and 3.4.
- Parties should consider using accepted international standards in defining a "forest," so as to be consistent with other international processes related to forests.
- The definition of forest by a Party can, where appropriate, vary by biome or other ecosystem category. The definition a Party uses should specify an area of land that represents a minimum area that constitutes a forest.
- The definition of forest used by a Party must be applied consistently over time.
- Each Party should use the same definition of forest when accounting for afforestation and deforestation.

- The (re)establishment of forests through natural means should be considered a form of afforestation (or reforestation).
- If a Party wishes to change its definition or accounting system for the purposes of Articles 3.3 or 3.4, a process should determine how and when the change should be adopted.
- The basis for a definition of forest should be vegetation characteristics rather than administrative characteristics. Vegetation characteristics (such as canopy cover or above-ground carbon per unit area) relate more closely to carbon exchanges with the atmosphere than land category designations that Parties might make for their internal policy purposes. In addition, land-use or other administrative classifications of land would be very easy to manipulate in response to inventory specifications.

The U.S. approach to defining forest

- In the U.S. view, the whole issue of forest definitions would be greatly simplified under a broad approach that includes forest, cropland, and grazing land management because broad categories of managed lands must be accounted for whether or not they not meet a particular definition of forest.
- If LULUCF activities under the Kyoto Protocol are limited to land use change to and from forest, then Parties will naturally concern themselves much more with the elaboration of the forest definitions.
- The U.S. definition of forest combines both vegetation and administrative aspects and is based upon an internationally accepted definition modified to reflect U.S. conditions for roadside, streamside, windbreak, and shelterbelt strips. The U.S. definition is:

Land with tree crowns (or equivalent stocking) of more than 10 percent and area of more than 0.5 ha (1 acre). The trees should be able to reach a minimum height of 5 meters (16 feet) at maturity *in situ*. Stands may consist of either closed forest formations where trees of various stories and undergrowth cover a high proportion of the ground, or open forest formations with a continuous vegetation cover in which tree crown cover exceeds 10 percent and is not currently developed for nonforest use. Young natural stands and all plantations established for forestry purposes which have yet to reach a crown density of 10 percent or tree height of 5 meters (16 feet) are included under forest, as are areas normally forming part of the forest which are temporarily non-stocked as a result of human intervention or natural causes but which are expected to revert to forest.

- The U.S. definition includes: forest nurseries and seed orchards that constitute an integral part of the forest; forest roads and trails (if less than 36 meters or 120 feet wide); cleared tracts; firebreaks; and reserves and other protected areas such as those of special environmental, scientific, historical, cultural, or spiritual interest; roadside, streamside, windbreak, and shelterbelt strips of trees with an area of more than 0.5 ha (1 acre) and a width of more than 36 meters (120 feet). Rubber plantations and cork oak stands are included. Lands predominantly used for agricultural purposes are excluded. However, marginal agricultural lands that are afforested are included. Lands in the Conservation Reserve Program that are planted to trees are considered forest rather than cropland.

Detecting and accounting for deforestation

- When a forest area is harvested, it may not be immediately obvious whether a long term land-use change has occurred or whether the land is in the process of being replanted/regenerated.

- This difficulty can be addressed by including the broad activity of forest management under the accounting system under Article 3.4. Under this approach, reductions of carbon stock on managed forests during the commitment period are accounted for during the commitment period in which they occur, whether the stock losses are due to deforestation or not.
- If forest management is not included under Article 3.4, then there could be a discrepancy between the actual carbon stock change during the commitment period and the accounted carbon stock change for the same period. This could occur because of a delay in the determination that an area was deforested.

Afforestation and deforestation: Implications for the U.S.

- As reflected in the Table One below, the U.S. projects that the contribution of afforestation (and reforestation under an IPCC definitional approach) to our assigned amount, assuming business as usual, would be about 26 to 54 MMTCE per year during the first commitment period. The BAU projections are slightly higher for subsequent commitment periods, though we note that later projections are more uncertain.
- The U.S. projects that deforestation, assuming business as usual, would result in emissions of 33 to 61 MMTCE per year during the first commitment period. The BAU projections for deforestation emissions are slightly lower for subsequent commitment periods, again noting the particular uncertainties for longer term projections.

**Table One:
Estimated U.S. Emissions and Removals from Afforestation, Reforestation, and
Deforestation since 1990, assuming Business-as-Usual**

U.S. Sink/Source	Estimated Annual MMTCE Carbon Sequestration (+) or Emissions (-) during the budget period (BAU Case) for the U.S.		
	2008-2012	2013-2017	2018-2022
A. IPCC definition of reforestation			
Afforestation/ Reforestation	(26) 40 (54)	(29) 45 (61)	(30) 48 (66)
Deforestation	(-61) -47 (-33)	(-54) -39 (-24)	(-49) -31 (-13)
Total of ARD	(-16) -7 (0)	(-7) 6 (13)	(3) 17 (31)

U.S. Sink/Source	Estimated Annual MMTCE Carbon Sequestration (+) or Emissions (-) during the budget period (BAU Case) for the U.S.		
	2008-2012	2013-2017	2018-2022
B. FAO definition of reforestation (Land-based II accounting) -- Includes carbon stock changes on regenerated harvested forest lands; excludes carbon emitted at the time of the first harvest since 1990.			

Afforestation	(26) 40 (54)	(29) 45 (61)	(30) 48 (66)
Reforestation	(73) 91 (109)	(106) 129 (152)	(137) 163 (189)
Deforestation	(-61) -47 (-33)	(-54) -39 (-24)	(-49) -31 (-13)
Total of ARD	(66) 84 (102)	(111) 135 (159)	(151) 180 (209)

U.S. Sink/Source	Estimated Annual MMTCE Carbon Sequestration (+) or Emissions (-) during the budget period (BAU Case) for the U.S.		
	2008-2012	2013-2017	2018-2022
C. FAO definition of reforestation (Activity-based accounting) -- Includes carbon stock changes on regenerated harvested forest lands; excludes carbon emitted at the time of the first harvest since 1990.			
Afforestation	(26) 40 (54)	(29) 45 (61)	(30) 48 (66)
Reforestation	(144) 168 (192)	(176) 207 (238)	(203) 242 (281)
Deforestation	(-61) -47 (-33)	(-54) -39 (-24)	(-49) -31 (-13)
Total of ARD	(137) 161 (185)	(181) 213 (245)	(218) 259 (300)

Reference case: Comprehensive accounting for US managed forests, 2008-2012	(115) 288 (403)
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Table One Notes:

1. These data reflect expected accounting for definitions that treat afforestation and deforestation as land use changes (as opposed to a degradation/aggradation scenario, for example).
2. Data include the following carbon pools: above ground, litter, soils, woody debris, and harvest wood in products and landfills.
3. Under the accounting approach used in Table One, the FAO approach to reforestation would include carbon sequestered during the regrowth of forests regenerated since 1990, but would not debit the emissions from the initial harvesting that put the land into the set of lands under Article 3.3.
4. Emissions from all harvests that occur after the first regrowth are counted.
5. For harvests that count (deforestation and, for FAO land-based II, the harvests after the first regeneration since 1990), the accounting approach accounts for the carbon that goes into harvested wood products and landfills.

B. Reforestation

The U.S. recognizes there are many potential definitions of reforestation and accounting approaches that could be applied. Some of the approaches featured in the IPCC LULUCF report include:

- Intergovernmental Panel on Climate Change (IPCC): forest establishment on land that has a history of forest cover but has been deforested for some extended period of time. This definition is expressed in terms of a land use change.
- UN Food and Agricultural Organization (FAO)-Activity Based: forest establishment of any type, including re-establishment of forest cover on forest lands that have recently been harvested.--Effects of prior activities on emissions are not counted (e.g. emissions from harvest before reforestation are not counted).
- FAO-Land Based: same as FAO-Activity Based except that effects of prior activities on emissions are counted (e.g., emissions from the slash left on the land after the harvest are counted).

If the COP-6 decision on LULUCF includes forests more generally under Article 3.4 then the U.S. could support the IPCC definition of reforestation:

- The U.S. views the IPCC Glossary definition of reforestation as a special case of afforestation and has included it in the projections for afforestation in Table One, part A above.
- Some of the benefits of the IPCC definitional approach include the following:
 - The IPCC definitional approach for reforestation clearly separates land-use changes in and out of forest use from other activities that affect emissions and removals from forests.
 - For forest lands undergoing a conversion in land use, the IPCC definitional scenario combined with a land-based accounting system covering the commitment period should accurately reflect exchanges of greenhouse gases between the converted forest (including its above- and below-ground biomass, soils, and products) and the atmosphere.
 - The IPCC approach also provides consistent incentives for Annex I Parties to reduce deforestation and promote afforestation and reforestation to mitigate climate change.
- However, it should be recognized that the IPCC approach to reforestation leaves the vast majority of anthropogenic emissions and removals of greenhouse gases from forestry activities unaccounted for. The U.S. views this as a serious weakness of the IPCC definitional approach, and therefore would support this approach to Article 3.3 only if forest activities were included more generally in the Protocol pursuant to Article 3.4.
- The limited nature of the IPCC definitional approach for the U.S. is illustrated by the fact that only about 6% of U.S. managed forests would be included in the Kyoto Protocol accounting system under Article 3.3.
- Despite a large GHG removals by U.S. managed forests, the U.S. would likely experience a net debit from LULUCF accounting under Article 3.3, assuming business as usual.
- Although the U.S. could in theory take additional action to reduce deforestation and encourage afforestation, as reflected in the IPCC Special Report on Land Use, Land Use Change, and Forestry, such actions are unlikely to provide significant potential to mitigate net emissions in the first commitment period.

The IPCC vs. FAO definitions of reforestation: Implications for the U.S.

- The U.S. believes that the negotiating history of Article 3.3 supports other definitions of reforestation, in particular the FAO definition.
- Although the U.S. recognizes significant disadvantages of the FAO definition of reforestation, the U.S. invites Parties considering the U.S. proposal for including forest management under Article 3.4 to note the implications for the U.S. of the FAO definition of reforestation. Those implications are reported in Table One.
- Table One includes two accounting approaches for the FAO definition of reforestation. The first, called land-based II accounting in the IPCC Special Report, would include carbon sequestered during the regrowth of forests regenerated since 1990, but would not debit the emissions from the initial harvesting that put the land into the set of land under Article 3.3. Emissions from all harvests that occur after the first regrowth are counted. The second accounting approach, called activity-based, is the same, except it would not include emissions from the slash left over after the harvest.

Conclusion: Given the negotiating history of the Kyoto Protocol, which supports a broader inclusion of forestry activities, including in particular replanting after harvest, the U.S. sees a strong link between a more inclusive elaboration of forestry activity under Article 3.4 and adopting the more limited IPCC definitional approach for Article 3.3.

IV. How and which additional human-induced activities should be included under Article 3.4, including modalities, rules, and guidelines related to these activities and their accounting

- The U.S. strongly supports including broad land management activities under Article 3.4. These land management activities are ongoing, and therefore have occurred since 1990, allowing their inclusion in the first commitment period. The U.S. proposes include the following specific human-induced activities:
 1. Forest management
 2. Cropland management
 3. Grazing land management
- The human-induced activities of forest, cropland, and grazing land management cover the U.S. landscape of managed, vegetated, lands. Land with a minimal amount of management (e.g. wilderness areas) should generally be excluded from accounting under Article 3.3 and 3.4.
- If a vegetated or forested area is (re)established since 1990, an issue arises as to whether this area should be included under Article 3.3 or 3.4. If the newly vegetated area is part of a managed system, then it can be included under one of the broad management categories the U.S. has proposed.
- It may be desirable to include newly vegetated land under Article 3.4, even if the land is intended to remain in a generally unmanaged state, for example as a rehabilitated natural ecosystem. Inclusion of such revegetated land under Article 3.4 could encourage and reward conversions of degraded lands to natural undisturbed systems. To the extent that some revegetation would neither qualify as forest, nor as managed land in one of the three broad activities, it may be helpful to include another additional activity under Article 3.4 explicitly to recognize these lands. Because the U.S. has very little newly-established non-forest unmanaged land, it has not included a proposal for this activity in our submission. However, the U.S. recognizes that revegetation could be of interest to other Parties, and

welcomes discussion about how revegetated land could be included in the accounting system under the Kyoto Protocol.

- The U.S. proposes a land-based accounting system for its proposed activities. This accounting should focus on changes in carbon stocks from the beginning to the end of the commitment period, but also account for emissions of other greenhouse gases during the commitment period.
- Each of these human-induced activities (forest, cropland, and grazing land management) refers to a combination of land management and land use alternatives that can be described along a continuum that range from low intensity to high intensity.
- In Section VI below, this submission describes U.S. proposals regarding changes in land use categories during the commitment period (e.g., land that shifts from an unmanaged state to managed cropland or forest).

A. Forest management

- Forest management is an activity involving the regeneration, tending, protection, harvest, and utilization of forest resources to meet goals defined by the forest landowner. The goals can focus on one or a multiple of outcomes and outputs. Any number and variety of very specific practices may be employed in the management activity to meet the intended goals.
- Regeneration can be of either natural means, taking advantage of existing seed source or coppice material, or artificial means, using planting stock or direct seeding.
- Tending involves the manipulation of forest vegetation to meet product, species composition, habitat quality, and fire and insect and disease protection goals.
- Harvest systems that are efficient in material collection and delivery as well as resource conservation are a crucial part of forest management.
- Utilization involves the processing of raw material into a variety of products. Utilization encompasses the level of biomass (carbon) that is removed from the forest system and the mix of products into which the biomass goes.
- Conservation of soil, water, vegetation, wildlife, carbon and nutrient resources is an integral part of each step in the process. Carbon sequestration is one of the benefits of management, and the potential for carbon sequestration differs by the suite of management practices chosen.
- Common high intensity management practices include regeneration with site preparation, pre-commercial thinning, commercial thinning, conversion of natural stands to other species, clear-cutting and planting with genetically-improved stock, and nutrient management.
- Medium intensity management practices include clear-cutting with natural regeneration, partial harvesting, salvage harvesting, stocking control and crop tree release, and fire and pest management.
- Low management practices include maintaining wilderness and special recreation use areas. The U.S. does not intend to include forested lands that are in a largely unmanaged condition, e.g., vast majority of Alaskan forests. These lands experience very little direct anthropogenic influence.

- It is important to note that some practices are applied in combination to increase the overall management intensity to a level above that of an individual practice.

B. Cropland management

- Cropland management includes cropping systems, tillage management practices, crop residue management, use of cover crops, crop rotations, and fertilizer management. Changes in cropping systems would include activities such as shifting from a corn and soybeans rotation to a corn/hay rotation.
- Tillage management practices such as conventional tillage and no-till, a strategy where the soil surface is left undisturbed from harvest until planting the next crop.
- Land use change activities that fall within cropland management include, for example, long-term cropland protection (e.g. Conservation Reserve Program) and conversion of cropland to urban uses.

C. Grazing land management

[USDA – need a description of management, not just changes in management. Please help revise this:]

- Because of the wide diversity of U.S. grazing lands, there are a wide range land management options currently available. Examples of improved grazing land management include: improved rangeland management (e.g. grazing intensity), improved pasture land management (e.g. fertility management, manure application, planting improved species), and improved cattle grazing management on pasture land. Similar to cropland, grazing land use change includes such activities as cropland being enrolled in a long-term cropland protection program (e.g. Conservation Reserve Program) or converting cropland to grazing land.

How proposed additional activities relate to the objective and principles of the Convention and its Kyoto Protocol

- The U.S. believes the broad approach it proposes is most consistent with the principles and objective of the UNFCCC.
- The UNFCCC objective is to achieve stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system.
- including in particular the principles of comprehensiveness and cost-effectiveness.

General U.S. views on narrowly-defined practices and activity-based accounting

- In addition to the general disadvantages of narrow practices over broad activities, the U.S. sees a number of practical problems that would be posed by Narrow Practices under Article 3.4. These problems generally do not arise with broad activities.
- Narrow approaches that include specific land management practices would require complex and arbitrary accounting decisions to implement.

- Most land managers implement a suite of practices simultaneously and therefore, identifying individual management practices or projects and measuring their associated net greenhouse gas emissions is likely to be problematic. Ad hoc attempts to separate the effects of individual practices on net greenhouse gas emissions are likely to be misleading because the effects of individual practices are not additive.
- Land comes in and out of various management practices regularly (often with a different mix of other practices), raising the issue of exactly when the activities trigger accounting for carbon stock changes. Available data may not allow determination of, for example, which land has had a narrowly-defined practice during or since 1990.
- Even if a Party can determine the land area where an activity occurred, the accounting system for the activity would necessarily involve arbitrary decisions. For example, if the system includes land that only experienced the activity for one season (e.g., in 1992) and never since, then much of the accounted removals and emissions could have little to do with that activity. On the other hand, if a rule requires the land to have experienced the activity consistently since 1990, much of the land on which the activity has been applied would be excluded, and thus significant carbon stocks related to the activity would not be counted.
- Even narrowly-defined practices (e.g., conservation tillage) can refer to a wide variety of practices (e.g., reduced-, mulch-, and no-till soil management systems). Thus, it may be very difficult to determine the land base on which the activity is applied and which emissions and removals are associated with it. Databases for narrow practices such as pest and fire management in forests may not be broken out spatially, making land-based accounting almost impossible.
- A limited list of narrow practices could provide incentives to concentrate mitigation efforts in a way that is environmentally inappropriate. For example, if pest management is included as an activity, with few other options, then Parties may have an incentive to invest in pest management to an extent that creates ancillary environmental concerns.
- On the other hand, if a longer list of narrowly-defined practices is adopted, then it would be more straightforward to simply add the broad management activity associated with the land.
- The U.S. believes that narrowly-defined practices that are expressed as "improvements" over conventional practices have significant disadvantages compared to broad activities for consideration under Article 3.4. Conventional practices vary significantly over time and location, making it very difficult to determine objectively what the improvements are relative to. Improvements relative to an historical date could inadvertently penalize Parties and their entities that adopted improved land management strategies early. Finally, the U.S. believes that to encourage net emissions reductions optimally, it is important to include land on which improved management systems have not been adopted.
- Activity-based accounting as described by the IPCC in its Special Report presents a number of practical problems. For example, problems arise when a unit of land is subject to multiple practices (as is often the case), data are not available to separate these practices, and the carbon effects are not additive. Also, if a practice (e.g., conservation tillage) is interrupted for one year, an activity-based accounting system may not reflect the actual changes in carbon stocks. The data collections systems and methods presently used in the U.S. on annual forestry and agricultural practices make it very difficult, if possible, to distinguish among the variety of practices used on a given piece of land. The data cannot distinguish between lands where such practices (e.g., conservation tillage on croplands)

occur annually without interruption, and those where an interruption in the practice has occurred, with potential reversible of carbon benefits.

V. Methodologies for measuring and reporting in relation to Article 3.3 and 3.4 activities

A. Monitoring and measuring

- Parties should develop quality data and measurement systems to account for activities under Articles 3.3 and 3.4. Article 5.1 requires Annex I Parties to have a national system for estimation of sources and sinks in place at least one year prior to the first commitment period. If Parties are unable to directly measure their changes in carbon stocks and emissions of other greenhouse gases, IPCC default values may be used, as is currently done in the emissions inventory.
- Uncertainty in measurements of emissions and removals associated with activities under Articles 3.3 and 3.4 should be treated in the same manner as the 1996 Revised IPCC Guidelines specify for uncertainties in emissions from other sectors. No special discounts should be applied to LULUCF accounts based solely on uncertainty.
- Parties should have flexibility to develop national methods for LULUCF accounts, just as they do for emissions from other sources.

B. Accounting for non-CO₂ GHG emissions and removals

- If activities under Articles 3.3 and 3.4 affect emissions or changes in emissions from GHG sources (both CO₂ and non-CO₂) in Annex A, an issue arises as to whether those should be counted as additions to Parties assigned amounts or be reflected in Annex A inventories.
- The U.S. believes that, in general, non-CO₂ anthropogenic emissions related to LULUCF activities are already reported in the inventories under the UNFCCC and would be covered by Annex A sources in the Kyoto Protocol.
- One LULUCF source of non-CO₂ GHG emissions that is not clearly covered by Annex A is N₂O from forest and urban soils. This could involve, for example, N₂O emissions that arise from fertilization of industrial timberland, lawns, and golf courses. The U.S. suggests that Parties interpret Annex A broadly to include sources of N₂O from forest and urban soils. The U.S. has already been reporting these emissions in its national communications because it estimates N₂O emissions from soils using data on total nitrogen fertilizer [production or sales? Still need input from EPA here], without distinguishing where the fertilizer is ultimately deposited.
- Although emissions and removals of non-CO₂ GHG gases are not included under Articles 3.3 because they cannot be measured as “verifiable changes in carbon stocks,” any non-CO₂ GHG emissions from those Article 3.3 activities are likely to be very small in the U.S.
- The U.S. has very limited data on CH₄ and N₂O from forest burning or other forest management activities not related to nutrient application. We believe such non-CO₂ gas emissions by U.S. forests are minor.
- Wetland soils naturally emit methane. Those emissions are not included in GHG inventories under the Revised 1996 IPCC Guidelines as they have generally been considered natural. To the extent that

human-induced activities convert land to or from wetlands, the methane emissions associated with these lands will change. If methane emissions from wetlands are included under the Kyoto Protocol, Parties could lower methane emissions by destroying wetlands. However, the situation is complicated because large reserves of carbon stored in natural wetlands could be released to the atmosphere as CO₂ when the wetlands are destroyed. Parties that establish or restore wetlands could increase their methane emissions. For these reasons, and because of other vital ecological goods and services provided by wetlands, their preservation by parties should be encouraged. Therefore, the U.S. believes that natural wetland-related methane should continue to be excluded from GHG inventories and the LULUCF accounts that result in contributions to assigned amounts.

- Microbes in soils can also naturally emit CH₄ and N₂O, and remove CH₄. Therefore, land use changes that alter soils can change these emissions. The limited data that are available on natural emissions and removals by soil biota indicate that they are generally small for cropland soils, but could be important over some large areas of grasslands. In particular, U.S. grasslands could provide a significant natural sink for CH₄. The U.S. is not suggesting that such removals be accounted for under the Kyoto Protocol.

VI. Overall accounting approaches in relation to requirements of Article 3.3, 3.4 and 3.7, and regarding inter alia reversibility, natural effects, and accounting interlinkages.

A. General accounting for LULUCF activities

[Put here Sue's equation showing how sinks fit into the overall accounting for targets and emissions]

- Activities under Articles 3.3 and 3.4 should be accounted using land-based accounting, i.e., counting all of the changes in carbon stocks (natural or otherwise) on lands under Article 3.3 and 3.4. As recognized by the IPCC Special Report, a land-based approach is well-suited to broadly-defined activities.
- Accounting for lands under Articles 3.3 and lands under 3.4 should be identical in the second and subsequent periods. For the first commitment period, accounting procedures should be developed to address any overlap between lands under Article 3.3 and lands that could be subject to a phase-in approach under Article 3.4.
- If broad activities are included under Article 3.4, then accounting should commence with the beginning of the commitment period.
- Land that comes into the system under Articles 3.3 and 3.4 should remain in the accounting system indefinitely, as long as there is a chance of any significant changes in carbon stocks. That means that all future emissions and removals should be counted in the commitment periods in which they occur.

B. Accounting for carbon pools

- Relevant carbon pools should be determined through the IPCC Good Practice Guidance and accounted for. For forest management, carbon pools should include: live biomass including roots; litter mass; organic soil carbon to a depth of one meter; logging residue; carbon in harvested wood products and landfills; and carbon in standing dead wood in the forest. For agricultural soils (crop land and grazing land), pools should include carbon in the top 30 cm of soil. Above or below ground plant biomass, harvested materials, or litter and woody debris could be excluded. [USDA – are these

proposed pools right? Are we really saying we won't count any above ground biomass on grazing land? What about shrubby areas?]

- Parties must make a determination which pools for each activity are likely to be going down. All of those carbon pools should be accounted for.
- To the extent that a pool is not changing, or is likely only to increase, then a Party may choose not to count it in the first commitment, assuming the Party has otherwise met data requirements to include additional broad activities under Article 3.4.
- To the extent feasible, the accounting system should reflect the actual emissions from and removals as they occur.
- The U.S. believes the carbon in forest products and landfills are carbon pools that should be accounted for in measuring the carbon stock changes from harvesting. Including these pools in the accounting system encourages managing them to reduce net emissions. Including wood products creates an issue as to how to treat carbon emitted from harvested wood products that cross national borders. The U.S. supports the process scheduled for 2001 that will address this question.

C. Incentives for land management

- The Kyoto Protocol's definitions and accounting system for LULUCF could influence Parties' domestic implementations. However, given the flexibility that parties have in implementing the Protocol, any direct effect of Articles 3.3 and 3.4 on land management incentives would be the result of domestic policies affecting land managers rather than the decisions taken by the CoP/MOP.
- Parties should strive to avoid creating harmful land management incentives and seek to capture environmental co-benefits through their domestic implementation decisions. In particular, Parties should consider the effects of their domestic implementation strategies on biodiversity, air and water quality, the capacity of ecosystems to adapt to climate change, fire and pest disturbances, invasive species, desertification, and the protection of key native terrestrial ecosystems. Parties should also consider ancillary environmental effects that may extend beyond their borders.
- The U.S. notes that the broad activity approach it proposes would account for the emission of GHGs upon conversion of lands from an unmanaged state to a managed state. For example, the conversion of primary native forest to industrial timberland would produce a significant debit at the time of the loss of native forest cover. Net debits could continue for some time as a result of decaying harvest slash and soil disturbances. We believe this approach can provide new incentives to protect carbon reservoirs, particularly those in mature forests.

D. Accounting for changes in land use and rules to address double counting

- If multiple activities included under Articles 3.3 and 3.4 are applied to land, accounting procedures should ensure that the carbon stock changes are counted only once. For example, IPCC Good Practice could set out procedures to avoid double counting, or Parties could choose a single account under which the land is included.
- IPCC Good Practice should also develop procedures to account for land that is converted from an unmanaged state to one of the managed land categories under Article 3.4 or converted from forest,

crop, or grazing land to urban purposes. The procedures should account for carbon lost upon conversion, but carbon that is not actually emitted should not be debited. For example, not all carbon necessarily disappears from land that is converted to housing developments.

E. Phase-in Approaches for the first commitment period

- The Kyoto Protocol text of Article 3.4 requires that all additional activities will be included in the second period. Thus, a priority for the design of Article 3.4 should be to get the system right for the second and subsequent periods. The U.S. believes this is best done by including comprehensive, broadly defined land management activities. This approach should include comprehensive accounting of all pools and all relevant GHG emissions and removals related to Article 3.4 lands.
- Recognizing particular concerns about comprehensive accounting in the first commitment period, the U.S. proposes a one period phase-in approach.
- The U.S. strongly recommends that any phase-in approach that is adopted:
 - Be simple and transparent,
 - Preserve incentives to reduce emissions, increase removals, and protect carbon reservoirs,
 - Take full GHG accounts as its point of departure, and
 - Encourage the development of appropriate measurement, monitoring, and verification infrastructure by Annex I Parties.
- The U.S. believes at least two general approaches could be appropriate. Accounting procedures could apply a discount to certain activity accounts, or count only net removals above a pre-determined threshold. The U.S. also welcomes discussion of other approaches.
- Discount example?
- Threshold example?
- Given that much of the concern regarding comprehensive accounting in the first commitment period involves the scale of possible net removals from broad activities, the U.S. suggests applying the phase-in accounting system only to the most significant activities from a carbon removal standpoint. For the U.S., this is clearly forest management.
- Crop and grazing land management will likely produce less than 5% of total U.S. net removals, even with above-BAU effort. Another rationale for excluding crop and grazing land management from the phase-in approach is that those carbon removals largely derive from improved management systems, whereas some forest removals are more likely to be due to natural or indirect human effects.
- The U.S. notes that its proposal for a phase-in approach is limited to the first commitment period. For subsequent commitment periods, the full GHG accounts for broad activities should apply.

F. How additional activities should be included in the first and subsequent commitment periods

- Parties should choose which additional activities under Article 3.4 that they intend to count for the first commitment period by the beginning of the first commitment period. This avoids allowing Parties to choose activities based on carbon stock changes that have already occurred. [Parties only have a choice about whether to include activities in the first commitment period. The COP/MOP decisions under Article 3.4 shall apply to all parties in subsequent periods.]

- Parties should have the option to add activities or change approaches to LULUCF over time, at the end of each commitment period, prior to the start of the subsequent period. Changes in the Protocol's approach to LULUCF could occur as early as the establishment of second commitment period targets.
- Parties may choose not to account for broad land management activities in the first commitment period. However, the U.S. encourages such Parties to prepare full GHG accounts for their broad activities for the first commitment period anyway, to help prepare for a broader accounting approach in the second and subsequent commitment periods.
- Parties that do not have national systems to adequately measure, monitor, verify, and report data for additional activities under Article 3.4 during the first commitment period should not be able to apply those activities in the first period. Those Parties should work towards developing adequate national systems, and starting with the second commitment period all Annex I Parties should properly comply with Article 5, 7, and 8 requirements related to all LULUCF activities under Articles 3.3 and 3.4.

G. Impermanence and leakage

- Impermanence of sinks is not an issue for Articles 3.3 and 3.4 with the broad activity approach as long as commitment periods are contiguous in time and included land remains in the accounting system. The U.S. strongly supports these approaches. U.S. views on accounting are addressed in more detail in the sections above (e.g., Section A).
- The issue of leakage argues for a broad approach and contiguous commitment periods.

H. LULUCF accounting and natural and indirect effects

- The IPCC Special Report notes a large terrestrial carbon uptake from land-use practices and natural regrowth in middle and high latitudes, the indirect effects of human activities (e.g., atmospheric CO₂ fertilization and nutrient deposition), and changing climate (both natural and anthropogenic) (paragraph 8 of the Summary for Policymakers). The IPCC Special Report notes that it is not possible to determine the relative importance of these different processes, which also vary from region to region, and also notes the considerable uncertainty in the size of this indirectly deduced terrestrial carbon sink.
- The U.S. believes that measurable, verifiable changes in carbon stocks should be the focus of policy development for LULUCF under the Kyoto Protocol. To the extent that Parties are concerned about the role of natural and indirect effects in producing changes in carbon stocks, then the science can inform decisionmaking in the context of negotiated outcomes.
- In no case can a Party should GHG inventory methods rely on deduced measurements of carbon stock changes for compliance with Articles 5, 7, and 8.
- The U.S. does not believe that complex methods of simultaneously factoring out natural and indirect factors from other changes in stocks during the commitment period would be workable.

I. The relationships between Articles 3.3 and 3.4 and other Articles of the Protocol

- Decisions on Article 3.3 and 3.4 activities should not prejudice forest project eligibility or accounting under the Clean Development Mechanism.

- LULUCF activities account for a significant share of GHG emissions globally. Substantial opportunities exist to enhance sinks in developing countries, for example through afforestation and restoration of degraded lands, reduced deforestation, improved forest management and improved agricultural and grazing practices.
- LULUCF projects can contribute to broader regional distribution of CDM projects, and produce significant co-benefits.
- The U.S. believes LULUCF projects share many of same issues as other types of CDM/JI projects, including determining environmental additionality, monitoring, and addressing leakage. In addition, sinks projects involve the issue of permanence or reversibility. The U.S. believes these problems can be addressed through appropriate rules and project designs and welcomes discussions on solutions to these issues.
- The U.S. elaborates its views on LULUCF activities and Article 12 in its August 1 submission on Kyoto Protocol mechanisms.

J. Views on Article 3.7

- Article 3.7 allows certain Parties to “include in their 1990 emissions base year or period, the aggregate anthropogenic carbon dioxide equivalent emissions minus removals in 1990 from land use change for the purposes of calculating their assigned amount. This section describes U.S. views on how this inclusion should be implemented.
- In describing our views, we first note that land use change (LUC) accounting under Article 3.7 will have important differences from accounting for ARD under Article 3.3:
 - Parties may choose definitions for ARD that do not constitute long term changes in land use. For example, even if Parties choose the FAO definition of reforestation under Article 3.3, such an approach would not be appropriate for calculating LUC emissions and removals under Article 3.7.
 - LUC-related emissions or removals under Article 3.7 must be anthropogenic. Emissions and removals accounted under Articles 3.3 may not necessarily be anthropogenic. Under Article 3.3 it is the activities that are direct human-induced, not necessarily the emissions and removals.
 - Activities under Article 3.3 must be measured as verifiable changes in carbon stocks, but LUC under Article 3.7 involves “emissions minus removals,” a more general approach.
 - In particular, LUC under Article 3.7 includes LUC-related emissions or removals of non-CO₂ gases, which Article 3.3 does not.
 - LUC under Article 3.7 includes the conversion of land to or from non-forest land types, such as woody savannas and grasslands, which Article 3.3 does not.
- The calculation of net emissions from land use change (LUC) should cover a single year, calendar 1990.

- The interpretation of LUC for purposes of Article 3.7 should involve long term changes in land use consistent with IPCC Guidelines.

VII. Country-specific Data: Tables and Explanatory Text

[Insert file Table 1.doc]

[Insert file Table 2.doc]

[Insert file Table 3.doc]

VIII. Textual proposals

~~15~~ *Option A is neutral*
Linkage Option
B. Reforestation

The U.S. recognizes that the term "reforestation" can be defined and accounted for in several possible ways. The definitional approaches featured in the IPCC LULUCF report include:

- *IPCC Approach*: Forest establishment on land that has a history of forest cover but has been deforested for some extended period of time. This definition is expressed in terms of a land-use change.
- *FAO-Activity Based Approach*: Forest establishment of any type, including re-establishment of forest cover on forest lands that have recently been harvested. Under this approach, the effects of prior activities on emissions are not counted (including emissions from harvesting). *91 million tons*
- *FAO-Land Based II Approach*: Same as FAO-Activity Based approach except that all emissions and removals count that occurred during the relevant time period on the land area that has been reforested (in particular, emissions due to continued decomposition of the harvest slash).

The IPCC Definitional Approach

With regard to the IPCC definitional scenario, the United States has the following general observations:

- The U.S. views the IPCC Glossary definition of "reforestation" as a special case of afforestation. Therefore, Part A of Table One (addressing the IPCC definition) does not distinguish between afforestation and reforestation.
- Some of the benefits of the IPCC definitional approach include the following:
 - The IPCC definitional approach for reforestation clearly separates land-use changes into and out of forest use from other activities that affect emissions and removals from forests.
 - For forest lands undergoing a change in land use, the IPCC definitional scenario, combined with a land-based accounting system covering the commitment period, should accurately reflect exchanges of greenhouse gases between the converted forest (including its above- and below-ground biomass, soils, and products) and the atmosphere.
 - The IPCC approach provides consistent incentives for Annex I Parties to reduce deforestation and promote afforestation and reforestation to mitigate climate change.
- However, it should be recognized that the IPCC approach to reforestation leaves the vast majority of anthropogenic emissions and removals of greenhouse gases from forestry activities unaccounted for. The U.S. views this as a serious weakness of the IPCC definitional approach. Therefore, if this approach to Article 3.3 were adopted, then

forestry activities would need to be included more generally in the Protocol pursuant to Article 3.4, as the United States proposes.

- The limited nature of the IPCC definitional approach for the United States is illustrated by the fact that only about 6% of U.S. managed forests would be included in the Kyoto Protocol accounting system under Article 3.3.
- Even though U.S. managed forests remove very large amounts of GHGs, the U.S. would likely experience a net debit under Article 3.3 under the IPCC definitional approach, assuming business as usual.
- Although the U.S. could in theory take additional action to reduce deforestation and encourage afforestation, such actions are unlikely to provide significant potential to mitigate net emissions in the first commitment period.

The FAO Definitional Approach

- The U.S. believes that the negotiating history of Article 3.3 provides some support for other definitions of reforestation, in particular the FAO definition.
- As Table One indicates, under the FAO definitional approach, the United States would receive significant net credits during the first commitment period, in contrast to net debits of between 0 and 17 MMTCE under the IPCC definitional approach.
- Table One includes both the FAO Land-Based II approach and the FAO Activity-Based Approach (Table One, Parts B and C). Under the FAO Land-Based II approach, the United States would receive credits of between 66 and 102 MMTCE during the first commitment period. Under the FAO Activity-Based approach, the U.S. would receive credits of between 137 and 185 MMTCE during the first commitment period. For the reasons explained in section xx above/below, the United States does not support activity-based accounting under either Article 3.3 or 3.4.
- The United States recognizes that the FAO definitional approach raises significant issues - in particular, it could allow countries to receive credits from a forest area that experiences a significant loss of carbon during the commitment period (as a result of harvesting). Because of the problems raised by the FAO definition, the United States strongly supports the broader inclusion of forestry activities under Article 3.4 of the Protocol, so that both emissions and removals resulting from forestry activities are counted in a comprehensive and symmetric manner.

Conclusion

- Given the negotiating history of the Kyoto Protocol, which supports a broader inclusion of forestry activities - in particular, reforestation after harvest - the U.S. believes that there is an important connection between the decisions regarding forests under Articles 3.3 and 3.4. Thus, if the more limited IPCC definitional approach is adopted for Article 3.3, it would be necessary to include forest management activities more broadly under Article 3.4.

E. Phase-in Approaches for the first commitment period

- The Kyoto Protocol requires that any decision regarding the inclusion of additional sink activities under Article 3.4 shall apply in the second and subsequent commitment periods. For this reason, a priority for Article 3.4 decisionmaking should be to get the system right for the long-term. As explained in section xx above, the U.S. believes that this would be best accomplished through the inclusion of broadly-defined land management activities, combined with comprehensive accounting of all pools and all relevant GHG emissions and removals related to Article 3.4 lands.

- The United States recognizes that the emissions reduction targets set forth in Article 3.1 of the Protocol were adopted without knowledge of what decisions would be taken by the Parties regarding the inclusion of additional sink activities under Article 3.4, and that decisions under Article 3.4 will have implications for the achievement by Parties of their first commitment period reduction targets. In particular, the U.S. notes that some Parties have expressed concern that the inclusion of additional sink activities under Article 3.4 could undermine the first commitment period targets contained in Article 3.1.

- In light of these considerations, the U.S. proposes a first commitment period phase-in approach. Appropriately designed, a phase-in could limit the implications of additional sink activities for first commitment period targets, as well as the implications of business-as-usual sequestrations and natural or indirect human effects.

- The U.S. strongly recommends that any phase-in approach:

- Be simple and transparent.
- Preserve incentives to reduce emissions, increase removals, and protect carbon reservoirs.
- Take full GHG accounts as its point of departure.
- Encourage the development of appropriate measurement, monitoring, and verification systems by Annex I Parties.

- A first commitment period phase-in could be structured in several ways. One possible approach would to allow countries to receive credits only for net removals above a pre-determined threshold. Another possible approach would be to apply a discount rate to credits under Article 3.4. The U.S. would welcome other proposals for how a first commitment period phase-in could be structured. Further discussion will be needed to determine which approach is most appropriate and how any particular threshold, discount rate or other phase-in factor would be determined.
- Given that much of the concern regarding comprehensive GHG accounting in the first commitment period involves the scale of possible net removals under a broad-activities based approach, the U.S. proposes that the first commitment period phase-in be limited only to the most significant activities from a carbon removal standpoint.

- For the U.S., forest management accounts for approximately xx% of total U.S. net removals, and is clearly the most significant activity. In contrast, crop and grazing land management will likely produce less than 5% of total U.S. net removals, even with increased effort. For this reason, the phase-in approach, for the U.S., should be limited to forest management.
- A more general rationale for excluding crop and grazing land management from the phase-in approach is that those carbon removals largely derive from improved management systems, whereas some forest removals are more likely to be due to natural or indirect human effects.
- The U.S. notes that its proposal for a phase-in approach is limited to the first commitment period. For subsequent commitment periods, comprehensive GHG accounting should apply.

* Adele
* Ian

**A/S Climate Change Meeting:
August 1 Sinks Submission**

July 21, 2000, 3:30-5:00 PM, Rm. 7835

*Written Comments
on Draft
Submission*

Call Adele Masnie

1. Background

Our proposals regarding carbon sinks under the Kyoto Protocol are due on August 1, and must address the following key issues:

- the definitions of afforestation, reforestation and deforestation (ARD) under Article 3.3, and
- whether to include additional sink activities under Article 3.4 and, if so, which ones
- accounting rules for sink activities.

*Include 3.4 comprehensive
Submission 3.3 under it.*

A copy of the draft submission is attached for your review. It reflects our discussions at previous meetings, as well as additional inter-agency consultation. The key open issue relates to Article 3.3, in particular, whether to endorse the IPCC definition of reforestation, or continue to remain neutral between the FAO and IPCC definitions. A deputies meeting is scheduled for next Tuesday, July 25, to address this issue. Our meeting on Friday will review the submission generally, and address any other remaining issues.



Highlights of the submission include the following:

- Comprehensive carbon stock accounting for the long-term, through the inclusion of broad sink activities under Article 3.4. Proposed activities will include forest management, cropland management, and grazing land management. The BAU carbon stock changes resulting from these activities during the first commitment period are projected to be about 300 MMTCE per year (approximately 30% of our 1990 base year emissions), virtually all from forests.
- A phase-in during the first commitment period, to counter arguments that comprehensive carbon stock accounting would undermine the emissions reductions targets in the Kyoto Protocol. Under the first commitment period phase-in, parties would be allowed to claim only a share of the total carbon stock changes on managed lands. Possible phase-in approaches include: (a) counting changes in carbon stocks only above a pre-defined threshold, or (b) applying a discount rate, for example, to factor out sequestrations due to indirect human effects such as carbon fertilization.

We do not plan to address the issue of sinks in the CDM in our August 1 submission, since we believe that this issue should be addressed in the mechanisms group.

2. Issues

*General terms / a phase-in of
compensation*

Issue 1: How specific should the U.S. submission be with regard to a possible phase-in approach?

Options (from less to more specific):

- Give no specific numbers or equations, but indicate (as we did in our Poland presentation) that a phase-in could be implemented using a discount rate or threshold or some other general approach.
- Indicate which general phase-in approach the U.S. prefers (e.g. discount or threshold or other), but do not include any calculations for specific examples for the U.S.
- Choose a phase-in approach and show a range of calculated accounts for the U.S. by applying different specific parameter assumptions.
- Choose a phase-in approach and show one set of calculated credits for the U.S. with that general approach by applying one specific parameter assumption. This is the "opening bid" approach.

*Discounts
Thresholds*

Proposed approach

- Elaborate the phase-in only in general terms, without advocating any particular approach or specifying how many tons of carbon we would expect to be able to claim.
- Leave until later in the negotiations the choice of approach (thresholds, discount rates, etc.), as well as any specific number or equations that would be used to calculate thresholds or discount rates.

*Rational for phase-in?
1st commitment targets already
existed.*

Pros

- Requires fewer decisions now.
- Leaves negotiators flexible to respond to others' views.
- Doesn't show the US hand on how many BAU tons we could be seeking.
- Avoids the need to pick a specific number, which will be very difficult. Since any number we put forward would likely become the starting point of the negotiations, we need to put forward a higher number than our bottom line. However, a high number would attract significant criticism, in particular from environmental groups.

*Phase-in -
~~commitment~~*

Cons

- May raise suspicions that we want to claim large BAU sinks.
- May be criticized for not completing all parts of the data tables agreed at SBSTA 12.

If we were to be more specific in our August 1 submission, we would need to further consider:

- The pros and cons of various possible phase-in approaches.
- The relative roles of scientific vs. political factors in defining possible thresholds or discount rates.
- Specific methodologies for constructing baselines or choosing discount rates (for example, setting thresholds based on BAU).

Issue 2: Should the US submission propose a rule that would restrict crediting for conversion of old growth forests, native grasslands or other native habitat?

Option:

- Propose rule excluding credits under Articles 3.3 or 3.4 for conversion of native habitats.
- Articulate general support for further discussion of such a rule, but note a reluctance to add a myriad of complex rules that could be difficult to apply.
- Be silent on this issue.

Discussion:

The EU, some Umbrella Group countries, and a number of environmental NGOs have supported this approach. The US currently converts little old growth forest and almost no native grasslands to other uses. Canada, however, does significantly log old growth forests.

To some degree, conversions of old growth forests and other native habitats would be discouraged, to the extent that they released carbon into the atmosphere during the commitment period. A rule prohibiting credits would further discourage such activities.

Pros of proposing a rule:

- Could address an important concern of NGOs.
- Forest industry would not be likely to oppose, since it would have little effect on them.

Cons:

- Could open the door to other, more problematic, rules.
- Limitation of regrowth credit could reduce regeneration just as much as it discourages conversion.
- May be difficult to define and identify which land should qualify for special accounting treatment. Land types could include primary native forests, wetlands, and native grasslands. We would likely have to gather additional data and add some special tracking features to implement such a rule.

+ Real
+ Additional
+ Long-term

Legally difficult to exclude deforestation

Tropical Forests and the CDM

- John O. Niles, staff scientist

Center for Conservation Biology

Stanford University - jniles@bing.stanford.edu

[Need to include forest conservation]

- Annie Petsonk, senior legal advisor

Environmental Defense Annie_Petsonk@edf.org

Land Parameters

Triple Punch

tropical forest conservation

reduces emissions
10-30% worldwide

maintains sink
1 gained per 10 protected

stabilizes land surface
1) warming not = GHG
2) @ equator
3) forests are cool

*Neo tropics →
.6 quads of U.S.*

*6 GHG in the basket
Climate change not GHG
strictly.*

AGENDA

- legal analysis/interpretation
- Biology & physics 101
- Market potential $\rightarrow$ *definitions*
- Long-term requirement
- Liability issues
- Results from Madagascar [*5 studies from 5 countries*]

Kyoto Protocol's Article 12

- Certified Emission Reductions (CERs)
- sinks not mentioned
- linked with other Articles?
- long-term
- sectors not mentioned
- **CONCLUSION - - legally difficult to exclude forest conservation from CDM**

One gained for ten....?

907,389,000	Ha of neotropical forests ⁽¹⁾
620,000,000	C-tons sequester/year ⁽²⁾
0.68	C-tons/ha/year
13.67	Sink for 20 years?
130	Average C/ha for neotropics
10.5%	"Bonus" sink %

1) *FAO, 1999.* 2) *Phillips et al. 1999. Science 282:439-442.*

to try sinks
in CDM.

Forestry ~~and~~ Conservation

Perimeter Forests
[Protect core.
Different environment
opportunities]

multi-component forestry

Plantations -

- less risks
- improved performance
- higher participation - both Parties
- improved financial strength

[WRI -
If CDM moves ahead **

10% per year

40 million

[300-400 reduction
for U.S.

Estimate of forest conservation potential in CDM

10.2 million hectares being lost

100 C tons lost when deforested

8% of potential emissions addressed

31% of projects meet Article 12's req'mnts

Emissions Avoided: 40 million C tons/year

How long is long term?

~ 30-50 years ~

Handwritten notes:
[Natural
cheap
Non G4G technologies

– atmospheric retention

– structural changes in incentives/tech.

– precedent

Liability

- seller liability more efficient
- impure schemes increase participation
- incremental funding possible
- developing countries retain control
- price “negotiated” for success

Create incentives that
last →
The longer you keep
you make developing countries
liable
Hold credit in a
separate facility
or bank.

EDF + Wrenrock
Regional forest banks

Case Study: Madagascar

- Madagascar should log - even after AID
- \$20 damage function/C ton
- world underpaying by \$10-50 million
- CDM only policy to redress

Conclusions

- include forest conservation
- irreversible so use precaution
- benefits not valued under Kyoto
- no other policy
- respectable start to LULUCF

Discussion

- immediate research needs
- how to clarify the issue
- suggestions for scientific community

The long-term requirement for CDM forestry and economic liability

By Reimund Schwarze and John O. Niles¹

Abstract

The Clean Development Mechanism (CDM) of the Kyoto Protocol allows developed countries to gain greenhouse gas emission reduction credits by sponsoring projects in developing countries. The CDM requires that credits for emission reductions only be granted to projects that produce long-term benefits to climate change. However, countries that host CDM projects may be reluctant to engage in long-term projects for fear of sacrificing national sovereignty, a concern particularly acute in land use efforts such as forest conservation. One solution to this is to use economic liability in CDM contracts, which delays payments to parties to encourage long-term contracting. In this paper, we evaluate CDM-sponsored forest conservation using several types of economic liability schemes (or contracts). We find that one type of liability -- seller liability -- has intrinsic advantages over other types of liability contracts. We then propose a modified seller liability contract for CDM forestry that is more profitable to host countries than pure seller liability, while still providing sufficient long-term incentives. If long-term contracting can be done efficiently and equitably, we suggest more CDM-sponsored forest conservation could occur in the near future and other challenges in climate change policy can be overcome.

1. Introduction

The Clean Development Mechanism (CDM) is an instrument of international cooperation within the Kyoto Protocol to the United Nations Framework Convention on Climate Change. The primary purpose of the CDM is to assist developing countries, called Non-Annex I countries in the Protocol, achieve sustainable development while stabilizing greenhouse gas concentrations in the atmosphere. The CDM's second purpose is to assist industrialized countries (Annex I countries) achieve the emission reduction commitments that they agreed to under the terms of the Protocol. Under the CDM, Annex I-parties may fund emission reduction projects in amenable Non-Annex I countries and get credit for Certified Emission Reductions (CERs) from these projects. These CERs can then be used to meet the commitments of the Annex I countries. Due to the "flexible" nature of CDM, most CERs will probably cost less than domestic Annex I reductions. As such, these CERs will likely lower the cost of meeting the Kyoto Protocol's target reductions.

A major field of application for the CDM is tropical forest conservation. Tropical deforestation causes approximately 20-30% of worldwide greenhouse gas (GHG) emissions (Brown et al., 1996 and Houghton, 1999).

¹ Dr. Reimund Schwarze (email: Reimund.Schwarze@TU-Berlin.DE) is assistant professor for environmental economics at the University of Technology Berlin and was a visiting researcher at the Center for Environmental Science and Policy of Stanford University. John O. Niles (jniles@bing.stanford.edu) is a staff scientist at the Center of Conservation Biology at Stanford University and a doctoral student at the University of California, Berkeley. Financial support from the Thyssen Foundation (RS), the Morrison Institute for Population and Resource Studies, the Heinz Foundation and the Stanford Center for Conservation Biology (JN) is gratefully acknowledged.

Stopping or slowing the rate of deforestation compared to a business-as-usual scenario will reduce emissions of GHGs into the atmosphere. In this regard, forest conservation is quite different from forestry sequestration activities (such as re-planting) that increase the uptake of carbon from the atmosphere.² Due to the relatively low cost of forest conservation and reforestation in the tropics (Halsnaes et al., 1996) CDM forestry is a topic of considerable debate.³ Other probable applications of the CDM will be in areas of energy efficiency, power-plant upgrades, transportation projects and other activities that verifiably reduce GHG emissions.

One of the unique legal stipulations of the CDM is that emission reduction projects must achieve "real, measurable and long-term environmental benefits" if they are to be credited (and therefore be valuable). A few problems arise out of this "long-term" requirement that are unique to land-use projects. First, host countries may be reluctant to commit to forest protection for long periods of time. A developing country might want to leave its land use options open to accommodate future changes in its national development priorities or to be able to respond to changes in commodity prices, land tenure, or social conditions. A second problem is that a forest protected one year (over a baseline scenario) may easily be degraded the following year. Consequently, emission reductions in land use programs may be more transitory than emission reductions in technology-based programs. Long-term forest protection is particularly at risk if the certified emission reductions (CERs) and the host-country payments are granted early in a project. In this case neither party has a substantial interest in sustained forest protection since credits and payments would already have been collected. These concerns and others have led some people to suggest that the CDM should not allow forest conservation as a project type, or at least the CERs generated by forest protection should be discounted. Yet the CDM, if it leads to real and lasting increased tropical forest conservation, could be a powerful new way to finance sustainable development. Investors from wealthy countries would be teemed up with developing countries that want to conserve their natural resources but are unable to give up the income associated with logging or agriculture (Kremen et al, 2000). Since the Kyoto Protocol requires that CERs be real, additional and independently monitored, this will in essence make actual on-the-ground forest conservation profitable. This is a dramatically

² While both source prevention (i.e. stopping deforestation) and sink enhancement (growing new forests or increasing the biomass of existing forests) achieve the same net result on the balance of GHGs, we discuss only source prevention. We do this in part due to the language of article 12 of the Protocol ("certified emission reductions") as well as to avoid the ethical issue of Annex 1 countries buying entitlements to pollute by growing large plantations in developing countries.

³ In addition to the accounting-based issues discussed here, there are considerable ethical and legal issues that are discussed elsewhere. See Vine and Sathaye, 1997, Brown and Kete, 1998, Cullet and Kameri-Mbote, 1998, Goldberg, 1998, Mulongoy et al., 1998, Niles and Schwarze, 2000.

different approach to traditional aid-based financing that does not explicitly tie financing to measured results. Perhaps this is the reason that despite more than 100 international efforts and agreements, tropical forests continue to be lost at the tragic rate of 15 million hectares per year (FAO, 1999).

There are other benefits to conserving tropical forests as well. In terms of mitigating climate change, forest protection not only prevents GHG emissions but it also maintains a land surface at the equator with a stabilizing impact on many climate parameters (Niles and Schwarze, 2000). Additionally, vast amounts of endangered biological and cultural diversity are located in tropical forests.

And so an important challenge facing parties that want to stall climate change is how to design contracts within the Kyoto Protocol to reward long-term tropical forest protection.⁴ If specific accounting and macro-economic tools can be developed that foster long-term forest conservation, the CDM could emerge as a potentially powerful new way to finance sustainable development. These contracts would be paid for by wealthy countries and carried out in poorer countries that want economic assistance to safeguard forests that would otherwise be degraded.

Legal liability

One solution is to allow the courts or other legal channels to decide the consequences of contract failure. If a CDM project to protect a forest fails after a short period, one party could sue the other, invoke trade sanctions, or pursue other legal remedies to either force compliance or collect a fine. Legal liability and sanctions, however, are difficult to implement in global environmental regulation (Wiener, J.B., 1999). Additionally, legal liability imposes some measure of lost decision making at the national level and could create some land-tenure uncertainty in general. Some developing countries have pointed out that courts or other multi-lateral institutions could try to force adherence to a CDM contract. While this infringement on national decision making is applicable to all CDM project types, the problem is potentially more acute in land-use. Thus, while both a host country and a donor country must agree to start conserving a forest under the auspices of the CDM, they may object to a legal framework to force long-term contracting. Moreover, international legal liability could cause high litigation and other transaction costs.

⁴ The problem of achieving lasting emission reductions from CDM projects is actually not a specific problem of CDM forestry but applies to other mitigation activities as well, e.g. energy efficiency projects. The reasoning in this paper could be easily generalized to these cases if the long-term requirement of Art. 12 KP is interpreted in the way as it is done in this paper, i.e. as a minimum period of contract duration.

Economic Liability

Another way to encourage long-term conservation is to delay the payments to either the host or the sponsor country. By having its benefits withheld until "long-term protection" has been achieved, a party has an economic incentive to sustain forest conservation. We refer to this procedure as assigning economic liability, which is the focus of this paper.⁵ Economic liability encourages long-term participation but does not demand it legally. If one of the parties in a contract wants to disengage from a CDM project, they can look at what was being withheld from them, what they can gain by breaking the contract, and then determine which is better. In this regard, economic liability makes the consequences of a broken or failed contract clear and transparent. Under economic liability for example, host countries can change their development priorities (say, and sell logging rights to a forest they had placed under CDM conservation). In doing so they won't face any legal challenges to their decision. What they will give up is the portion of the proceeds that they were to receive had they kept their forest in long-term protection.

Economic liability conceptually resembles an assurance bonding system, which has been discussed as a flexible tool to enforce environmental liability (Perrings, 1989; Constanza and Perrings, 1990) and labor contracts (Becker and Stigler, 1974; Akerlof and Katz, 1989).⁶ In contrast to this general principal-agent literature, our paper is concerned with a specific enforcement problem – contract duration – in the legal setting of Article 12 (the Article that defines the Clean Development Mechanism) of the Kyoto Protocol. Under the CDM, two questions must be answered before economic liability can be used. First, who is held responsible (liable) for an emission reduction contract? And second, when should the benefits from the contract be disbursed to the different parties? This paper examines these two issues through a series of discussions, examples and analyses.

We begin in section 2 by discussing the question "how long should 'long-term' be for climate change mitigation projects"? From a variety of perspectives, we conclude that a 30-50 year timeframe is reasonable. In section 3, we introduce and define three basic types of contracts that can foster sustained emission reductions, i.e. buyer liability, seller liability and double liability. We then develop a hypothetical model forest conservation project undertaken under the auspices of the CDM that uses these different liability schemes. In section 4, we show that one type of economic liability (seller-liability) has a fundamental efficiency advantage over other types of liability. We

⁵ Most of our results also apply to an accounting procedure based on certification. Certification rules, however, are less suitable as an incentive scheme compared to crediting rules because they can not be easily disintegrated to have a piece-meal approach as in the case of crediting rules.

explain how this is caused by the "no borrowing" provision of the Protocol and also because only certain countries agreed to specific emission reduction targets. In section 5, we propose a hybrid type of seller liability that we call a forest-secured escrow account. This contract type increases the internal rate of return to potential sellers without unduly diluting the incentive to maintain long-term forest conservation. Section 6 summarizes our results and discusses the implications of applying an escrow account, or any form of economic seller liability, to enforce the long-term requirement of the CDM.

2. The long-term requirement of the Clean Development Mechanism

How long should 'long-term' be in the case of CDM forestry projects? Article 12(4) of the Protocol only states that emission reductions under the CDM "shall be certified on the basis of real, measurable and *long-term* benefits to the mitigation of climate change". The Protocol does not provide any further guidance on what is meant by long-term -- but it does clearly require that emission reduction projects must have some long-term assurance. Thus, it seems unlikely that year-to-year CDM projects will be certifiable since they fail the durability litmus test. It is also possible that long-term contracts will be intrinsically more efficient since individual year-by-year contracts would probably have relatively higher transaction costs.

But what exactly does "long-term" mean? Does the CDM's long-term requirement imply permanence? As discussed in the introduction, permanent conservation could be unacceptable to potential CDM host countries. The permanent protection of a forest could be perceived by developing countries as a *de-facto* expropriation, or at least a forfeiture of control. Several key developing countries such as Brazil have expressed exactly this objection to the CDM, arguing it would limit their ability to make "domestic decisions domestically" (MCT, 1999).

From a scientific point of view, 'long-term' could be logically interpreted to suggest a project should endure the minimum time that it takes for a GHG emission to decay in the atmosphere, e.g. 50-200 years for carbon dioxide (IPCC, 1994). While delaying emissions would be financially advantageous for Annex I-countries (because they can use CERs to offset their duty to reduce emissions domestically), postponed emissions will not necessarily help stabilize atmospheric greenhouse gas concentrations.

⁶ We are grateful for an anonymous referee of this journal, who made us aware of this pertinent stream of literature.

Less than permanence, however, could be sufficient if we approach this question of duration from a socio-political point of view. If GHG emissions are reduced for a period of time while alternative abatement strategies become widespread, delayed emissions will provide an important "bridge" to future atmospheric GHG stabilization. In this sense, the long-term requirement is justified and defined by the expectation that structural changes in the world economy and technology will arise at a later date. These changes could be the emergence of new technologies or an increased valuation of forests outside of their role in climate change mitigation. Widespread adoption of low-carbon technologies such as solar or wind power will be cheaper in the coming decades (for references see Wigley et al, 1996). Thus, even semi-permanent reductions *now* will help transition into more lasting reductions *later*. Alternatively, the value of tropical forests may rise in the future such that deforestation is no longer an economically attractive activity. This increase could either be in the form of domestic values (i.e., watershed protection) or external values (i.e., biotechnology companies paying higher amounts for natural genetic biodiversity). Thus, forest conservation under the CDM could help stall global warming by delaying emissions until the incentive to deforest is lost or low carbon technologies develop and become widely adopted.

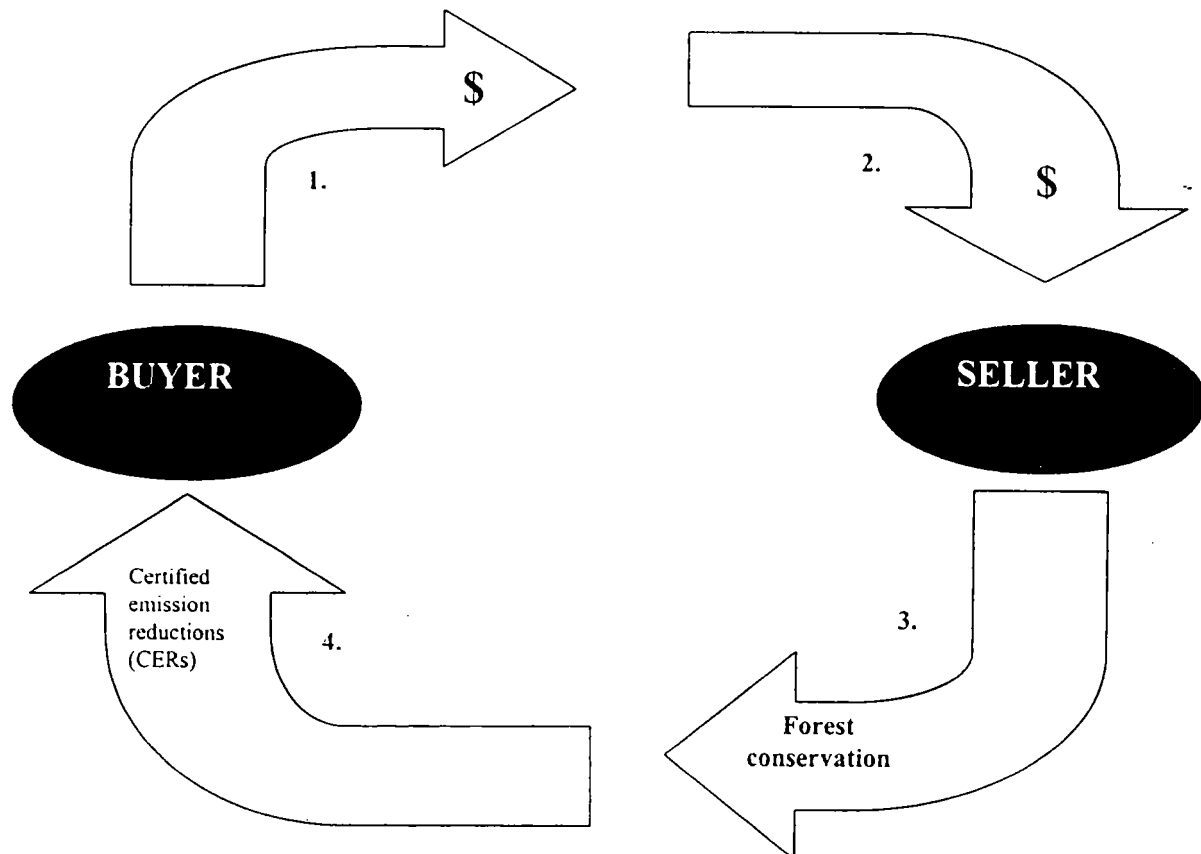
Another way to establish the minimum amount of time for the long-term requirement is to consider the precedent that was established in the pilot phase of Activities Implemented Jointly (AIJ). Both AIJ and the CDM mandated "real, measurable and long term environmental benefits". According to our study, the average duration of AIJ forestry projects is 39 years with a median duration of 32.5 years.

Together, these arguments suggest that a minimum period of 30-50 years would be a practical period of time for the CDM's long-term requirement. To summarize, this suggestion is based on the minimum amount of time for CO₂ to begin decaying in the atmosphere, the expectation that new technologies will become cost-effective in a few decades, and on the precedent that was established under AIJ which also required long-term benefits for climate change.

3. Basic types of economic liability contracts

We can think of a CDM-project as having four distinct contractual procedures (see Fig. 1).

Figure 1. CDM contractual procedures



1. The donor country ("buyer") funds a project according to some specified payment schedule.
2. The host country ("seller") receives payments from this fund according to a specified schedule.
3. In exchange for this payment, the host increases forest conservation over a baseline rate, thus preventing the emission of greenhouse gases.
4. The donor country is credited for these emission reductions in the form of Certified Emission Reductions (CERs).

For the purpose of establishing economic liability, any of these contractual procedures can be decoupled from one another and tied to a stipulation. For example, any of these four actions can be explicitly tied to long-term forest

conservation, mandating that the procedure only happen once sustained protection is verified. From these contractual procedures then, we can distinguish four contract types to assign liability (see Table 1).

Table 1. Basic contract types

Donor Host	<i>Continuous crediting</i>	<i>Terminal crediting</i>
<i>Continuous crediting</i>	No liability (service contract)	Buyer liability
<i>Terminal crediting</i>	Seller liability	Double liability

A *service contract* credits the host and the donor continuously. This "pay as you go"-scheme does not impose any kind of economic liability. In fact, under a "pay as you go"-scheme, a long-term contract is separated into a sequence of single service contracts, each in the amount of *annually* reduced emissions. All other contracts impose some kind of economic liability to one or both of the parties. Let us examine each of these contract types (or schemes) in more detail with particular consideration for CDM forest-conservation.

Buyer-liability is when the buyer of emission reductions, in this case a developed Annex I country, does not receive certified emission reductions (CERs) until the end of the long-term period. In other words, buyer liability uncouples the donor's payment to the host from the donor's receipt of CERs (see Figure 1). Because of discounting and a decreasing value of money with time, payments that are delayed reduce the net present value of the emission reductions being organized. Under buyer liability, this decrease in value is born solely by the purchaser of emission reductions (i.e., the buyer). Meanwhile, under buyer liability, the seller of the credits (the host country) receives its payment for forest conservation without delay. Since it is paid as forest conservation ensues, the host country realizes the full, undiscounted value of its potential gain.

Seller-liability is the mirror image of buyer liability. Here, the seller of emission reductions, a developing non-Annex I host country, is not compensated for forest conservation until the long-term requirement is satisfied, e.g., 30-50 years. Under seller liability, payments to a host country for sponsoring forest conservation are withheld even while actual forest conservation is increasing in an area. Again, because of discounting, seller-liability reduces the

value of the payments for forest conservation to the host country. Since the income from the donor is not immediately accessible by the host, a fund arises that would need managing. Presumably this fund would be managed by a third party, possibly the Global Environmental Facility (GEF) at the World Bank or some other body appointed by the CDM's executive board.

Double liability is an odd form of holding both parties responsible until the contract is fully performed. It foresees a continuous funding of tropical forestry by the donor and a continuous effort by the host to preserve forests. However, both countries are only rewarded for their efforts after the project is completed. Double-liability, because it imposes high costs on both parties, will tend to lower the value of the CDM-sponsored forest conservation so that in practice, very little forest conservation would occur. As such, it is not discussed in detail in this paper.

To illustrate important differences between liability contract types, we constructed a hypothetical model of a CDM forest preservation project. In this example, we envision a forest conservation project that is sponsored by a CER buyer (an Annex I country) and hosted by a seller (a non-Annex I country). The buyer of the emission reductions pays the seller \$30/ton of carbon (tC) for each of the 150tC/hectare (ha) that are prevented from entering the atmosphere each year via forest conservation. We used the following assumptions:

- Project area: 30 ha
- Baseline deforestation: 1ha/yr
- Deforestation rate under the CDM project: 0 ha/yr.
- Project period: 30 yr.
- Carbon stock: 150 tC/ha
- Market price paid for carbon reductions in the project: \$30/tC
- Donor's Opportunity Cost (i.e. the cost of domestic mitigation): \$50/tC
- Host's Opportunity Cost, (i.e. revenue foregone if the forest is conserved): \$1500/ha = \$10/tC
- Discount rate: 3%.

We used these values because we think they are roughly representative of actual costs and benefits possible under CDM forest conservation. We also purposefully pegged the market price of carbon (\$30/tC) half way between the seller's opportunity cost of carbon (\$10/tC) and the cost of the buyer's domestic compliance (\$50/tC). We selected these values to highlight structural asymmetries between the liability schedules. For example, the host country will receive \$20 more per ton of carbon if it chooses to place its forest in protection instead of exploiting the land and collecting the opportunity cost (\$30/tC - \$10/tC). The sponsoring country also stands to gain \$20 for every ton of carbon it prevents from entering the atmosphere under the project because it is paying \$30/tC instead of the next cheapest form of mitigation of \$50/tC. Given that the two parties both stand to gain \$20/tC from a CDM project, we eliminate any variation in the value of different contracts that derives solely from different potential gains used in our model.

To evaluate how different liability schemes effect the overall value of the contract, we employed two equations. First, we estimated the net present value (NPV) of the opportunity costs faced by both potential parties. A net present value is simply the discounted sum of future costs or benefits. For the host, this value was calculated as the lost income from the forest if it were not exploited commercially (\$10/tC). For the buyer, this value is calculated from the discounted stream of costs it would face reducing emissions domestically (\$50/tC).

The second equation used was the total economic value (TEV) of the project, calculated as the difference between the two parties' opportunity costs. This difference is actually the net potential gain by the world from international trade in emission reductions. A higher TEV signifies a more efficient (and therefore more profitable) contract, while a lower TEV indicates that some of the efficiency achievable by world trade is compromised by a particular contract type. Based on these assumptions, we estimate the total economic value (TEV) of this project as \$117,962. This was calculated as the difference of the net present value (NPV) of opportunity costs to the donor (\$147,003) and to the host (\$29,041). This can be thought of as the maximum potential of a contract to both parties given that no benefits are withheld. Naturally, for the host to agree to any project, it must be compensated at a value greater than the current opportunity cost of the land. In our example, the host country is paid three times the opportunity cost of the land (\$4,500 per ha of forest conserved versus \$1,500/ha if exploited).

The value of the contract *to the parties* depends on the specification of the liability rule as specified in Table

2. A spread sheet for our model that shows our calculations is provided in the appendix.

Table 2. Net present values (NPV) of contract net benefits

Liability Type	Host's NPV	Seller's NPV	Total NPV
None	\$ 58,801	\$ 58,801	\$ 117,602
Seller	\$ 24,598	\$ 58,801	\$ 83,399
Buyer	\$ 58,801	\$ 1,795	\$ 60,596
Double	\$ 24,598	\$ 1,795	\$ 26,393

From this table, we see that economic liability lowers the value of the project to any party that has its benefits withheld. With double liability, both the buyer and the seller of the emission reduction credits have their net present values diminished compared to a no-liability contract. In the case of seller liability, the seller's net present value is reduced from \$58,801 to \$24,598. Since the buyer's benefits are not withheld under a seller liability contract, its net present value is unchanged at \$58,801. Under buyer seller liability, the buyer's net present value is reduced from \$58,801 with no liability to \$1,795. Again, the seller's net present value under buyer liability remains unchanged. Given that we had constructed our example with equal potential gain for the two parties (i.e., both parties will benefit by \$20/tC under the project), the difference between buyer and seller liability may come as a surprise. However only on first sight. Under buyer liability, a buyer incurs a higher annual cost (\$30/tC) in the withholding period than a seller would (\$10/tC) under seller-liability. This higher cost carries a higher weight as a stream of negative income for the purpose of PV-calculation, resulting in the observed difference in efficiencies for the two contract types.

4. The efficiency advantage of seller liability

The efficiency of liability regimes has been analyzed in the law-and-economics literature. This literature is concerned with regimes of legal liability, i.e. legal sanctions attached to some kind of contract failure or general misbehavior. In the context of contract law (or legal liability) a general result is that seller and buyer liability have

identical efficiency properties in a world without transaction cost (see Polinsky, 1989). A different result arises in economic liability under the CDM. The withholding of contract benefits is different from legal liability for contract failure because it actually interrupts the contract in the withholding period. By contrast, legal liability does not interrupt contract performance, but only penalizes contract failures *ex post*.

One way to see how this interruption of benefits differentially impacts the efficiency of the liability types is to compare the total economic value (TEV) of the various contracting schemes to the economy as a whole. As discussed previously, the TEV is the present value (PV) of the difference of opportunity cost to the host and to the donor; and in our example, it amounts to \$117,962. The present value of net contract benefits in the case of seller liability is only 71% of the total economic value of a contract with no liability, or \$83,399 (\$24,598 + \$58,801). Under seller liability, there is a loss of contract value to the seller, expressed in a lower PV of contracting (\$24,598) compared to the no-liability regime (\$58,801). But this financial loss is exactly made up by gains of the fund where the money is held (\$34,204). Thus, the TEV to the economy as a whole is \$117,962 (= \$58,801 + \$24,598 + \$34,204), which implies there is no economic loss incurred due to economic seller liability. In the case of buyer liability, this TEV is reduced to 51% of the possible TEV, or \$60,596, as a result of the low economic value of the contract to the buyer (\$1,795) and no equivalent fund to make up the difference as in the case of seller liability. Double liability results in only 22% (\$26,393) of the contract potential being realized.

This asymmetry of economic seller versus economic buyer liability essentially arises from the particular legal setting of the CDM. The CDM does not allow Annex I countries to use future emission reductions to offset the commitments they agreed to meet in the years 2008-2012. This provision is commonly referred to as "no borrowing". In the case of buyer liability, the buyer still has to fulfill its Kyoto commitments, i.e. reduce its emissions domestically. This comes at a higher cost than buying this service from the seller. Thus, a liable buyer of CERs has to fulfill its actual duties during the withholding period by other means, e.g. domestic abatement.⁷ This missing "when flexibility" of the CDM limits the efficiency of "where flexibility". The no borrowing rule, combined with the fact that only buyer's have undertaken commitments to reduce their emissions, results in a net economic loss under buyer liability that does not arise with seller liability.

⁷ At some future date when the long-term requirement is satisfied and the credits for the emission reductions are validated and transferred to the Annex I buyer, it will be able to use them at that point. Thus, the Kyoto Protocol's no-borrowing principle would not necessarily negate any CDM-sponsored forest conservation even under buyer liability.

There is no economic loss under seller liability because withholding the income from a host country (for agreeing to protect its forest), does not force the host country to go out and buy alternate credits. Remember, under the Kyoto Protocol only Annex 1 countries (the buyers in any CDM transaction) agreed to reduce their emissions or pay for reductions elsewhere. Of course, the seller is worse off in the withholding period compared to a no-liability or a buyer-liability scheme. But as noted previously, the financial loss to the seller is exactly compensated by the accrual of interest in the fund held by a third party. Thus, there is no loss incurred under seller liability to the economy as a whole. Consequently, our results indicate an intrinsic difference in the efficiency of seller versus buyer liability for the CDM. Differences in transaction costs and other differences between these two systems could override the asymmetry described here. Yet, it is interesting to note this *a-priori* advantage for seller liability compared to buyer liability in the CDM's no-borrowing setting.

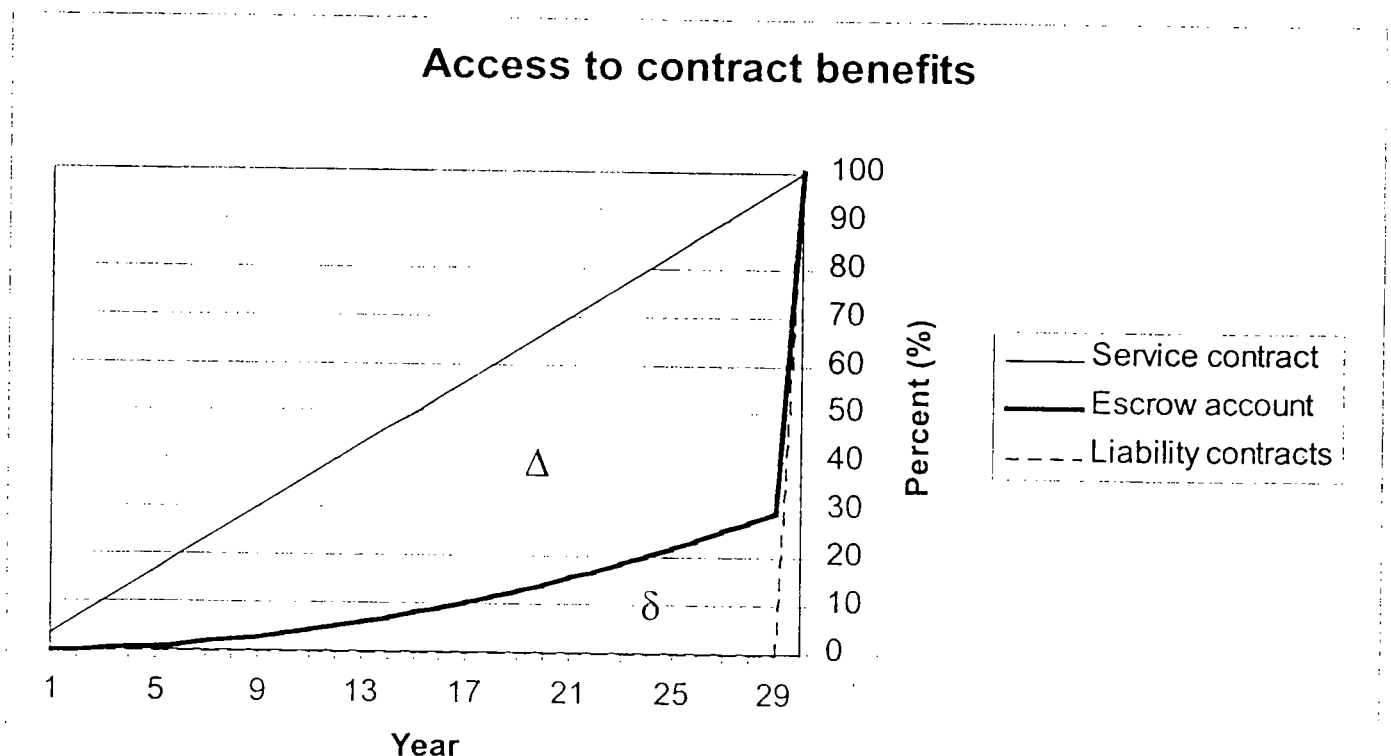
5. The CDM forest-secured escrow account

So far we have discussed only pure types of liability contracts to establish some general properties. As we discovered, seller liability appears to have an intrinsic advantage over buyer liability. Given this however, it should be apparent that sellers under seller liability still stand to receive less money than they would if there were no liability. Withholding benefits to the seller to encourage long-term protection results in the seller realizing a lower present value. In some cases, this lower value may deter potential hosts from conserving their forests since they will make less money. There is, however, an interesting "impure" type of seller liability that increases the present value and the internal rate of return of contracting to the seller, making CDM forest protection more profitable. We refer to this idea as a forest-secured escrow account. This scheme resembles escrow accounts used in the U.S. to enforce mortgage contracts. An escrow account is a special savings account required of a mortgager to cover future costs such as real estate taxes, home insurance, or minor repairs. Escrow accounts secure the lender's investment, not the mortgager, because the mortgager has to prepay into the escrow. The mortgager still legally owns the principle and the interest in any escrow account. It is refunded to her/him if s/he repays the loan or meets the conditions established to retrieve the escrow.

Under the CDM, a forest-secured escrow account could be established where the donor country establishes a savings account on behalf of the host country with the funds from the contract. Placing the money into an escrow would be done to secure continued protection of a forest. In the case of this proposed forest-secured escrow account, both the principle and the interest are a legal entitlement to the host. The principle would be handed over to the host country if after 30-50 years the forest is still standing. Practically speaking, satellite measurements and ground-truthing could be used to verify that actual forest protection. Meanwhile, the interest from the escrow account would be distributed to the host on a continuous or semi-continuous basis. This would give the host some income during the project, an important consideration if developing countries are being asked to safeguard their forests for long periods of time.

Looking at the long-term incentives of a forest-secured escrow we find it provides sound incentives for long-term contracting. A convenient way to do this is to analyze the time distribution of net benefits to contracting parties (see Figure 2).

Figure 2. *Time distributions of contract benefits*



The time distribution of contract benefits measures the percentage of accessible contract benefits at any point in time during the contract period. It is obviously different for service contracts (no liability) and economic liability contracts. In the case of a service contract, contract benefits are immediately accessible to both parties at any point in time. The donor is credited with CERs as it pays and the host is credited this payments as it protects the forest. Using our model project outlined previously, 50% of the benefits of a 30-year contract would be accessible to both parties after 15 years of contract duration.

In the case of pure buyer or pure seller liability, all contract benefits are withheld from one party until the contract is completed. In our example no contract benefits are accessible in the years 1 to 29 to the liable party or parties (in the case of double liability), and full crediting only occurs at the end of year 30. The forest-secured escrow account is a hybrid between no-liability and pure seller liability. A major part of contract benefits – the principle – is withheld for 30 years, however the interest can be accessed as it accrues. Looking at Figure 2, the proportion of contract benefits available with a forest-secured escrow account during the project would be $\delta/\Delta+\delta$, or about 25% in our example.⁸ This secures a significant incentive to ensure contract durability while making some of the proceeds available to the host country during the forest conservation project.

This forest-secured escrow account provides a higher internal rate of return to the seller (12% in our numerical example) compared to a pure seller liability (6% in our numerical example).⁹ This higher rate of return would make the escrow account more acceptable to potential sellers than pure seller-liability and would presumably lead to increased rates of forest conservation. These calculations can be found in the Appendix (last row).

While a forest-secured escrow account would make it more profitable to engage in CDM activity, it also establishes two independent economic incentives to sustain long-term forest conservation. On one hand, as a form of economic seller liability, the forest-secured escrow account withholds the principle payment from the host until obligations are fulfilled. On the other hand, the interest is increasing with time since the principle on which the interest is paid is increasing over time. So even during the withholding period, contracting is more rewarding the longer it is

⁸ In our figure this is the ratio of the area (δ) which is the cumulative income available in from the escrow account, and the total area ($\Delta + \delta$) which is the cumulative income of a no liability contract. This is an application of the Gini-coefficient, a technique used to compare the equality of income distributions.

⁹ The internal rates of return (IRRs) for our numerical example of the economic liability contracts are given in the last row of the appendix.

sustained. Lastly, as a type of seller liability, the escrow system is efficient and the awarding of some payments up front does not affect this property.

6. Conclusion

In this paper we show that seller liability is economically more efficient than buyer liability. This asymmetry derives from the prohibition of borrowing and unequal commitments under the Protocol. Then, we proposed a hybrid scheme of seller liability, an escrow account secured by long-term forest conservation. This hybrid accounting method would be more acceptable to potential CDM hosts than pure seller liability while still providing incentive for long-term forest conservation. Essentially, the escrow approach attempts to balance long-term assurances with short-term economic incentives that developing countries will need in order to agree to not exploit their forests. Other modifications of pure economic seller liability could be suitable as well. One example would be to release portions of the principle as a function of time.

Our findings so far have only discussed the efficiency of various contract types. Throughout our analysis, we have not considered issues of equity or fairness. On first sight, seller-liability appears to harm potential host countries disproportionately. After all, given that most GHG emissions have been caused by the developed countries, why should developing countries agree to be held liable for an effort to reduce GHG emissions? We suggest that seller liability may give a developing country more control over its land than buyer liability.

Given that both a sponsor and a host country must agree to start a CDM forest conservation project, which form of liability would give the host country the most freedom to change its plans along the way? Buyer-liability could result in arm-twisting of a developing nation by a developed nation to adhere to the contract. If the developed country were held liable, it might engage in behind-the-scene maneuvers to make the developing country fulfill its contract. For example, if a developed country was liable for a project in a country that was receiving World Bank loans, it might try to tie the loans to the continuation of the contract. Or the developed country might threaten to withhold humanitarian aid or block private investments if a developing country was considering defaulting on the CDM contract.

Seller-liability would not be as prone to such activities. Since the developing country would be the one liable, it would decide whether to stay in a contract based on the relative costs and benefits it perceives from the various choices. Since the buyer would be receiving its CERs, it would not be as likely to manipulate compliance by the developing country.

Another implication of seller liability is that it will give rise to a substantial worldwide fund being held and possibly supplemented to maintain long-term forest conservation. This will require an international body with experience and skills managing large international funds and handling international projects. This body could be located at the Global Environmental Facility (GEF) of the World Bank or under the guidance of the CDM executive board. It would act as trustee comparable to the trustee holder of an escrow account or a trust fund. Moreover, it could act as a clearinghouse for bids and offers of CDM projects and generally guide interested parties in establishing CDM contracts.

This body may also have an opportunity to supplement the escrow account or another form of seller liability. For example, since a seller-liability system rewards long-term forest conservation at the expense of short-term gain realized by developing countries, incremental funding from the GEF could compensate host countries for the economic loss associated with seller-liability (GEF, 1999). The GEF's goal is to reduce GHG emissions and maintain biodiversity by paying incremental costs associated with running a development activity sustainably versus unsustainably. GEF funds are typically leveraged with five times their amount in private investments. In these regards, paying costs (born by developing countries) associated with seller-liability to achieve long-term forest conservation seems an appropriate target for the GEF sponsorship. This supplement should be designed not to diminish the incentive for long-term contracting, but rather to compensate developing countries for the costs associated with seller-liability.

The fund manager could also serve as an authority to tax the proceeds of CDM activities in accordance with Article 12 (8) of the Protocol. Article 12 (8) calls for developing countries particularly vulnerable to the adverse effects of climate change to be helped meet the cost of adaptation to the change with a tax from CDM activities.

Lastly, a fund such as will arise under seller liability could potentially bridge the two divergent views on the institutional character of the CDM (Farhana, 1998). One view, shared by many Annex I-countries, stresses a market-based CDM similar to the Activities Implemented Jointly (AIJ) pilot phase. In this view the CDM would facilitate the monitoring, verification, and assignment of emission reductions while the contracts and prices would be set by parties.

The other view emphasizes a multilateral character for the CDM as a fund fed by CER proceeds and proceeds from the adaptation tax of Article 12(8) of the Protocol. This feature is proposed by many developing countries and would be a more managed process where bids and contracts are actively facilitated by the CDM. A forest-secured escrow account, as well as a pure seller liability, would blend the two ideas on the nature of the CDM. As the manager of the seller-liability fund, the CDM would be a market-based institution watching over money from contracts that individual countries agree to jointly establish. At the same time, as a trustee holder of several accounts and with the ability to leverage additional monies or institute other procedures (such as subsidizing interest rates or facilitating risk hedging), a seller-liability accounting system would have a multilateral face that involved managing and facilitating.

Although there are numerous disagreements and discussions about the ultimate shape of the CDM, we believe that a form of seller-liability has some intrinsic advantages. Structuring the CDM in this manner may resolve other challenges, namely how to encourage long-term emission reductions in an efficient and equitable manner, how to maximize the amount of early mitigation via the CDM, and what form the CDM's executive board should take. The resolution of its nature will impact climate change mitigation, tropical forest conservation and the fair allocation of the costs and benefits of sustainable development.

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Appendix. Explanatory remarks.

In this appendix, we provide the computations for our example in the text. We computed the present value of contract net benefits as benefits minus costs separately for each party under different liability schemes (including no liability). To do this we used the simple net present value formula,

$$NPV = \text{Sum } (B_j - C_j) / (1+r)^j.$$

The total economic value of the contract to the society is calculated as the difference of the present value of opportunity cost to the donor and to the host, i.e. \$ 147,003 minus \$ 29,401. These figures were calculated by applying the same NPV-formula as for contract net benefits to the stream of annualized costs, i.e. \$ 7500, in the case of the buyer, and \$ 1500, in the case of the seller, using the 3% discount rate. The IRR-figures were computed by using the Excel procedure to set the NPV-formula equal to 3.6 E-0.8, which is effectively zero, and solving the equation for r with the contract costs and benefits.

Appendix

Year	Buyer				Seller							Fund
	Opp. costs	No liability	Net-Benefits		Opp. costs	No liability	Interest	Net-Benefits			Fund	
			No liability	Buyer Liability				No liability	Seller Liability	Escrow		
1	7500	-4500	3000	-4500	-1500	4500	0	3000	-1500	-1500	4500	
2	7500	-4500	3000	-4500	-1500	4500	135	3000	-1500	-1365	4500	
3	7500	-4500	3000	-4500	-1500	4500	270	3000	-1500	-1230	4500	
4	7500	-4500	3000	-4500	-1500	4500	405	3000	-1500	-1095	4500	
5	7500	-4500	3000	-4500	-1500	4500	540	3000	-1500	-960	4500	
6	7500	-4500	3000	-4500	-1500	4500	675	3000	-1500	-825	4500	
7	7500	-4500	3000	-4500	-1500	4500	810	3000	-1500	-690	4500	
8	7500	-4500	3000	-4500	-1500	4500	945	3000	-1500	-555	4500	
9	7500	-4500	3000	-4500	-1500	4500	1080	3000	-1500	-420	4500	
10	7500	-4500	3000	-4500	-1500	4500	1215	3000	-1500	-285	4500	
11	7500	-4500	3000	-4500	-1500	4500	1350	3000	-1500	-150	4500	
12	7500	-4500	3000	-4500	-1500	4500	1485	3000	-1500	-15	4500	
13	7500	-4500	3000	-4500	-1500	4500	1620	3000	-1500	120	4500	
14	7500	-4500	3000	-4500	-1500	4500	1755	3000	-1500	255	4500	
15	7500	-4500	3000	-4500	-1500	4500	1890	3000	-1500	390	4500	
16	7500	-4500	3000	-4500	-1500	4500	2025	3000	-1500	525	4500	
17	7500	-4500	3000	-4500	-1500	4500	2160	3000	-1500	660	4500	
18	7500	-4500	3000	-4500	-1500	4500	2295	3000	-1500	795	4500	
19	7500	-4500	3000	-4500	-1500	4500	2430	3000	-1500	930	4500	
20	7500	-4500	3000	-4500	-1500	4500	2565	3000	-1500	1065	4500	
21	7500	-4500	3000	-4500	-1500	4500	2700	3000	-1500	1200	4500	
22	7500	-4500	3000	-4500	-1500	4500	2835	3000	-1500	1335	4500	
23	7500	-4500	3000	-4500	-1500	4500	2970	3000	-1500	1470	4500	
24	7500	-4500	3000	-4500	-1500	4500	3105	3000	-1500	1605	4500	
25	7500	-4500	3000	-4500	-1500	4500	3240	3000	-1500	1740	4500	
26	7500	-4500	3000	-4500	-1500	4500	3375	3000	-1500	1875	4500	
27	7500	-4500	3000	-4500	-1500	4500	3510	3000	-1500	2010	4500	
28	7500	-4500	3000	-4500	-1500	4500	3645	3000	-1500	2145	4500	
29	7500	-4500	3000	-4500	-1500	4500	3780	3000	-1500	2280	4500	
30	7500	-4500	3000	-4500	-1500	4500	3915	3000	-1500	2415	4500	
31				225000			4050		135000	139050	135000	
Sum	225000	-135000	90000	90000	-45000	135000	62775	90000	90000	152775	0	
NPV	147003	-88202	58801	1795	-29401	88202		58801	24598	58801	34204	
IRR			infinite	3%				infinite	6%	12%		



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ESTIMATE OF FOREST CONSERVATION POTENTIAL IN THE CDM

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This working paper used available country-by-country data to estimate a realistic assessment of the potential for forest conservation to reduce emissions under the rubric of the Clean Development Mechanism (CDM). This paper is limited to analysis of forest conservation since this is the primary land use, land use change and forestry (LULUCF) option for reducing greenhouse gas emissions (transfer of carbon from the land to the atmosphere).

Assumptions

Several assumptions were used in this estimate:

- 1) Only projects that meet the requirements of Article 12 of "real, measurable and certifiable" and long-term benefits to climate change mitigation will receive certified emission reductions (CERs).
- 2) There are no reliable global, country-by-country estimates of forest degradation. Consequently, it was not possible to calculate the avoided emissions for reducing forest degradation.
- 3) This paper assumes that on lands being deforested, all above ground carbon would be released with deforestation. Please note, assumptions #2 and #3 should tend to cancel each other out; #2 will underestimate potential avoided emissions and #3 will overestimate potential avoided emissions possible under CDM projects.

Methods:

The annual area of forest loss was multiplied times the above ground carbon on these lands. This was then multiplied by the institutional ability to initiate projects which was then multiplied by the likelihood that a project would be able to successfully reduce emissions for a long period of time.

Potential for CERs via forest conservation =

**rate of deforestation (X) above-ground carbon (X)
projects started (X) project successful and sustainable**

- 1) Only developing countries that had more than 120,000 estimated hectares of deforestation per year were considered.¹ Twenty-five countries were evaluated and deforestation rates were assumed to remain constant. Combined, these countries are losing an estimated 10.3 million hectares of forest per year.
- 2) Carbon stocks were estimated from several studies² and updated by the author and others. Only above ground biomass was considered and these were conservatively estimated and did not include small trees, vines nor roots or belowground biomass. Averaging across countries, it was estimated that 100 tons of carbon are stored above ground in these forests; multiplied times the deforestation rate, these countries are estimated to be releasing 1.2 billion tons of carbon per year.
- 3) It was estimated that institutional and operational constraints would limit the amount of projects that would be started to reduce deforestation. Estimates of this potential were derived on a country-by-country basis from "country profiles"³ which included quantifying infrastructure, forestry experience, political and economic conditions, land tenure and other factors. Averaging across countries, only 8% of deforestation was estimated to be addressed with projects under the CDM.

¹ FAO. 1999. *State of the World's Forest*. 1999. FAO, Rome.

² Alcamo et al. 1995. An evaluation of the IPCC IS92 Emissions scenarios. In: Houghton et al. (eds.). *Climate Change 1994*. Cambridge University Press. Cambridge. Brown, S. 1997. *Estimating Biomass and Biomass Change of Tropical Forests: A Primer*. FAO Forestry Paper #134. FAO, Rome. Fearnside, P.M. 1997. Greenhouse gases from deforestation in Brazilian Amazonia: net committed emissions. *Climatic Change* 35:321-360. Trexler, M and C Haughen. 1995. *Keeping It Green*. WRI & EPA, Washington, D.C. Tomich et al. 1998. *Alternatives to slash-and-burn in Indonesia*. ASB-Indonesia and ICRAF, Bogor, Indonesia. IPCC. 2000. *Land Use, Land-Use Change and Forestry*. Cambridge University Press, Cambridge. Brown, S. 2000. Personal communication.

³ Trexler, M and C Haughen. 1995. *Keeping It Green*. WRI & EPA, Washington, D.C.

- 4) It was further assumed that a strong burden of proof for avoided emissions would be required. Thus, a substantial fraction of projects started would not be able to pass the litmus tests of being successful and lasting. Historical data from World Bank projects were used or estimated for each country.⁴ The country's historical rate of satisfactory project implementation was multiplied times the percent of projects deemed to be sustainable. This provides a valuable estimate of a country's ability to meet both the measurable and long-term requirements of the CDM. Averaging across countries, only 31% of projects started were expected to meet both the success and sustainability litmus test. (This should be seen as the combined average of CERs that might be expected from all projects, including some that meet both criterion but not at 100% and some projects that do not meet 100% of both criterion but do result in some CERs.)

ESTIMATE OF FOREST CONSERVATION POTENTIAL IN THE CDM

Country	1000 ha deforest.	C above ground	C ton emissions per year	% attempted	% successful & sustainable	CERs (carbon tons)
Angola	237	36.5	8,650,500	0	0.00	0
Bolivia	581	115	66,815,000	0.1	0.53	3,529,785
Brazil	2,554	157.5	402,255,000	0.1	0.36	14,642,082
Cambodia	164	150.5	24,682,000	0.1	0.00	0
Cameroon	129	108.5	13,996,500	0.1	0.43	603,110
CAR	128	100	12,800,000	0.1	0.00	0
Colombia	262	100	26,200,000	0.1	0.27	710,102
Congo (DR)	740	172	127,280,000	0	0.00	0
Ecuador	189	91	17,199,000	0.2	0.43	1,482,212
Indonesia	1,084	131	142,004,000	0.1	0.47	6,710,958
Madagascar	130	98	12,740,000	0.1	0.00	0
Malaysia	400	115.5	46,200,000	0.1	0.80	3,697,752
Mexico	508	75	38,100,000	0.05	0.60	1,142,338
Myanmar	387	115.5	44,698,500	0	0.43	0
Nicaragua	151	117.5	17,742,500	0	0.00	0
Nigeria	121	24.5	2,964,500	0.1	0.03	9,554
P.N Guinea	133	112	14,896,000	0	0.43	0
Paraguay	327	100	32,700,000	0.2	0.00	0
Peru	217	96	20,832,000	0.05	0.57	591,052
Phillipines	262	111.5	29,213,000	0.1	0.41	1,200,612
Tanzania	323	22.5	7,267,500	0.1	0.38	274,183
Thailand	329	92.5	30,432,500	0.1	0.72	2,191,795
Venezuela	503	100	50,300,000	0.1	0.43	2,167,430
Viet Nam	135	131	17,685,000	0.1	0.43	762,048
Zambia	264	23.5	6,204,000	0.1	0.10	61,420
Total	10,258,000		1,213,857,500			39,776,433

⁴ World Bank. 1999. Supplemental Tables to the 1999 Annual Review of Development Effectiveness. World Bank Operations Evaluation Department, Washington, D.C. <http://wbinfo018.worldbank.org/oed/oeddoclib.nsf/11d38e62c269811285256808006a0022/33fe48c4480af0198525684100590102?OpenDocument>

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11. H. Mueller, R. Samanta, E. Wieschaus, *Development* **126**, 577 (1999).
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14. K. M. Cadigan, M. P. Fish, E. J. Rulifson, R. Nusse, *Cell* **93**, 767 (1998).
15. Fz1, Fz2, and the chimeric receptors were expressed with *sevGal4* in the developing eye, in a specific subset of photoreceptor precursors (in R3 and R4 at the time of polarity determination). For analysis in imaginal discs, the enhancer trap line H123 was used as a marker for R4 and detected as described [M. Fanto and M. Mlodzik, *Nature* **397**, 523 (1999)]. Eye imaginal discs and sections of adult eyes were prepared, photographed, and processed as described [D. I. Strutt, U. Weber, M. Mlodzik, *Nature* **387**, 292 (1997)].
16. J. Zhang and R. W. Carthew, *Development* **125**, 3075 (1998).
17. A. H. Brand and N. Perrimon, *Development* **118**, 401 (1993).
18. Several independent lines were generated for these and the chimeric constructs, and at least four were tested in the functional assays, all giving equivalent results. The transgenic strains showed comparable protein expression levels as determined by Western blotting with the inserted myc-epitope tag.
19. M. Boutros, J. Mihaly, M. Mlodzik, unpublished results.
20. Capped synthetic RNA of the different receptors was injected into both blastomeres of the two-cell embryo. At stage 9, animal cap ectoderm was explanted and cultured till sibling embryos reached stage 11. Reverse transcriptase-polymerase chain reaction (RT-PCR) was done as described [T. Bouwmeester, S.-H. Kim, Y. Sasai, B. Lu, E. De Robertis, *Nature* **382**, 595 (1996)]. Protein levels were checked by Western blot analysis with anti-myc and anti-Fz1 antibodies. Dsh relocalization assays were done as described [J. D. Axelrod, J. R. Miller, J. M. Shulman, R. T. Moon, N. Perrimon, *Genes Dev.* **12**, 2610 (1998)]. For Xnr-3 and Sia induction, 100 to 800 pg of RNA was injected; for Dsh relocalization, Fz receptors were injected at 100 to 200 pg of RNA together with 100 pg of Dsh-EGFP RNA.
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24. Both Fz1 and Fz2 recruited Dsh to the membrane at a concentration of 25 pg of injected RNA and were unable to do so at 12.5 pg, indicating that both receptors have the same threshold in this assay.
25. C. R. Vinson, S. Conover, P. N. Adler, *Nature* **338**, 263 (1989).
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27. We generated Fz1 and Fz2 chimeric constructs by assembling their CRD (Fz1, amino acids 1 to 166; Fz2, 1 to 219), seven-pass transmembrane region (Fz1, amino acids 167 to 557; Fz2, 220 to 617), and cytoplasmic tails (Fz1, amino acids 558 to 585; Fz2, 618 to 694). In brief, chimeric receptors consisted of 10 base pairs of the Fz1 5'-untranslated region, the CRD domain (except for Δ CRD) linked to the transmembrane region (inserted by generating a Hind III site), and a myc tag in a nonconserved region. For COOH-terminal swaps, a Xho I site was created after the last transmembrane domain. We created chimeric receptors by assembling different fragments in pBS-SK and then shuttling them into *Drosophila* and *Xenopus* expression vectors. Constructs were confirmed by sequencing. For each construct, several independent transgenic *Drosophila* lines were generated and tested in the assays described.
28. The chimeric receptors were expressed under the control of the *apGal4* driver in the dorsal wing and notum. The chimeras that showed mild dominant-negative behavior did not affect *wg* expression at the dorsal/ventral (D/V) margin, indicating that the observed effect is due to *Wg* read-out defects in the third larval instar. Planar polarity was analyzed in the wing cell hairs (Fig. 3) and by the orientation of the microchaetae on the notum. Effects on planar polarity in the notum were seen with Fz1 and Fz2-1, as is the case in the eye and wing.
29. To analyze the effects of the chimeric receptors in the legs, we used *DllGal4* as a driver [other *Gal4* drivers resulted either in all chimeras having a wild-type appearance irrespective of the Fz receptors expressed or were lethal]. *DllGal4>Fz1* gave no detectable planar polarity phenotype, whereas *DllGal4>Fz2* was lethal. Fz2-1 and Fz2-2-1 were pupal lethal, showing loss of distal leg structures, a dominant-negative *Wg*-related effect. Fz1-2 and Fz1-1-2 showed a mild *Wg* GOF phenotype, as judged by loss of the dorsally derived claws (indicating a transformation to ventral *Wg*-induced structures) [W. J. Brook and S. M. Cohen, *Science* **273**, 1373 (1996)].
30. To determine the affinity of the different Fz chimeras for *Wg*, we expressed them with a *dppGal4* driver perpendicular to the normal *wg* expression. All chimeras containing the Fz2 CRD behaved like Fz2 or Fz2CRD-GPI [K. M. Cadigan, M. P. Fish, E. J. Rulifson, R. Nusse, *Cell* **93**, 767 (1998)], leading to *Wg* stabilization (Fig. 3). The inverse chimeric receptors with the Fz1 CRD had no effect on *Wg* stability.
31. The Fz1- and Fz2-1-induced GOF planar polarity eye phenotype depends on the amount of Fz expressed in the R3 and R4 precursor cells. At high expression levels (as with *Gal4*-driven expression), the phenotype is the same in wild-type and in *fz^{-/-}* eye discs. At lower overexpression levels, the presence of the endogenous protein is important for the overall amounts to reach the threshold necessary for constitutive activation.
32. A small difference in Fz signaling levels between the neighboring R3 and R4 cells is critical to establish correct ommatidial polarity and leads reproducibly to correct polarity; the small difference is amplified by Delta/Notch signaling [M. Fanto and M. Mlodzik, *Nature* **397**, 523 (1999); M. T. Cooper and S. J. Bray, *Nature* **397**, 526 (1999); A. Tomlinson and G. Struhl, *Development* **126**, 5725 (1999)]. The rescue experiments demonstrate that the CRD of Fz1 and a putative ligand are important to establish this difference. Nevertheless, for constitutive activation of downstream pathways the Fz1 CRD is not required.
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34. Different signaling preferences of Fz1 and Fz2 are also corroborated by the observation that simultaneous overexpression of *Wg* and Fz1 in the wing disc neutralizes the GOF effects of each on either *Wg* signaling or the planar polarity pathway [J. D. Axelrod, J. R. Miller, J. M. Shulman, R. T. Moon, N. Perrimon, *Genes Dev.* **12**, 2610 (1998)].
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38. Wing imaginal discs were dissected from larvae and stained by standard methods. The discs were incubated with mouse antibody to Ac (1:200 dilution; gift of S. Carroll) or to *Wg* (gift of S. Cohen). Fluorescent-labeled secondary antibody mix (1:500 dilution).
39. We are grateful to P. Adler, K. Basler, S. Carroll, R. Carthew, S. Cohen, R. Nusse, and M. Strigini for fly strains and reagents. We thank members of the Bouwmeester and Mlodzik labs and M. Strigini and S. Cohen for discussions, and J. Curtiss for helpful comments on the manuscript. M.B. was supported by a predoctoral fellowship from the Boehringer Ingelheim Fonds. J.M. is a recipient of a long-term fellowship from the European Molecular Biology Organization.

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Economic Incentives for Rain Forest Conservation Across Scales

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Globally, tropical deforestation releases 20 to 30% of anthropogenic greenhouse gases. Conserving forests could reduce emissions, but the cost-effectiveness of this mechanism for mitigation depends on the associated opportunity costs. We estimated these costs from local, national, and global perspectives using a case study from Madagascar. Conservation generated significant benefits over logging and agriculture locally and globally. Nationally, however, financial benefits from industrial logging were larger than conservation benefits. Such differing economic signals across scales may exacerbate tropical deforestation. The Kyoto Protocol could potentially overcome this obstacle to conservation by creating markets for protection of tropical forests to mitigate climate change.

Each year, an estimated 13 million ha of forests are destroyed (1), 5.6 to 8.6 Gt of carbon are emitted (2), and 14,000 to 40,000 species disappear from tropical forests (3). Greenhouse gas emissions are likely to increase Earth's temperature by 1° to 4° C in the next century, leading to the possibility of increasingly severe droughts and floods, enhanced rates of species invasion and extinction (4), and thus significant economic harm.

Tropical deforestation alone is responsible for 20 to 30% of carbon emissions (5) and most species extinction worldwide (6). Conserving tropical forests could therefore reduce both global warming and biodiversity loss (7). Despite conservation efforts, many "protected areas" in the tropics continue to be degraded, while unprotected forests are being converted by logging and agriculture (8). We analyzed the economic benefits of forest con-

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servation from local, national, and global perspectives to determine the structure of incentives; ultimately, it is the interaction of these incentives across scales that will determine the fate of forests.

We used the Masoala National Park Integrated Conservation and Development Program (ICDP) in Madagascar as our case study, because it provided ample data for economic evaluation (9–13). The park (2300 km²) is composed of primary rain forest and is surrounded by a 1000-km² buffer of unprotected forest. Slash-and-burn farming for subsistence rice production represents the current principal threat to these forests. At current rates, farmers may reach the park boundaries in as few as 9 years. To counter

deforestation, the Masoala ICDP's strategy is to create economic incentives for conservation, by working with local communities to develop markets for forest products from the buffer areas and nature-based tourism in the park (9).

Although local incentives are important, incentives at national and global scales are also essential to the success of conservation efforts, because national governments often make large-scale natural resource decisions affecting conservation, and the international community sponsors conservation through foreign aid and technical assistance. Conservation is most likely to succeed when benefits outweigh costs at the scales of all relevant decision-makers. To assess benefits and costs, we developed an opportunity-cost scenario and compared estimates of net benefits from the ICDP against the net benefits from the opportunity-cost scenario at local, national, and global scales. All estimates were calculated as net present values (NPVs) based on market values or shadow prices obtained with standard valuation techniques and appropriate local, national, and global data sources (see footnotes to Table 1). Two time-frames

(10 and 30 years, based on the length of forestry concession in the opportunity-cost scenario) and three discount rates [3% (14), 10% (15), and 20% (16)] were used to test sensitivity. We report results as ranges (in U.S.\$ 1996) over these time frames and discount rates. In some cases, ranges also include results from two other opportunity-cost scenarios (see below).

The opportunity-cost scenario is the land use that produces the highest alternative return. At the national level, the highest return would come from large-scale industrial forestry concessions. We assumed that such logging enterprises would be foreign-owned, bounded in scale based on the required capital investment, respect Malagasy laws, and invest the minimum in infrastructure to export high-value roundwood from Madagascar (17). It is unlikely, however, that Madagascar would receive all the financial benefits legally due from a large-scale logging operation (18). Thus, we also calculated a lower bound opportunity cost assuming that only a portion of the benefits (about 33%) would be captured by the nation (17). In both cases, we assumed that while logging "selectively,"

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Table 1. Local, national, and global net benefits for the integrated conservation and development program [ICDP; see (17) for further details].

Discount rate	3%		10%		20%	
Time span of net present values	10 years	30 years	10 years	30 years	10 years	30 years
Local economy: impact of ICDP per community						
Sustainable community forestry (9)	129.7	315.6	88.5	143.6	55.1	68.3
Ecotourism (17)	2.7	19.1	1.9	6.1	1.3	2.2
Nontimber forest products (NTFPs)*	86.6	221.6	61.9	101.0	41.9	51.0
Hill rice†	–11.5	–26.5	–8.3	–12.7	–5.7	–6.7
Opportunity cost: Large-scale forestry‡	–1.4	–3.2	–1.0	–1.5	–0.7	–0.8
Local net benefit	206.1	526.6	143.1	236.5	91.9	113.9
National economy: impact of ICDP						
Donor investment§	7.81	9.95	6.01	6.80	4.43	4.66
Ecotourism/park employment (17)	7.06	42.49	5.10	12.91	3.50	5.16
Sustainable community forestry/biodiversity products (9, 13)	2.96	13.08	1.33	3.29	0.50	0.80
Sustained use of NTFPs*	7.28	28.57	4.71	11.01	2.77	4.27
Watershed protection value	0.58	3.40	0.38	1.13	0.22	0.38
Park/buffer zone management costs§	–8.97	–13.06	–6.70	–8.07	–4.79	–5.15
Internal benefit from ICDP project	16.73	84.44	10.83	27.07	6.64	10.12
Opportunity cost: Industrial logging concession‡	–92.57	–333.89	–56.36	–127.89	–30.02	–47.14
Opportunity cost: Hill rice farming†	–6.53	–15.00	–4.70	–7.22	–3.21	–3.81
Total opportunity costs	–99.10	–348.89	–61.06	–135.10	–33.23	–50.95
National net benefit	–82.38	–264.45	–50.23	–108.03	–26.59	–40.83
Global Economy: impact of ICDP¶						
Carbon conservation value @ \$20/t C (27, 28)	188.94	655.41	122.35	260.66	71.97	105.11
Donor investment in ICDP	–7.81	–9.95	–6.01	–6.80	–4.43	–4.66
Global net benefit	181.13	645.46	116.34	253.85	67.54	100.45

*We calculated annual flows from NTFPs by cumulating the hectares of deforestation avoided each year, and multiplying by the annual value for sustained use of NTFPs [~\$15/ha (9)]. NPVs were then calculated from these annual flows. †The value of one rice harvest after logging was estimated at \$69/ha on the basis of typical rain-fed rice productivity on the Masoala Peninsula (13). ‡The national opportunity costs to Madagascar for not granting a large-scale logging concession included stumpage fees, taxes, employment, and infrastructure development. We based our model on similar timber companies operating in developing countries, assuming that expatriate investors (i) invest in minimum infrastructure, (ii) hire national staff primarily, (iii) harvest all currently exported hardwoods, (iv) export roundwood to mills outside of Madagascar, and (v) pay all taxes and fees legally due to Madagascar (full capture scenario). We used timber inventory data from Masoala (9, 13) to assess per hectare harvest levels, values and stumpage fees, and GIS to determine where harvesting was profitable (26). We assumed that half of the wood would be exported, and the rest sold domestically. At the local scale, opportunity costs equaled lost local employment from large-scale logging. See (17) for further details. §Donor investment and project costs were based on the current Masoala ICDP budget, assuming 5 years of aid for park management and 20 years for development, with diminished inputs after 10 years. ||We calculated the annual value of watershed protection to irrigated rice agriculture and to marine fisheries by first obtaining a per hectare annual value for each watershed component, and then multiplying this value times the cumulative number of hectares deforested each year. For irrigated rice agriculture, we calibrated a watershed study from a nearby park (37). For fisheries (38), we divided the annual value of the artisanal marine fishery on Masoala (13) by the number of hectares of forest and multiplied by 0.5, because it is unlikely that forest clearing would reduce fisheries to zero. ¶To calculate global impacts of the ICDP, we estimated public values that are nonexcludable and nonrival benefits. We did not evaluate the net impact of forest conservation versus exploitation on private actors (e.g., logging, ecotourism, or international airline companies) or private goods (e.g., timber, souvenirs, or planes).

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forests would be extensively damaged from road-building and mechanized harvest (19). Then, subsistence farmers would follow logging roads to slash-and-burn the high-graded forests (18); thus, the value of one rice harvest was calculated as part of the total opportunity cost. In 1995, however, Madagascar enacted environmental laws to prevent industrial-scale activities from degrading the environment (20). Consequently, we also developed and evaluated a "best management practices" scenario to compare with industrial logging (21).

To evaluate the ICDP scenario, we estimated projected financial costs and benefits from establishing and maintaining the Masoala National Park and its buffer zones. Benefits included employment, foreign aid, tourism, and the sustainable production of forest products, watershed protection, and carbon conservation resulting from prevention of projected deforestation. Costs included management of the park and implementation of development activities around the park. A major source of uncertainty in estimating these benefits was whether the ICDP would meet its stated goals, which include (i) arresting deforestation in the area, (ii) implementing community-based sustainable forestry projects in 50,000 ha over 15 years, and (iii) reaching ecotourism targets of 10,000 visitors per year within 5 years (22). Complex devel-

opment projects in developing countries have high failure rates (15). Our projections assumed that this ICDP will succeed; by comparison, the uncertainty resulting from data error is a minor problem.

At the local level, we found that communities would lose significant economic benefits if lands they were to use for community-based sustainable forest management and tourism were placed in large-scale logging concessions, whether sustainable or not. With the ICDP, communities would enjoy surpluses of \$92,000 to \$527,000 (23) over the industrial logging scenario (Table 1). A large proportion of this value is due to the subsistence use of nontimber forest products (NTFPs) for artisanal production, food, fuel, fiber, and construction (10, 11), all key to quality of life for local residents.

While initially dependent on foreign aid in our model, we terminated aid to the Masoala park in year 5 and to the development component in year 20. Gross benefits to Madagascar from the ICDP, ignoring opportunity costs, ranged from \$7 million to \$84 million (Table 1) and were positive within 10 years. The ICDP would thus be a reasonable business proposition for Madagascar in comparison to current slash-and-burn land use on the peninsula.

The financial benefits from industrial logging concessions, however, exceeded the

ICDP's value (Table 1) even when the lowest estimates of revenue generated by logging were used. Although uncertainties exist in the estimate of opportunity cost, these three scenarios show that any large-scale logging operation would be significantly more profitable to the state than the ICDP, by \$6 million to \$265 million (Table 2).

Lucrative large-scale logging operations are leading to the destruction of many forests, particularly in Africa and Asia (24, 25). We found no physical or economic barriers that would prevent large-scale logging companies from accessing the entire forest on the Masoala Peninsula (26). We estimated net annual returns on investment to large-scale logging companies and found profit margins of \$2.37 million/year even for the least-profitable scenario, best management practices. Thus, large-scale logging is a realistic prospective land use for Masoala and similar areas.

Several timber companies were prospecting for concessions on the Masoala Peninsula during the time that the National Park was being established, and the government nearly abandoned the park project in favor of a logging company. The conservation and diplomatic community played a large role in persuading the government to reject the logging companies' proposals, using both political and economic arguments. Without this

Table 2. The cost of conserving carbon. Regardless of opportunity-cost scenario, when Madagascar conserves forests, it pays most of the costs of preventing transfers of carbon from the biosphere to the atmosphere.

Units		Full capture scenario for opportunity costs			Partial capture scenario for opportunity costs			Best management practices scenario for opportunity costs		
		3%	10%	20%	3%	10%	20%	3%	10%	20%
Discount rate										
Timespan of NPV						10 years				
Net value of ICDP to Madagascar of logging including	U.S.\$ 1996 $\times 10^6$	-82.38	-50.23	-26.59	-21.29	-13.31	-7.18	-15.60	-10.14	-5.83
National opportunity cost of land	U.S.\$ 1996/ha	-250	-152	-81	-65	-40	-22	-47	-31	-18
Madagascar's cost to conserve greenhouse gases	U.S.\$ 1996/t CO ₂ C	-3.91	-2.38	-1.26	-1.01	-0.63	-0.34	-2.47	-1.60	-0.92
Donor countries' cost to conserve greenhouse gases	U.S.\$ 1996/t CO ₂ C	-0.37	-0.29	-0.21	-0.37	-0.29	-0.21	-1.24	-0.95	-0.70
Total	U.S.\$ 1996/t CO ₂ C	-4.28	-2.67	-1.47	-1.38	-0.92	-0.55	-3.70	-2.55	-1.62
Proportion borne by Madagascar		0.91	0.89	0.86	0.73	0.69	0.62	0.67	0.63	0.57
Timespan of NPV						30 years				
Net value of ICDP to Madagascar of logging including	U.S.\$ 1996 $\times 10^6$	-264.45	-108.03	-40.83	-42.02	-23.29	-9.98	-19.81	-15.53	-7.60
National opportunity cost of land	U.S.\$ 1996/ha	-801	-327	-124	-127	-71	-30	-60	-47	-23
Madagascar's cost to conserve greenhouse gases	U.S.\$ 1996/t CO ₂ C	-4.18	-1.71	-0.65	-0.66	-0.37	-0.16	-1.04	-0.82	-0.40
Donor countries' cost to conserve greenhouse gases	U.S.\$ 1996/t CO ₂ C	-0.16	-0.11	-0.07	-0.16	-0.11	-0.07	-0.52	-0.36	-0.25
Total	U.S.\$ 1996/t CO ₂ C	-4.34	-1.82	-0.72	-0.82	-0.48	-0.23	-1.57	-1.18	-0.65
Proportion borne by Madagascar		0.96	0.94	0.90	0.81	0.77	0.68	0.67	0.70	0.62

pressure, the Masoala Peninsula, one of Madagascar's most important reservoirs of biodiversity, would perhaps have become a forestry concession instead of a national park. However, many other countries do not have vigilant watchdog organizations and strict environmental laws (20), so logging often constitutes a serious threat to forests (24, 25).

The loss of Masoala's forests would be a significant economic cost to the international community (\$68 million to \$645 million) (Table 1). We estimated their global value on the basis of the damages avoided by preventing greenhouse gas emissions from the deforestation that would otherwise occur without the ICDP (17). To develop a conservative estimate, we used a damage cost of \$20/t C (27), used an estimate of net committed emissions, and developed a schedule for the gradual release of greenhouse gases over a 10-year period (28). We did not include costs or benefits to private actors such as logging or ecotourism companies, because our concern at the global scale was with public goods and services. Nor did we include other significant global benefits, such as the option or existence value of biodiversity in Masoala's forests, because a market in these values is unlikely to emerge. These values would be high relative to other regions, however, because Madagascar is among the top five countries for plant and vertebrate endemism per unit area (29), with a globally unique and species-rich biota, and Masoala is one of its most significant biodiversity areas (9).

We then estimated the unit cost of conserving carbon [in metric tons of CO₂ C equivalents (28)] between \$0.23 and \$4.34 (Table 2); this range is comparable to per metric ton C costs for trial climate-related forestry and conservation projects (30). The unit cost can be partitioned into the global cost (foreign aid for forest protection) and Madagascar's cost (opportunities foregone). Madagascar, one of the world's poorest countries (31), is paying 57 to 96% of the total costs (Table 2), but itself would benefit relatively little from reducing global greenhouse gas emissions. While the Masoala ICDP was established to conserve biological diversity, not terrestrial carbon, the global community is reaping the concurrent public benefit of carbon conservation at the low cost of \$0.07 to \$1.24/t C.

Both Madagascar's opportunity costs (\$18 to \$801/ha) and the costs of conserving carbon vary by more than an order of magnitude, depending on the logging scenario, discount rate, and time-frame. Madagascar and many developing countries have high private rates of discount and poor ability to capture legal rents from forestry concessions (16, 18). Thus, the partial capture scenario with a discount rate between 10 and 20% is the most realistic estimate of the minimum market rate

required for compensation for carbon conservation (Table 2: 10-year NPV, \$22 to \$40/ha; 30-year NPV, \$30 to \$71/ha), corresponding to a cost of \$0.16 to \$0.63/t CO₂ C equivalents (32).

Estimates of damages from carbon release range from \$5 to \$100/t C, but probabilistic studies showed that \$20/t C is a conservative estimate of mitigation of damages (27). Thus, by conserving carbon at <\$1/t, one could generate a 20-fold surplus to pay transaction costs and buffer against the risk of individual project failure [e.g., one out of two development projects in Africa (15)]. Paying the opportunity cost for forest conservation is an economical mechanism for securing reduced greenhouse gas concentration (7), while promoting other benefits including the protection of a threatened biota of inestimable value (29), maintenance of ecosystem services, and promotion of human welfare. If Madagascar could receive the opportunity cost, it would then receive \$10 million to \$23 million (Table 2: 30-year NPV, partial capture scenario, discount rate 10 to 20%) for the value of the Masoala National Park and its surrounding buffer zone, instead of the \$4.7 million to \$6.8 million that we project it will receive (Table 1: 30-year NPV, donor investment, discount rate 10 to 20%). These funds would be sufficient to ensure the long-term protection of the park, whereas current budgets may be insufficient (22).

This case study suggests that the conservation and sustainable-use approach could provide significant economic benefits at all scales. At the national level, however, where decisions about conservation are generally made, large-scale logging currently provides better economic returns. We believe that similar split-incentive situations exist in many humid forested areas (24, 25) and other ecosystems (33) in the developing world.

The Kyoto Protocol, however, could secure net local, national, and global benefits equitably by recompensing nations for the opportunity costs of conservation through global transfers under the Clean Development Mechanism (34, 35), which would allow industrialized countries to exceed domestic emissions quotas by creating equivalent emissions reductions in a developing country (36). If such transfers do not occur, we can expect that many developing nations will continue to liquidate their forests for foreign exchange, although it is not in their best long-term interest (24, 25).

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mGluR1 in Cerebellar Purkinje Cells Essential for Long-Term Depression, Synapse Elimination, and Motor Coordination

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Targeted deletion of metabotropic glutamate receptor-subtype 1 (mGluR1) gene can cause defects in development and function in the cerebellum. We introduced the mGluR1α transgene into mGluR1-null mutant [mGluR1 (–/–)] mice with a Purkinje cell (PC)-specific promoter. mGluR1-rescue mice showed normal cerebellar long-term depression and regression of multiple climbing fiber innervation, events significantly impaired in mGluR1 (–/–) mice. The impaired motor coordination was rescued by this transgene, in a dose-dependent manner. We propose that mGluR1 in PCs is a key molecule for normal synapse formation, synaptic plasticity, and motor control in the cerebellum.

mGluRs are G protein-coupled glutamate receptors and are implicated in modulation of synaptic transmission and plasticity (1). mGluR1 (–/–) mice have characteristic cerebellar symptoms such as ataxic gait, intention tremor, and motor discoordination (2–4). The blockade of mGluR1 by antisense or mGluR1 results in ataxia, suggesting that mGluR1 is required for motor coordination (5). In mGluR1 (–/–) mice, the anatomy of the cerebellum, the morphology of PCs, and the synaptogenesis onto PCs from parallel fibers (PFs) are normal. However, developmental transition from multiple to mono-innervation of PCs by climbing fibers (CFs) (6), the other excitatory input to

PCs (7), is impaired during the third postnatal week (8). Long-term depression (LTD) at PF-PC synapses is clearly deficient in mGluR1 (–/–) mice (3, 4). Thus, mGluR1 is thought to be essential for CF synapse elimination and LTD induction, and its disruption may contribute to motor deficits of mGluR1 (–/–) mice. However, mGluR1 is expressed in various cell types in the central nervous system (CNS) other than PCs. Hence it is not clear to what extent mGluR1 in PCs contributes to these phenotypes.

We introduced a transgene (L7-mGluR1) that expressed mGluR1α under the control of the PC-specific L7 promoter (Fig. 1, A and B) into the mGluR1 (–/–) mice. One line of transgenic mice homozygous mutant for endogenous mGluR1 allele showed the cerebellum-restricted expression of the transgene (Fig. 1C) (9). (We refer to these mice as mGluR1-rescue mice.) The amount of mGluR1α protein in mGluR1-rescue cerebella was about 80-fold less than that in wild-type cerebella (Fig. 1C). mGluR1α immunoreactivity was abundant in the cerebellum, olfactory bulb, and thalamus in wild-type mice, whereas it was restricted to the cerebellum in mGluR1-rescue mice (Fig. 1E) (10). High-magnification micrographs revealed

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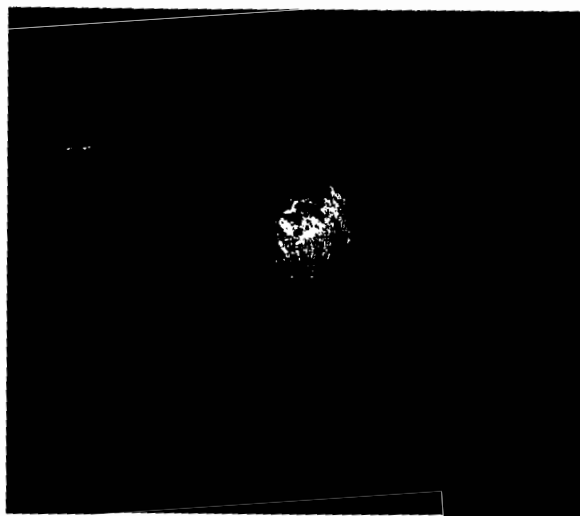
Counting the Cost of Deforestation

Robert Bonnie, Stephan Schwartzman, Michael Oppenheimer, Janine Bloomfield

The free market is generally not thought of as an ally of forest conservation. Although societies value forests in myriad ways, traditionally the marketplace has assigned a high value to wood products and nonforest uses of forestland such as agriculture. The marketplace often fails to value the "ecosystem services" that forests provide, such as watershed protection, biodiversity conservation, carbon sequestration and the consequent reduction in greenhouse gas (GHG) emissions. These ecosystem services have enormous value to society (1), yet forests continue to be degraded or lost at alarming rates. Currently, 14×10^6 ha of tropical forests are lost annually worldwide (2).

Increasingly, forest conservationists have sought to use market economics to protect natural forests from liquidation and conversion to nonforest uses. Examples include ecotourism, certification of wood products from sustainably managed forests, and selling non-timber forest products such as Brazil nuts and mushrooms. In response to global efforts to address climate change, there is increased interest in the benefits of carbon sequestration that accompany forest conservation. Successful marketing of the carbon benefits provided by forest conservation will depend on instigation of international GHG emissions targets such as those contained in the Kyoto Protocol (a treaty of the United Nations Framework Convention on Climate Change). Although such targets have yet to enter into force, investments have already been made in forest conservation projects by energy companies and other industries seeking to secure "credits" for reducing GHG emissions. For example, American Electric Power, PacifiCorp, and BP-Amoco have invested nearly \$10 million

in the Noel Kempff Mercado Climate Action Project, covering some 600,000 ha of Bolivian rainforest (see the figure). Efforts such as this are a valuable supplement to decreasing



Amazonian rainforest in Bolivia's Noel Kempff National Park.

fossil fuel consumption, an essential step in the reduction of GHG emissions.

On page 1828 of this issue, Kremen *et al.* (3) demonstrate that the formal adoption of forest carbon markets (as proposed under the Kyoto Protocol) by the international community could dramatically increase incentives for developing nations to protect forests. Using a case study in Madagascar, the authors analyze the costs and benefits associated with preserving a 33,000-ha area of tropical forest (Masaola National Park and surrounding buffer zone) or, alternatively, authorizing large-scale industrial logging. From the standpoint of the local inhabitants and the global community, the financial benefits from designation of the park outweigh those provided by logging. In contrast, at the na-

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tional level, the state would benefit more by offering logging concessions. This benefit to the state is important because it is often the state that has the greatest voice in the future of its forests. However, Kremen and co-workers demonstrate that establishing the Masaola National Park would still be financially preferable for the state provided it received compensation for the reduction in GHG emissions associated with this forest conservation project.

Of course, loss of intact forests often defies economic rationality on any scale. Road building has been the underlying cause of increased deforestation in the Brazilian Amazon since the 1970s. The decision to promote colonization of forest boundaries by building roads was a geopolitical one, and yet the major colonization projects it fostered were economic failures. Current infrastructure development plans for the Brazilian Amazon (the \$100 billion *Avanço Brasil* program), designed to expand soy exports, would result in a further 18 million ha of deforestation. Further clouding the cost accounting, many of the large-scale projects most destructive to tropical forests depend on international public-sector subsidies, notably from export credit agencies.

Even where developing countries have taken steps to conserve forests, ways to compensate forest and forest-dependent communities and nations for protecting tropical ecosystem services are essential. Indigenous and traditional forest communities that now have rights to and control over large expanses of forest (for example, the 20% of the Brazilian Amazon that is indigenous land) need access to markets and the cash income they provide. If other options are unavailable they will resort to unsustainable mining of forest resources. Even where there are subsidies or where public goods are privately appropriated with broad social and environmental costs, deforestation has developed substantial momentum. Significant private and public costs in halting or reversing deforestation will be incurred by, for example, restoring degraded areas, instigating sustainable agriculture or agroforestry, and monitoring and enforcing forest protection.

In the Madagascar case, after considerable international pressure, the country did establish the Masaola National Park. Kremen *et al.* argue that as industrial logging and its successor, slash-and-burn agriculture, result in dramatic emissions of carbon dioxide and other GHGs, Madagascar is providing substantial global reductions in GHG emissions free-of-charge by protecting a large area of tropical forest.

The Intergovernmental Panel on Climate Change estimates that tropical deforestation was responsible for 20 to 30% of global, an-

thropogenic GHG emissions during the 1990s (see note 5 in Kremen *et al.*). These data argue strongly for finding ways to reduce emissions from tropical deforestation. Despite this, international negotiators have yet to decide whether forest conservation and certain other land use activities that provide GHG benefits will count toward meeting the GHG emissions reduction targets of the Kyoto Protocol.

Specifically, in the coming months, nations have to decide whether forest conservation should be an eligible activity under the Clean Development Mechanism (CDM) of the Kyoto Protocol. The CDM allows industrialized nations to secure "certified emissions reductions" by undertaking projects to reduce GHG emissions in developing countries. Such certified emissions reductions would count toward achieving the emissions targets set for industrialized nations. If regulations are formulated to guard against the possibility of perverse outcomes, such as violation of indigenous people's land tenure, these CDM projects will also contribute to the sustainable development of poorer nations.

Seeking to curb tropical deforestation (together with the primary objective of reducing GHG emissions from fossil fuels) should be one goal of international efforts to address climate change. But there are complexities associated with accurate quantification of GHG benefits from forest conservation. Baselines must be established that account for the rate of deforestation that would have occurred in the absence of the conservation project.

Satellite photographs suggest how objective baselines for deforestation can be established (4). Deforestation is neither homogeneously nor randomly distributed throughout the world. Stratified deforestation maps for the Brazilian Amazon between 1991 and 1996 showed that nearly 90% of the new clearing was within 25 km of areas deforested in 1978, whereas 74% occurred within 50 km of major roads. Using this type of historical evidence, the location and extent of future deforestation can be predicted. For example, the Instituto de Pesquisa Ambiental na Amazônia (IPAM) and Instituto Socioambiental in Brazil predict that between 8 and 18 million ha of the Amazonian rainforest will be deforested in the next 25 to 35 years because of the building of four major roads (5). IPAM and the Woods Hole Research Center have developed and are testing a computer mapping model for fire prediction in the Amazon (6). Developing such modeling tools and applying conservative assumptions in program design will allow reliable formulation of deforestation baselines.

In addition to the question of baselines, international negotiators must develop accounting rules that ensure countries do not receive credit for forest conservation in one region if the project merely shifts logging to other forests, thereby negating the project's

GHG benefits. It will also be necessary to use accounting systems that capture the fluctuations in forest carbon stocks caused by natural disturbances such as fire and pests. Some countries and even environmental organizations believe that these complexities cannot be overcome and that forest conservation, therefore, should not be an eligible activity under the CDM.

In considering the fate of forests under the CDM, nations should be guided by the Special Report on Land Use, Land-Use Change, and Forestry. Released by the International Panel on Climate Change in May of this year, the Special Report was written by many of the world's leading experts on carbon sequestration in forests and other land uses. Much of the report analyzes alternative interpretations of the Kyoto Protocol's somewhat opaque language regarding carbon sequestration. Of most relevance to the CDM, the Special Report devotes an entire chapter to "project-based activities." This chapter and other sections of the report suggest that accounting systems can be developed to ensure the integrity of carbon credits generated through forest conservation.

Kremen *et al.*'s analysis provides further insight into how carbon sequestration and forest conservation under the CDM might work. Their case study concludes that the maximum cost of reducing carbon emissions through establishing the Masaola National Park would be \$4.34 per metric tonne of carbon. Given that the marginal cost of carbon is likely to be higher if the Kyoto Protocol enters into force, sale of carbon credits could provide ample funding to compensate the state for the cost of forgoing logging concessions and to buffer against project failure. For example, forest conservation projects might choose to hold some carbon credits in reserve as self-insurance against project risks. Alternatively, other mechanisms may also be developed, such as "carbon insurance" that could be purchased by project investors.

Inclusion of forest conservation in the CDM holds real promise for securing reductions in GHG emissions by providing substantial financial incentives to developing nations to reduce deforestation. Formulating appropriate accounting policies will take much effort, but given the magnitude of the ancillary benefits such as conservation of biodiversity that would also result, international negotiators should seize the opportunity to alter the way global markets value forests.

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The long-term requirement for CDM forestry and economic liability

By Reimund Schwarze and John O. Niles¹

Abstract

The Clean Development Mechanism (CDM) of the Kyoto Protocol allows developed countries to gain greenhouse gas emission reduction credits by sponsoring projects in developing countries. The CDM requires that credits for emission reductions only be granted to projects that produce long-term benefits to climate change. However, countries that host CDM projects may be reluctant to engage in long-term projects for fear of sacrificing national sovereignty, a concern particularly acute in land use efforts such as forest conservation. One solution to this is to use economic liability in CDM contracts, which delays payments to parties to encourage long-term contracting. In this paper, we evaluate CDM-sponsored forest conservation using several types of economic liability schemes (or contracts). We find that one type of liability -- seller liability -- has intrinsic advantages over other types of liability contracts. We then propose a modified seller liability contract for CDM forestry that is more profitable to host countries than pure seller liability, while still providing sufficient long-term incentives. If long-term contracting can be done efficiently and equitably, we suggest more CDM-sponsored forest conservation could occur in the near future and other challenges in climate change policy can be overcome.

1. Introduction

The Clean Development Mechanism (CDM) is an instrument of international cooperation within the Kyoto Protocol to the United Nations Framework Convention on Climate Change. The primary purpose of the CDM is to assist developing countries, called Non-Annex I countries in the Protocol, achieve sustainable development while stabilizing greenhouse gas concentrations in the atmosphere. The CDM's second purpose is to assist industrialized countries (Annex I countries) achieve the emission reduction commitments that they agreed to under the terms of the Protocol. Under the CDM, Annex I-parties may fund emission reduction projects in amenable Non-Annex I countries and get credit for Certified Emission Reductions (CERs) from these projects. These CERs can then be used to meet the commitments of the Annex I countries. Due to the "flexible" nature of CDM, most CERs will probably cost less than domestic Annex I reductions. As such, these CERs will likely lower the cost of meeting the Kyoto Protocol's target reductions.

A major field of application for the CDM is tropical forest conservation. Tropical deforestation causes approximately 20-30% of worldwide greenhouse gas (GHG) emissions (Brown et al., 1996 and Houghton, 1999).

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Stopping or slowing the rate of deforestation compared to a business-as-usual scenario will reduce emissions of GHGs into the atmosphere. In this regard, forest conservation is quite different from forestry sequestration activities (such as re-planting) that increase the uptake of carbon from the atmosphere.² Due to the relatively low cost of forest conservation and reforestation in the tropics (Halsnaes et al., 1996) CDM forestry is a topic of considerable debate.³ Other probable applications of the CDM will be in areas of energy efficiency, power-plant upgrades, transportation projects and other activities that verifiably reduce GHG emissions.

One of the unique legal stipulations of the CDM is that emission reduction projects must achieve "real, measurable and long-term environmental benefits" if they are to be credited (and therefore be valuable). A few problems arise out of this "long-term" requirement that are unique to land-use projects. First, host countries may be reluctant to commit to forest protection for long periods of time. A developing country might want to leave its land use options open to accommodate future changes in its national development priorities or to be able to respond to changes in commodity prices, land tenure, or social conditions. A second problem is that a forest protected one year (over a baseline scenario) may easily be degraded the following year. Consequently, emission reductions in land use programs may be more transitory than emission reductions in technology-based programs. Long-term forest protection is particularly at risk if the certified emission reductions (CERs) and the host-country payments are granted early in a project. In this case neither party has a substantial interest in sustained forest protection since credits and payments would already have been collected. These concerns and others have led some people to suggest that the CDM should not allow forest conservation as a project type, or at least the CERs generated by forest protection should be discounted. Yet the CDM, if it leads to real and lasting increased tropical forest conservation, could be a powerful new way to finance sustainable development. Investors from wealthy countries would be teemed up with developing countries that want to conserve their natural resources but are unable to give up the income associated with logging or agriculture (Kremen et al, 2000). Since the Kyoto Protocol requires that CERs be real, additional and independently monitored, this will in essence make actual on-the-ground forest conservation profitable. This is a dramatically

² While both source prevention (i.e. stopping deforestation) and sink enhancement (growing new forests or increasing the biomass of existing forests) achieve the same net result on the balance of GHGs, we discuss only source prevention. We do this in part due to the language of article 12 of the Protocol ("certified emission reductions") as well as to avoid the ethical issue of Annex 1 countries buying entitlements to pollute by growing large plantations in developing countries.

³ In addition to the accounting-based issues discussed here, there are considerable ethical and legal issues that are discussed elsewhere. See Vine and Sathaye, 1997, Brown and Kete, 1998, Cullet and Kameri-Mbote, 1998, Goldberg, 1998, Mulongoy et al., 1998, Niles and Schwarze, 2000.

different approach to traditional aid-based financing that does not explicitly tie financing to measured results. Perhaps this is the reason that despite more than 100 international efforts and agreements, tropical forests continue to be lost at the tragic rate of 15 million hectares per year (FAO, 1999).

There are other benefits to conserving tropical forests as well. In terms of mitigating climate change, forest protection not only prevents GHG emissions but it also maintains a land surface at the equator with a stabilizing impact on many climate parameters (Niles and Schwarze, 2000). Additionally, vast amounts of endangered biological and cultural diversity are located in tropical forests.

And so an important challenge facing parties that want to stall climate change is how to design contracts within the Kyoto Protocol to reward long-term tropical forest protection.⁴ If specific accounting and macro-economic tools can be developed that foster long-term forest conservation, the CDM could emerge as a potentially powerful new way to finance sustainable development. These contracts would be paid for by wealthy countries and carried out in poorer countries that want economic assistance to safeguard forests that would otherwise be degraded.

Legal liability

One solution is to allow the courts or other legal channels to decide the consequences of contract failure. If a CDM project to protect a forest fails after a short period, one party could sue the other, invoke trade sanctions, or pursue other legal remedies to either force compliance or collect a fine. Legal liability and sanctions, however, are difficult to implement in global environmental regulation (Wiener, J.B., 1999). Additionally, legal liability imposes some measure of lost decision making at the national level and could create some land-tenure uncertainty in general. Some developing countries have pointed out that courts or other multi-lateral institutions could try to force adherence to a CDM contract. While this infringement on national decision making is applicable to all CDM project types, the problem is potentially more acute in land-use. Thus, while both a host country and a donor country must agree to start conserving a forest under the auspices of the CDM, they may object to a legal framework to force long-term contracting. Moreover, international legal liability could cause high litigation and other transaction costs.

⁴ The problem of achieving lasting emission reductions from CDM projects is actually not a specific problem of CDM forestry but applies to other mitigation activities as well, e.g. energy efficiency projects. The reasoning in this paper could be easily generalized to these cases if the long-term requirement of Art. 12 KP is interpreted in the way as it is done in this paper, i.e. as a minimum period of contract duration.

Economic Liability

Another way to encourage long-term conservation is to delay the payments to either the host or the sponsor country. By having its benefits withheld until "long-term protection" has been achieved, a party has an economic incentive to sustain forest conservation. We refer to this procedure as assigning economic liability, which is the focus of this paper.⁵ Economic liability encourages long-term participation but does not demand it legally. If one of the parties in a contract wants to disengage from a CDM project, they can look at what was being withheld from them, what they can gain by breaking the contract, and then determine which is better. In this regard, economic liability makes the consequences of a broken or failed contract clear and transparent. Under economic liability for example, host countries can change their development priorities (say, and sell logging rights to a forest they had placed under CDM conservation). In doing so they won't face any legal challenges to their decision. What they will give up is the portion of the proceeds that they were to receive had they kept their forest in long-term protection.

Economic liability conceptually resembles an assurance bonding system, which has been discussed as a flexible tool to enforce environmental liability (Perrings, 1989; Constanza and Perrings, 1990) and labor contracts (Becker and Stigler, 1974; Akerlof and Katz, 1989).⁶ In contrast to this general principal-agent literature, our paper is concerned with a specific enforcement problem – contract duration – in the legal setting of Article 12 (the Article that defines the Clean Development Mechanism) of the Kyoto Protocol. Under the CDM, two questions must be answered before economic liability can be used. First, who is held responsible (liable) for an emission reduction contract? And second, when should the benefits from the contract be disbursed to the different parties? This paper examines these two issues through a series of discussions, examples and analyses.

We begin in section 2 by discussing the question "how long should 'long-term' be for climate change mitigation projects"? From a variety of perspectives, we conclude that a 30-50 year timeframe is reasonable. In section 3, we introduce and define three basic types of contracts that can foster sustained emission reductions, i.e. buyer liability, seller liability and double liability. We then develop a hypothetical model forest conservation project undertaken under the auspices of the CDM that uses these different liability schemes. In section 4, we show that one type of economic liability (seller-liability) has a fundamental efficiency advantage over other types of liability. We

⁵ Most of our results also apply to an accounting procedure based on certification. Certification rules, however, are less suitable as an incentive scheme compared to crediting rules because they can not be easily disintegrated to have a piece-meal approach as in the case of crediting rules.

explain how this is caused by the "no borrowing" provision of the Protocol and also because only certain countries agreed to specific emission reduction targets. In section 5, we propose a hybrid type of seller liability that we call a forest-secured escrow account. This contract type increases the internal rate of return to potential sellers without unduly diluting the incentive to maintain long-term forest conservation. Section 6 summarizes our results and discusses the implications of applying an escrow account, or any form of economic seller liability, to enforce the long-term requirement of the CDM.

2. The long-term requirement of the Clean Development Mechanism

How long should 'long-term' be in the case of CDM forestry projects? Article 12(4) of the Protocol only states that emission reductions under the CDM "shall be certified on the basis of real, measurable and *long-term* benefits to the mitigation of climate change". The Protocol does not provide any further guidance on what is meant by long-term -- but it does clearly require that emission reduction projects must have some long-term assurance. Thus, it seems unlikely that year-to-year CDM projects will be certifiable since they fail the durability litmus test. It is also possible that long-term contracts will be intrinsically more efficient since individual year-by-year contracts would probably have relatively higher transaction costs.

But what exactly does "long-term" mean? Does the CDM's long-term requirement imply permanence? As discussed in the introduction, permanent conservation could be unacceptable to potential CDM host countries. The permanent protection of a forest could be perceived by developing countries as a *de-facto* expropriation, or at least a forfeiture of control. Several key developing countries such as Brazil have expressed exactly this objection to the CDM, arguing it would limit their ability to make "domestic decisions domestically" (MCT, 1999).

From a scientific point of view, 'long-term' could be logically interpreted to suggest a project should endure the minimum time that it takes for a GHG emission to decay in the atmosphere, e.g. 50-200 years for carbon dioxide (IPCC, 1994). While delaying emissions would be financially advantageous for Annex I-countries (because they can use CERs to offset their duty to reduce emissions domestically), postponed emissions will not necessarily help stabilize atmospheric greenhouse gas concentrations.

⁶ We are grateful for an anonymous referee of this journal, who made us aware of this pertinent stream of literature.

Less than permanence, however, could be sufficient if we approach this question of duration from a socio-political point of view. If GHG emissions are reduced for a period of time while alternative abatement strategies become widespread, delayed emissions will provide an important "bridge" to future atmospheric GHG stabilization. In this sense, the long-term requirement is justified and defined by the expectation that structural changes in the world economy and technology will arise at a later date. These changes could be the emergence of new technologies or an increased valuation of forests outside of their role in climate change mitigation. Widespread adoption of low-carbon technologies such as solar or wind power will be cheaper in the coming decades (for references see Wigley et al, 1996). Thus, even semi-permanent reductions *now* will help transition into more lasting reductions *later*. Alternatively, the value of tropical forests may rise in the future such that deforestation is no longer an economically attractive activity. This increase could either be in the form of domestic values (i.e., watershed protection) or external values (i.e., biotechnology companies paying higher amounts for natural genetic biodiversity). Thus, forest conservation under the CDM could help stall global warming by delaying emissions until the incentive to deforest is lost or low carbon technologies develop and become widely adopted.

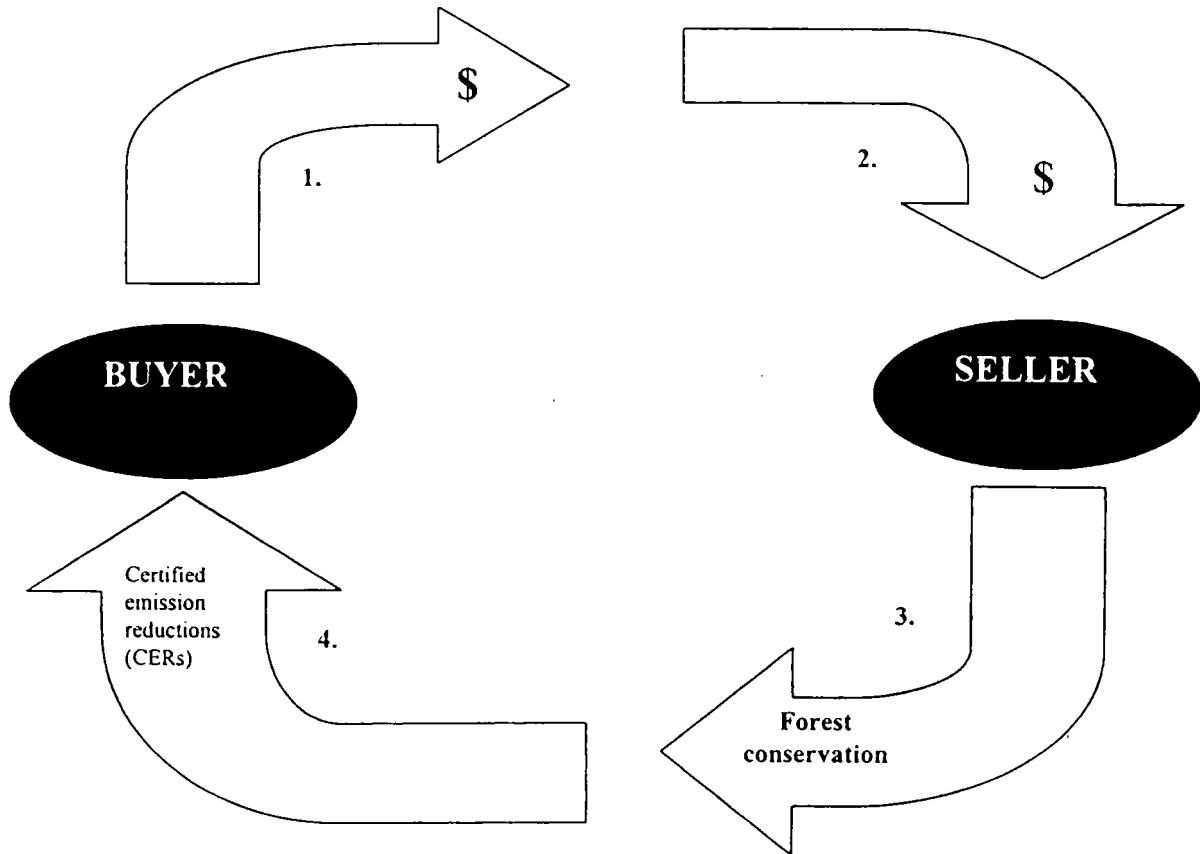
Another way to establish the minimum amount of time for the long-term requirement is to consider the precedent that was established in the pilot phase of Activities Implemented Jointly (AIJ). Both AIJ and the CDM mandated "real, measurable and long term environmental benefits". According to our study, the average duration of AIJ forestry projects is 39 years with a median duration of 32.5 years.

Together, these arguments suggest that a minimum period of 30-50 years would be a practical period of time for the CDM's long-term requirement. To summarize, this suggestion is based on the minimum amount of time for CO₂ to begin decaying in the atmosphere, the expectation that new technologies will become cost-effective in a few decades, and on the precedent that was established under AIJ which also required long-term benefits for climate change.

3. Basic types of economic liability contracts

We can think of a CDM-project as having four distinct contractual procedures (see Fig. 1).

Figure 1. *CDM contractual procedures*



1. The donor country ("buyer") funds a project according to some specified payment schedule.
2. The host country ("seller") receives payments from this fund according to a specified schedule.
3. In exchange for this payment, the host increases forest conservation over a baseline rate, thus preventing the emission of greenhouse gases.
4. The donor country is credited for these emission reductions in the form of Certified Emission Reductions (CERs).

For the purpose of establishing economic liability, any of these contractual procedures can be decoupled from one another and tied to a stipulation. For example, any of these four actions can be explicitly tied to long-term forest

conservation, mandating that the procedure only happen once sustained protection is verified. From these contractual procedures then, we can distinguish four contract types to assign liability (see Table 1).

Table 1. Basic contract types

Donor Host	<i>Continuous crediting</i>	<i>Terminal crediting</i>
<i>Continuous crediting</i>	No liability (service contract)	Buyer liability
<i>Terminal crediting</i>	Seller liability	Double liability

A *service contract* credits the host and the donor continuously. This "pay as you go"-scheme does not impose any kind of economic liability. In fact, under a "pay as you go"-scheme, a long-term contract is separated into a sequence of single service contracts, each in the amount of *annually* reduced emissions. All other contracts impose some kind of economic liability to one or both of the parties. Let us examine each of these contract types (or schemes) in more detail with particular consideration for CDM forest-conservation.

Buyer-liability is when the buyer of emission reductions, in this case a developed Annex I country, does not receive certified emission reductions (CERs) until the end of the long-term period. In other words, buyer liability uncouples the donor's payment to the host from the donor's receipt of CERs (see Figure 1). Because of discounting and a decreasing value of money with time, payments that are delayed reduce the net present value of the emission reductions being organized. Under buyer liability, this decrease in value is born solely by the purchaser of emission reductions (i.e., the buyer). Meanwhile, under buyer liability, the seller of the credits (the host country) receives its payment for forest conservation without delay. Since it is paid as forest conservation ensues, the host country realizes the full, undiscounted value of its potential gain.

Seller-liability is the mirror image of buyer liability. Here, the seller of emission reductions, a developing non-Annex I host country, is not compensated for forest conservation until the long-term requirement is satisfied, e.g., 30-50 years. Under seller liability, payments to a host country for sponsoring forest conservation are withheld even while actual forest conservation is increasing in an area. Again, because of discounting, seller-liability reduces the

value of the payments for forest conservation to the host country. Since the income from the donor is not immediately accessible by the host, a fund arises that would need managing. Presumably this fund would be managed by a third party, possibly the Global Environmental Facility (GEF) at the World Bank or some other body appointed by the CDM's executive board.

Double liability is an odd form of holding both parties responsible until the contract is fully performed. It foresees a continuous funding of tropical forestry by the donor and a continuous effort by the host to preserve forests. However, both countries are only rewarded for their efforts after the project is completed. Double-liability, because it imposes high costs on both parties, will tend to lower the value of the CDM-sponsored forest conservation so that in practice, very little forest conservation would occur. As such, it is not discussed in detail in this paper.

To illustrate important differences between liability contract types, we constructed a hypothetical model of a CDM forest preservation project. In this example, we envision a forest conservation project that is sponsored by a CER buyer (an Annex I country) and hosted by a seller (a non-Annex I country). The buyer of the emission reductions pays the seller \$30/ton of carbon (tC) for each of the 150tC/hectare (ha) that are prevented from entering the atmosphere each year via forest conservation. We used the following assumptions:

- Project area: 30 ha
- Baseline deforestation: 1ha/yr
- Deforestation rate under the CDM project: 0 ha/yr.
- Project period: 30 yr.
- Carbon stock: 150 tC/ha
- Market price paid for carbon reductions in the project: \$30/tC
- Donor's Opportunity Cost (i.e. the cost of domestic mitigation): \$50/tC
- Host's Opportunity Cost, (i.e. revenue foregone if the forest is conserved): \$1500/ha = \$10/tC
- Discount rate: 3%.

We used these values because we think they are roughly representative of actual costs and benefits possible under CDM forest conservation. We also purposefully pegged the market price of carbon (\$30/tC) half way between the seller's opportunity cost of carbon (\$10/tC) and the cost of the buyer's domestic compliance (\$50/tC). We selected these values to highlight structural asymmetries between the liability schedules. For example, the host country will receive \$20 more per ton of carbon if it chooses to place its forest in protection instead of exploiting the land and collecting the opportunity cost (\$30/tC - \$10/tC). The sponsoring country also stands to gain \$20 for every ton of carbon it prevents from entering the atmosphere under the project because it is paying \$30/tC instead of the next cheapest form of mitigation of \$50/tC. Given that the two parties both stand to gain \$20/tC from a CDM project, we eliminate any variation in the value of different contracts that derives solely from different potential gains used in our model.

To evaluate how different liability schemes effect the overall value of the contract, we employed two equations. First, we estimated the net present value (NPV) of the opportunity costs faced by both potential parties. A net present value is simply the discounted sum of future costs or benefits. For the host, this value was calculated as the lost income from the forest if it were not exploited commercially (\$10/tC). For the buyer, this value is calculated from the discounted stream of costs it would face reducing emissions domestically (\$50/tC).

The second equation used was the total economic value (TEV) of the project, calculated as the difference between the two parties' opportunity costs. This difference is actually the net potential gain by the world from international trade in emission reductions. A higher TEV signifies a more efficient (and therefore more profitable) contract, while a lower TEV indicates that some of the efficiency achievable by world trade is compromised by a particular contract type. Based on these assumptions, we estimate the total economic value (TEV) of this project as \$117,962. This was calculated as the difference of the net present value (NPV) of opportunity costs to the donor (\$147,003) and to the host (\$29,041). This can be thought of as the maximum potential of a contract to both parties given that no benefits are withheld. Naturally, for the host to agree to any project, it must be compensated at a value greater than the current opportunity cost of the land. In our example, the host country is paid three times the opportunity cost of the land (\$4,500 per ha of forest conserved versus \$1,500/ha if exploited).

The value of the contract *to the parties* depends on the specification of the liability rule as specified in Table

2. A spread sheet for our model that shows our calculations is provided in the appendix.

Table 2. *Net present values (NPV) of contract net benefits*

Liability Type	Host's NPV	Seller's NPV	Total NPV
None	\$ 58,801	\$ 58,801	\$ 117,602
Seller	\$ 24,598	\$ 58,801	\$ 83,399
Buyer	\$ 58,801	\$ 1,795	\$ 60,596
Double	\$ 24,598	\$ 1,795	\$ 26,393

From this table, we see that economic liability lowers the value of the project to any party that has its benefits withheld. With double liability, both the buyer and the seller of the emission reduction credits have their net present values diminished compared to a no-liability contract. In the case of seller liability, the seller's net present value is reduced from \$58,801 to \$24,598. Since the buyer's benefits are not withheld under a seller liability contract, its net present value is unchanged at \$58,801. Under buyer seller liability, the buyer's net present value is reduced from \$58,801 with no liability to \$1,795. Again, the seller's net present value under buyer liability remains unchanged. Given that we had constructed our example with equal potential gain for the two parties (i.e., both parties will benefit by \$20/tC under the project), the difference between buyer and seller liability may come as a surprise. However only on first sight. Under buyer liability, a buyer incurs a higher annual cost (\$30/tC) in the withholding period than a seller would (\$10/tC) under seller-liability. This higher cost carries a higher weight as a stream of negative income for the purpose of PV-calculation, resulting in the observed difference in efficiencies for the two contract types.

4. The efficiency advantage of seller liability

The efficiency of liability regimes has been analyzed in the law-and-economics literature. This literature is concerned with regimes of legal liability, i.e. legal sanctions attached to some kind of contract failure or general misbehavior. In the context of contract law (or legal liability) a general result is that seller and buyer liability have

identical efficiency properties in a world without transaction cost (see Polinsky, 1989). A different result arises in economic liability under the CDM. The withholding of contract benefits is different from legal liability for contract failure because it actually interrupts the contract in the withholding period. By contrast, legal liability does not interrupt contract performance, but only penalizes contract failures *ex post*.

One way to see how this interruption of benefits differentially impacts the efficiency of the liability types is to compare the total economic value (TEV) of the various contracting schemes to the economy as a whole. As discussed previously, the TEV is the present value (PV) of the difference of opportunity cost to the host and to the donor; and in our example, it amounts to \$117,962. The present value of net contract benefits in the case of seller liability is only 71% of the total economic value of a contract with no liability, or \$83,399 (\$24,598 + \$58,801). Under seller liability, there is a loss of contract value to the seller, expressed in a lower PV of contracting (\$24,598) compared to the no-liability regime (\$58,801). But this financial loss is exactly made up by gains of the fund where the money is held (\$34,204). Thus, the TEV to the economy as a whole is \$117,962 (= \$58,801 + \$24,598 + \$34,204), which implies there is no economic loss incurred due to economic seller liability. In the case of buyer liability, this TEV is reduced to 51% of the possible TEV, or \$60,596, as a result of the low economic value of the contract to the buyer (\$1,795) and no equivalent fund to make up the difference as in the case of seller liability. Double liability results in only 22% (\$26,393) of the contract potential being realized.

This asymmetry of economic seller versus economic buyer liability essentially arises from the particular legal setting of the CDM. The CDM does not allow Annex I countries to use future emission reductions to offset the commitments they agreed to meet in the years 2008-2012. This provision is commonly referred to as "no borrowing". In the case of buyer liability, the buyer still has to fulfill its Kyoto commitments, i.e. reduce its emissions domestically. This comes at a higher cost than buying this service from the seller. Thus, a liable buyer of CERs has to fulfill its actual duties during the withholding period by other means, e.g. domestic abatement.⁷ This missing "when flexibility" of the CDM limits the efficiency of "where flexibility". The no borrowing rule, combined with the fact that only buyer's have undertaken commitments to reduce their emissions, results in a net economic loss under buyer liability that does not arise with seller liability.

⁷ At some future date when the long-term requirement is satisfied and the credits for the emission reductions are validated and transferred to the Annex I buyer, it will be able to use them at that point. Thus, the Kyoto Protocol's no-borrowing principle would not necessarily negate any CDM-sponsored forest conservation even under buyer liability.

There is no economic loss under seller liability because withholding the income from a host country (for agreeing to protect its forest), does not force the host country to go out and buy alternate credits. Remember, under the Kyoto Protocol only Annex 1 countries (the buyers in any CDM transaction) agreed to reduce their emissions or pay for reductions elsewhere. Of course, the seller is worse off in the withholding period compared to a no-liability or a buyer-liability scheme. But as noted previously, the financial loss to the seller is exactly compensated by the accrual of interest in the fund held by a third party. Thus, there is no loss incurred under seller liability to the economy as a whole. Consequently, our results indicate an intrinsic difference in the efficiency of seller versus buyer liability for the CDM. Differences in transaction costs and other differences between these two systems could override the asymmetry described here. Yet, it is interesting to note this *a-priori* advantage for seller liability compared to buyer liability in the CDM's no-borrowing setting.

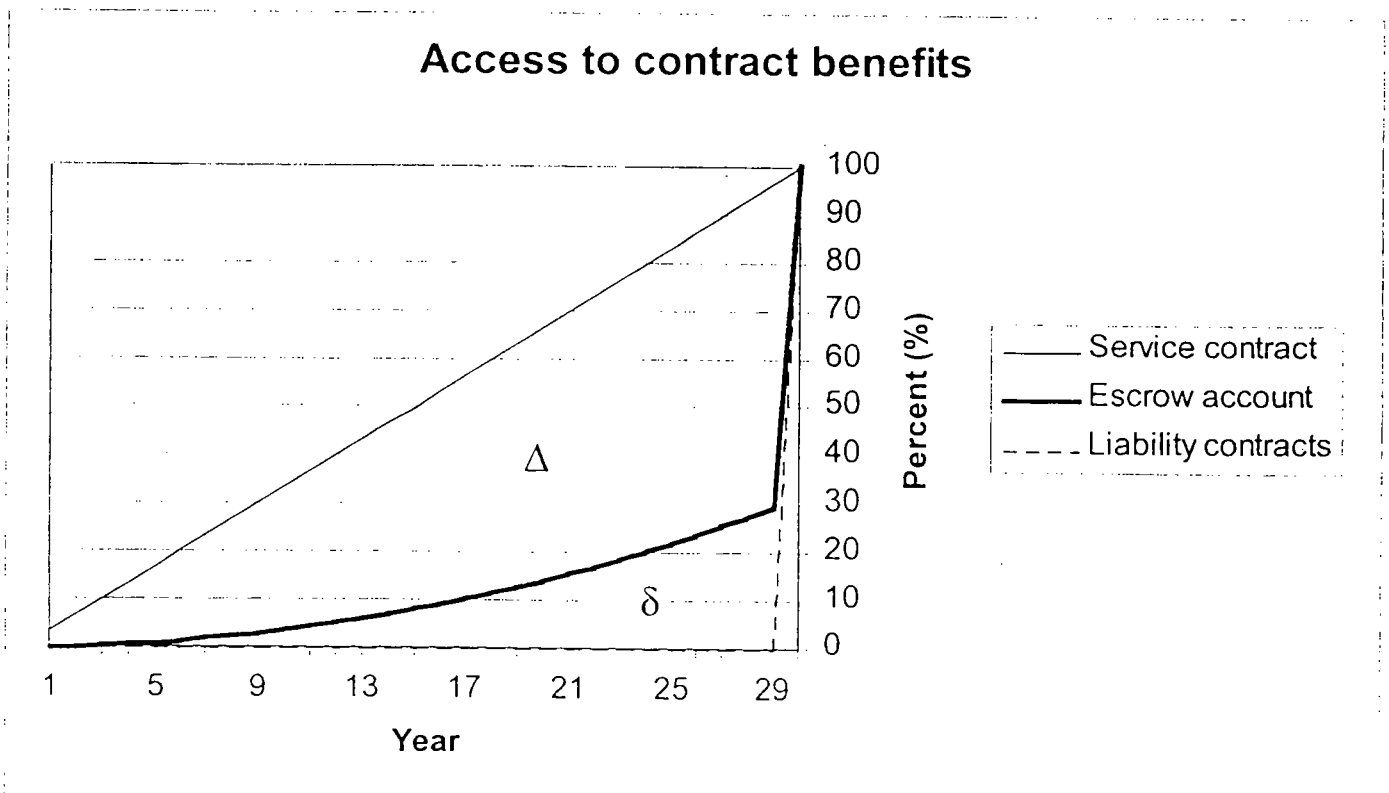
5. The CDM forest-secured escrow account

So far we have discussed only pure types of liability contracts to establish some general properties. As we discovered, seller liability appears to have an intrinsic advantage over buyer liability. Given this however, it should be apparent that sellers under seller liability still stand to receive less money than they would if there were no liability. Withholding benefits to the seller to encourage long-term protection results in the seller realizing a lower present value. In some cases, this lower value may deter potential hosts from conserving their forests since they will make less money. There is, however, an interesting "impure" type of seller liability that increases the present value and the internal rate of return of contracting to the seller, making CDM forest protection more profitable. We refer to this idea as a forest-secured escrow account. This scheme resembles escrow accounts used in the U.S. to enforce mortgage contracts. An escrow account is a special savings account required of a mortgager to cover future costs such as real estate taxes, home insurance, or minor repairs. Escrow accounts secure the lender's investment, not the mortgager, because the mortgager has to prepay into the escrow. The mortgager still legally owns the principle and the interest in any escrow account. It is refunded to her/him if s/he repays the loan or meets the conditions established to retrieve the escrow.

Under the CDM, a forest-secured escrow account could be established where the donor country establishes a savings account on behalf of the host country with the funds from the contract. Placing the money into an escrow would be done to secure continued protection of a forest. In the case of this proposed forest-secured escrow account, both the principle and the interest are a legal entitlement to the host. The principle would be handed over to the host country if after 30-50 years the forest is still standing. Practically speaking, satellite measurements and ground-truthing could be used to verify that actual forest protection. Meanwhile, the interest from the escrow account would be distributed to the host on a continuous or semi-continuous basis. This would give the host some income during the project, an important consideration if developing countries are being asked to safeguard their forests for long periods of time.

Looking at the long-term incentives of a forest-secured escrow we find it provides sound incentives for long-term contracting. A convenient way to do this is to analyze the time distribution of net benefits to contracting parties (see Figure 2).

Figure 2. *Time distributions of contract benefits*



The time distribution of contract benefits measures the percentage of accessible contract benefits at any point in time during the contract period. It is obviously different for service contracts (no liability) and economic liability contracts. In the case of a service contract, contract benefits are immediately accessible to both parties at any point in time. The donor is credited with CERs as it pays and the host is credited this payments as it protects the forest. Using our model project outlined previously, 50% of the benefits of a 30-year contract would be accessible to both parties after 15 years of contract duration.

In the case of pure buyer or pure seller liability, all contract benefits are withheld from one party until the contract is completed. In our example no contract benefits are accessible in the years 1 to 29 to the liable party or parties (in the case of double liability), and full crediting only occurs at the end of year 30. The forest-secured escrow account is a hybrid between no-liability and pure seller liability. A major part of contract benefits – the principle – is withheld for 30 years, however the interest can be accessed as it accrues. Looking at Figure 2, the proportion of contract benefits available with a forest-secured escrow account during the project would be $\delta/\Delta+\delta$, or about 25% in our example.⁸ This secures a significant incentive to ensure contract durability while making some of the proceeds available to the host country during the forest conservation project.

This forest-secured escrow account provides a higher internal rate of return to the seller (12% in our numerical example) compared to a pure seller liability (6% in our numerical example).⁹ This higher rate of return would make the escrow account more acceptable to potential sellers than pure seller-liability and would presumably lead to increased rates of forest conservation. These calculations can be found in the Appendix (last row).

While a forest-secured escrow account would make it more profitable to engage in CDM activity, it also establishes two independent economic incentives to sustain long-term forest conservation. On one hand, as a form of economic seller liability, the forest-secured escrow account withholds the principle payment from the host until obligations are fulfilled. On the other hand, the interest is increasing with time since the principle on which the interest is paid is increasing over time. So even during the withholding period, contracting is more rewarding the longer it is

⁸ In our figure this is the ratio of the area (δ) which is the cumulative income available in from the escrow account, and the total area ($\Delta+\delta$) which is the cumulative income of a no liability contract. This is an application of the Gini-coefficient, a technique used to compare the equality of income distributions.

⁹ The internal rates of return (IRRs) for our numerical example of the economic liability contracts are given in the last row of the appendix.

sustained. Lastly, as a type of seller liability, the escrow system is efficient and the awarding of some payments up front does not affect this property.

6. Conclusion

In this paper we show that seller liability is economically more efficient than buyer liability. This asymmetry derives from the prohibition of borrowing and unequal commitments under the Protocol. Then, we proposed a hybrid scheme of seller liability, an escrow account secured by long-term forest conservation. This hybrid accounting method would be more acceptable to potential CDM hosts than pure seller liability while still providing incentive for long-term forest conservation. Essentially, the escrow approach attempts to balance long-term assurances with short-term economic incentives that developing countries will need in order to agree to not exploit their forests. Other modifications of pure economic seller liability could be suitable as well. One example would be to release portions of the principle as a function of time.

Our findings so far have only discussed the efficiency of various contract types. Throughout our analysis, we have not considered issues of equity or fairness. On first sight, seller-liability appears to harm potential host countries disproportionately. After all, given that most GHG emissions have been caused by the developed countries, why should developing countries agree to be held liable for an effort to reduce GHG emissions? We suggest that seller liability may give a developing country more control over its land than buyer liability.

Given that both a sponsor and a host country must agree to start a CDM forest conservation project, which form of liability would give the host country the most freedom to change its plans along the way? Buyer-liability could result in arm-twisting of a developing nation by a developed nation to adhere to the contract. If the developed country were held liable, it might engage in behind-the-scene maneuvers to make the developing country fulfill its contract. For example, if a developed country was liable for a project in a country that was receiving World Bank loans, it might try to tie the loans to the continuation of the contract. Or the developed country might threaten to withhold humanitarian aid or block private investments if a developing country was considering defaulting on the CDM contract.

Seller-liability would not be as prone to such activities. Since the developing country would be the one liable, it would decide whether to stay in a contract based on the relative costs and benefits it perceives from the various choices. Since the buyer would be receiving its CERs, it would not be as likely to manipulate compliance by the developing country.

Another implication of seller liability is that it will give rise to a substantial worldwide fund being held and possibly supplemented to maintain long-term forest conservation. This will require an international body with experience and skills managing large international funds and handling international projects. This body could be located at the Global Environmental Facility (GEF) of the World Bank or under the guidance of the CDM executive board. It would act as trustee comparable to the trustee holder of an escrow account or a trust fund. Moreover, it could act as a clearinghouse for bids and offers of CDM projects and generally guide interested parties in establishing CDM contracts.

This body may also have an opportunity to supplement the escrow account or another form of seller liability. For example, since a seller-liability system rewards long-term forest conservation at the expense of short-term gain realized by developing countries, incremental funding from the GEF could compensate host countries for the economic loss associated with seller-liability (GEF, 1999). The GEF's goal is to reduce GHG emissions and maintain biodiversity by paying incremental costs associated with running a development activity sustainably versus unsustainably. GEF funds are typically leveraged with five times their amount in private investments. In these regards, paying costs (born by developing countries) associated with seller-liability to achieve long-term forest conservation seems an appropriate target for the GEF sponsorship. This supplement should be designed not to diminish the incentive for long-term contracting, but rather to compensate developing countries for the costs associated with seller-liability.

The fund manager could also serve as an authority to tax the proceeds of CDM activities in accordance with Article 12 (8) of the Protocol. Article 12 (8) calls for developing countries particularly vulnerable to the adverse effects of climate change to be helped meet the cost of adaptation to the change with a tax from CDM activities.

Lastly, a fund such as will arise under seller liability could potentially bridge the two divergent views on the institutional character of the CDM (Farhana, 1998). One view, shared by many Annex I-countries, stresses a market-based CDM similar to the Activities Implemented Jointly (AIJ) pilot phase. In this view the CDM would facilitate the monitoring, verification, and assignment of emission reductions while the contracts and prices would be set by parties.

The other view emphasizes a multilateral character for the CDM as a fund fed by CER proceeds and proceeds from the adaptation tax of Article 12(8) of the Protocol. This feature is proposed by many developing countries and would be a more managed process where bids and contracts are actively facilitated by the CDM. A forest-secured escrow account, as well as a pure seller liability, would blend the two ideas on the nature of the CDM. As the manager of the seller-liability fund, the CDM would be a market-based institution watching over money from contracts that individual countries agree to jointly establish. At the same time, as a trustee holder of several accounts and with the ability to leverage additional monies or institute other procedures (such as subsidizing interest rates or facilitating risk hedging), a seller-liability accounting system would have a multilateral face that involved managing and facilitating.

Although there are numerous disagreements and discussions about the ultimate shape of the CDM, we believe that a form of seller-liability has some intrinsic advantages. Structuring the CDM in this manner may resolve other challenges, namely how to encourage long-term emission reductions in an efficient and equitable manner, how to maximize the amount of early mitigation via the CDM, and what form the CDM's executive board should take. The resolution of its nature will impact climate change mitigation, tropical forest conservation and the fair allocation of the costs and benefits of sustainable development.

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Appendix. Explanatory remarks.

In this appendix, we provide the computations for our example in the text. We computed the present value of contract net benefits as benefits minus costs separately for each party under different liability schemes (including no liability). To do this we used the simple net present value formula,

$$NPV = \text{Sum } (B_j - C_j) / (1+r)^j.$$

The total economic value of the contract to the society is calculated as the difference of the present value of opportunity cost to the donor and to the host, i.e. \$ 147,003 minus \$ 29,401. These figures were calculated by applying the same NPV-formula as for contract net benefits to the stream of annualized costs, i.e. \$ 7500, in the case of the buyer, and \$ 1500, in the case of the seller, using the 3% discount rate. The IRR-figures were computed by using the Excel procedure to set the NPV-formula equal to 3.6 E-0.8, which is effectively zero, and solving the equation for r with the contract costs and benefits.

Appendix											
Year	Buyer				Seller						Fund
	Opp. costs	No liability	Net-Benefits		Opp. costs	No liability	Interest	Net-Benefits			Fund
			No liability	Buyer Liability				No liability	Seller Liability	Escrow	
1	7500	-4500	3000	-4500	-1500	4500	0	3000	-1500	-1500	4500
2	7500	-4500	3000	-4500	-1500	4500	135	3000	-1500	-1365	4500
3	7500	-4500	3000	-4500	-1500	4500	270	3000	-1500	-1230	4500
4	7500	-4500	3000	-4500	-1500	4500	405	3000	-1500	-1095	4500
5	7500	-4500	3000	-4500	-1500	4500	540	3000	-1500	-960	4500
6	7500	-4500	3000	-4500	-1500	4500	675	3000	-1500	-825	4500
7	7500	-4500	3000	-4500	-1500	4500	810	3000	-1500	-690	4500
8	7500	-4500	3000	-4500	-1500	4500	945	3000	-1500	-555	4500
9	7500	-4500	3000	-4500	-1500	4500	1080	3000	-1500	-420	4500
10	7500	-4500	3000	-4500	-1500	4500	1215	3000	-1500	-285	4500
11	7500	-4500	3000	-4500	-1500	4500	1350	3000	-1500	-150	4500
12	7500	-4500	3000	-4500	-1500	4500	1485	3000	-1500	-15	4500
13	7500	-4500	3000	-4500	-1500	4500	1620	3000	-1500	120	4500
14	7500	-4500	3000	-4500	-1500	4500	1755	3000	-1500	255	4500
15	7500	-4500	3000	-4500	-1500	4500	1890	3000	-1500	390	4500
16	7500	-4500	3000	-4500	-1500	4500	2025	3000	-1500	525	4500
17	7500	-4500	3000	-4500	-1500	4500	2160	3000	-1500	660	4500
18	7500	-4500	3000	-4500	-1500	4500	2295	3000	-1500	795	4500
19	7500	-4500	3000	-4500	-1500	4500	2430	3000	-1500	930	4500
20	7500	-4500	3000	-4500	-1500	4500	2565	3000	-1500	1065	4500
21	7500	-4500	3000	-4500	-1500	4500	2700	3000	-1500	1200	4500
22	7500	-4500	3000	-4500	-1500	4500	2835	3000	-1500	1335	4500
23	7500	-4500	3000	-4500	-1500	4500	2970	3000	-1500	1470	4500
24	7500	-4500	3000	-4500	-1500	4500	3105	3000	-1500	1605	4500
25	7500	-4500	3000	-4500	-1500	4500	3240	3000	-1500	1740	4500
26	7500	-4500	3000	-4500	-1500	4500	3375	3000	-1500	1875	4500
27	7500	-4500	3000	-4500	-1500	4500	3510	3000	-1500	2010	4500
28	7500	-4500	3000	-4500	-1500	4500	3645	3000	-1500	2145	4500
29	7500	-4500	3000	-4500	-1500	4500	3780	3000	-1500	2280	4500
30	7500	-4500	3000	-4500	-1500	4500	3915	3000	-1500	2415	4500
31				225000			4050		135000	139050	135000
Sum	225000	-135000	90000	90000	-45000	135000	62775	90000	90000	152775	0
NPV	147003	-88202	58801	1795	-29401	88202		58801	24598	58801	34204
IRR			infinite	3%				infinite	6%	12%	

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Article 3.4

Background

The U.S. has supported including broad land management activities under Article 3.4. One key advantage of including these broad activities, coupled with a land-based accounting system that counts changes in all the relevant carbon stocks on the land across the period, is that it would create the greatest incentive to maximize sequestration and minimize emissions. A broad approach would provide the most environmentally sound approach for the long run because all human contributions to emissions would be accounted for. It would also allow GHG reductions in the sectors where they are most cost effective.

Despite the long term advantages, we are unlikely to achieve full carbon accounting in the first commitment period, and pushing for full carbon accounting and only full carbon accounting could damage our chances for getting anything at the Hague. Our August 1 submission is an opportunity to advance a framework that might be accepted there. Thus, we need to consider our priorities – and bottom lines – for COP6 in this area and what to advance in our August 1 submission in that context.

Possible Broad Article 3.4 Activities

Forest management:

- Would include large areas and important stakeholders for U.S.
- Could provide significant BAU credits (approximately 200 MMTCE per year)
- Likely to be supported by Japan, Canada, Finland, Sweden, and France

Cropland management (agricultural soils):

- Would provide relatively few credits
- Could be politically important
- Likely to be supported strongly by Canada

Grazing land management (soils and vegetation on pasture, rangeland, etc.)

- Would provide relatively few credits
- Probably not politically important
- Not likely to be supported strongly by other Parties
- Large land area

Revegetation and/or Restoration of Degraded Lands

- Includes establishment of vegetation that would not qualify as forest
- Likely to be proposed by Australia, New Zealand, and Iceland
- Likely to provide significant BAU tons for other Parties, but not the U.S. (i.e., not really a

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broad activity for the U.S.)

General approaches to limiting first commitment period sinks

Limiting sink credits in the first commitment period without moving towards narrow activities is known as a "walkback" from full carbon accounting. Different walkback approaches may be desirable for different sink activities, and some activities may require no walkback at all.

1. Exclude some of the broad land management activities in the first period.

For example, Parties could include comprehensive accounting for forest management, but not grazing land management.

Pros:

- Relatively straightforward to calculate.
- Clear relationship between activity (i.e. land management category) and carbon accounts.

Cons:

- We would be unlikely to get forest management included, given its large contribution to our assigned amount (approximately 200 MMTCE for BAU activities, or more than 10% of our assigned amount). The broad categories more likely to be accepted, such as cropland management, would give us relatively few credits in the first commitment period.
- Since different activities are important to different Parties, it may be difficult to negotiate a single set of first period activities.
- Wouldn't encourage cost-effective additional sequestration (above BAU) from activities excluded in the first period.
- Wouldn't encourage development of monitoring and verifying capacity for excluded activities, unless there were a clear signal that these activities would be counted later.
- Could distort incentives across different land uses, depending on domestic implementation
- Domestic political problem of excluding certain sectors from possible credits.
- Especially hard to evaluate our deal relative to others'.
- Could leave important atmosphere exchanges unaccounted for.

2. Limit the number of sink tons to a fixed percent of the total sequestration.

Pros:

- Relatively straightforward to negotiate the discount level and to calculate credits.
- Would arguably affect all Parties proportionately the same.
- Provides incentives for across-the-board additional sequestration, but not at full value.

Cons:

- Raises the issue of whether land-related emissions should also be discounted, or whether only

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sequestration would be discounted. If the latter, a Party could potentially get a net debit even if its full account from sink activities was positive.

- Raises the issue of what discount factor to use, and whether the discount factor would any scientific basis.

3. Limit the number of sink tons to the share of the full carbon account that is arguably due to human-induced land management changes.

For example, factor out x% or X tons for BAU, y% or Y tons for indirect human-induced effects such as CO₂ fertilization and/or z% for natural variation (e.g., the El Niño cycle).

Pros:

- Although negotiating x, y and/or z may be difficult in practice, the conceptual approach is relatively straightforward, and, once these numbers were agreed, they could be applied relatively easily to calculate credits.
- Tons that would be accounted would arguably be related to human effect on GHG concentrations.
- Provides incentives for across-the-board additional sequestration, but possibly not at full value, depending on how the accounting system is set up.

Cons:

- If it turns out the missing sink is due to human factors such as improved fire suppression as some scientists believe, then this could result in large credits.
- Indirect human factors and natural variability are uncertain. Thus, it may be difficult to get agreement on particular numbers if confidence intervals are large.
- May not provide many tons.

4. Limit credits to the reported stock change above some predetermined threshold level.

Pros:

- Would provide broad incentives for additional sequestration unless the threshold level is too high to achieve.
- Once thresholds are set, carbon accounts would be relatively easy to calculate.
- Could combine with a discount factor for indirect human effects or natural variability (see option 3 above).

Cons:

- May provide few tons, depending on threshold.
- Raises the issue of how to set the threshold levels. For example, the number should vary by Party. Thus it would have to be a function of Party-level data such as:
 - a) a BAU projection or extrapolation of stock changes in the commitment period

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- b) stock changes during a historical base period, e.g. 1990 to 1995
- c) x% above or below BAU or historical stock changes,
- d) estimate of Party's possible share of "missing sink"
- e) some other number as negotiated
- Challenging to negotiate different threshold levels for each Party.
- Doesn't put an upper bound on credit, which would leave some Parties fearful we could get credit for the "missing sink."
- Raises the issue of how to count LULUCF activities if total sinks turn out to be below the threshold. One option would be to provide for one-way accounting, under which Parties would receive credit for additional sequestration above the threshold, but would not be debited if they fell short of their threshold.
- Could introduce disputes over how to do projections or construct other uncertain measures that would factor into the threshold.
- Especially hard to evaluate our deal relative to the deals other Parties get.

DSX 5. **Calculate sink credits based on a measure of progress in energy investments or some other indicator**

Pros:

- May get support from some environmental NGOs, if total credits are sufficiently limited.
- Sink credits would be available for Parties that demonstrate progress on the gross emissions side, or who can show energy-related improvements. The credits could be seen as "matching funds," which encourage domestic abatement.

Cons:

- Could provide sink credits in inverse proportion to how much they are needed to achieve targets.
- Hard to measure progress objectively, and raises the issue of whether to count "anyway progress."

6. **Limit credits to the reported stock change on a reasonably defined subset of the land within an activity.**

For example, we could count only the most intensively-managed lands in the first period. This would likely include lands on which most of the stock changes are occurring, and exclude lands that are not managed for commercial purposes. The meaning of "intensively managed" is not obvious, however, so we would have to find better modifiers to express exactly what subset of land of each type (forest, cropland, etc.) would count. It may be hard to find modifiers that work throughout Annex I.

Pros:

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- Provides fully-valued additional incentives, but only for the included lands.
- Could allow selective exclusion of the most controversial land, such as old growth forest and wilderness.
- Arguably related to human-induced factors.

Cons:

- Could leave important atmosphere exchanges unaccounted for.
- Many indirect and natural effects could be on heavily managed land, so critics might argue that this approach would not exclude the possibility of receiving credit for the missing sink.

Doniger
- upper + land limits

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ENGLISH, Kate	586-5316	586-0861
GARDINER, David	395-2343	395-2311
GERSON, Noel (Interior)	208-6291	208-1873
GOODMAN, Sherri	(703) 695-6639	(703)693-7011
HALES, David	712-1750	216-3174
LAWRENCE, Robert	395-5046	395-6958
STERN, Todd	622-0654	622-0073

June 12, 2000

**MEMORANDUM FOR ROBERT LAWRENCE
ANDY KEELER**

FROM: JOE ALDY

SUBJECT: Sinks issues under the Kyoto Protocol

The first climate change policy issue that will need to be addressed leading into COP-6 will likely be sinks. David Sandalow has held several meetings on this issue, and Roger Ballentine intends to hold two deputy level meetings on sinks later this month. The timing is forced by an August 1 deadline for submission of parties' views on sinks to the UNFCCC Secretariat. You will find attached Bob Cumby's memorandum to Eizenstat and the May 31 interagency memo on this issue. The May 31 memo outlines many of the key issues and Cumby's memo describes the strategic considerations from the perspective of the economic agencies. This memo simply sketches out the results of the June 1 Sandalow meeting and provides some additional background on the issues. I advise reviewing the May 31 memo prior to this memo.

Objectives for Sinks. At the June 1 Sandalow meeting, a set of objectives was identified. There are obviously trade-offs among these objectives, but Sandalow listed these without prejudice and resolved to address the trade-offs later.

- 3.3 and 3.4 decisions should come as close as possible to comprehensive carbon accounting.
- The 3.4 decision should deliver some potential benefits to agricultural interests that promote agricultural soil carbon sequestration.
- The 3.3 and 3.4 decisions should generate a lot of tons (cost-savings consideration).
- The decisions should not undermine climate integrity of Kyoto Protocol.
- The decisions should please the environmental NGOs.
- The decisions should do no harm to other environmental considerations (e.g., biodiversity).

Article 3.4 Options. In discussing the approach to adding sink categories under Article 3.4, the following options were raised:

- Limited set of activities. The COP would need to establish a list of sink activities that could generate carbon tons under the Kyoto framework.
- Project-based. This would require a JI/CDM-type system for domestic sinks activities.
- Arbitrary cap. This would require agreeing to a maximum number of tons that could be claimed under 3.4.
- National baseline. This would require setting a baseline (e.g., BAU), and sequestration in excess of baseline (e.g., meeting an additionality standard) would count as sink tons.
- Limit based on methodology. Only activities with methodologies meeting a minimum level of quality (e.g., adequate measuring/monitoring techniques) could count.

While the discussion was not resolved, some general points were made. The arbitrary cap proposal was opposed by most because of the obvious parallel to restrictions on international

emissions trading. The limit based on methodology could apply in concert with other options. The national baseline appealed to some, but others noted that setting a national baseline could also make achieving a target more difficult (if the country fell below BAU during the commitment period). Most agreed that the preferred option should be consistent with our long-term goal of comprehensive accounting.

History in Kyoto. There was some discussion of “what we agreed to at Kyoto.” The so-called asymmetry of the FAO definition approach was explicitly addressed at the Kyoto Conference. Specifically, whether the emissions associated with harvesting would be debited from a country’s carbon account was debated, and at the request of Canada, the term harvesting was deleted from the list of activities in Article 3.3 (afforestation, reforestation, and deforestation). Some claimed in Sandalow’s last meeting on this issue that we did not realize at Kyoto that the sequestration estimates under the FAO definition would turn out to be so large (about 100 MMTCE per year during the commitment period under BAU; see last page of Cumby memo). I spoke with Victoria Greenfield who worked on this issue at the Kyoto Conference, and she stated that 100 MMTCE is within the range of effects they thought was plausible under Article 3.3. I recall a conversation with Jon Gruber who also participated at Kyoto that he thought we could get at least 70 MMTCE/year under BAU with Article 3.3. Finally, in January 1998 we undertook several modeling analyses where we assumed that U.S. carbon sinks could be 104 MMTCE per year during the commitment period for the work that served as the foundation for Janet Yellen’s testimonies and the Administration’s economic analysis. This was based on estimates in our National Communication to the UNFCCC. Early (March 1998) rough interagency estimates were on the order of 50 MMTCE/year during the first commitment period, and increasing significantly through time (90 MMTCE/year over 2013-2017). Those working on this issue have known since the Kyoto Conference that Article 3.3 has the potential to significantly offset our emissions obligation.

Strategy. I have continued to advocate for the use of sinks as a critical component to our cost-effective strategy to implementing the Kyoto Protocol, as noted in the Administration’s economic analysis, numerous Administration testimonies, and other public statements by Administration officials. Some have countered that continued support of a broad sinks interpretation will draw significant negative attention from environmental NGOs over the next 5 months. I offered a longer term view that we should be concerned about the views of environmental NGOs, business interests, agriculture interests, Congress and others in terms of the agreement coming out of COP-6. Taking some heat in the short run for a deal in the long run that could positively impact the prospects for ratification may be worthwhile. In the end, a compromise on sinks that could limit the potential cost-savings of this provision should at least result in a positive outcome on 3.4 (e.g., inclusion of agricultural soil sinks in the first commitment period). In the larger strategy, compromising our position on sinks should also be used as leverage to achieve a positive outcome on another cost-related issue (such as the flexibility mechanisms or compliance).

June 4, 2000

MEMORANDUM FOR DEPUTY SECRETARY EIZENSTAT

FROM: Bob Cumby

SUBJECT: Climate Change Issues

The approach of COP-6 in November is bringing several issues to the fore. This memo focuses on two of the most important issues under discussion, sinks and a cost cap (commonly referred to as a safety valve). I am raising these together both because they both have the potential to limit compliance costs and because they may be linked in some sort of a bargain – both within the Administration and in the international negotiations. For example, some have argued that an effective cost cap would reduce the importance of using sinks to help achieve our Kyoto target.

These – and indeed all of the issues surrounding the COP-6 negotiations – need to be considered in context of the strategic question of what we want to accomplish at COP-6. Differing views on the broad, strategic question are coloring the discussion of alternative approaches to the narrower issues.

A strategic choice. The Administration is subject to conflicting pressures on several important issues. Environmental NGOs and key negotiating partners, especially the EU, are pushing the Administration to adopt positions on several issues that would, they argue, enhance the “environmental integrity” of the Protocol. But adopting these positions would raise the cost of reaching the Kyoto targets. (Indeed, raising the cost is seen by some as precisely the point of adopting these changes.) Moving in this direction would undermine efforts to obtain support in the Senate and with the business community by trying to make the Protocol more cost effective.

I have been arguing that we need to do what we can to reduce compliance costs and uncertainty about those costs in order to enhance the chances of obtaining an agreement that can be ratified.

An alternative view has emerged that begins with the premise that the Kyoto agreement cannot be ratified in the foreseeable future. It then proceeds to the conclusion that we should make sure that the agreement is as environmentally tight as possible for two reasons.

- Doing so would allow other countries to proceed with an environmentally strong agreement until such time as the United States can join.
- Taking positions in the negotiations (say involving sinks or a cost cap) that would seek to reduce compliance costs would have little payoff (because the chances of ratification are so remote). At the same time, by causing criticism from environmental NGOs, adopting these positions would have significant political costs and might endanger NGO support for the Protocol.

My view is that, even if one accepts that ratification is problematic in the near term, we need to do the best we can to achieve that goal. If we don't succeed in achieving ratification in the near

term, cost issues will almost certainly arise in the future. Any success we have on limiting compliance costs will therefore enhance the likelihood of future ratification.

I would like your guidance on whether and how strongly I should continue to push in this direction. The decision we take on this question affects our approach to virtually every issue leading up to COP-6.

Sinks. In your comment on our Economic Policy Weekly Report several weeks ago, you urged us strongly to oppose any efforts to restrict our ability to use sinks to meet our Kyoto targets. I have been doing so and would like to take this opportunity to fill you in on some of the details about the direction that sinks policy discussions have been moving.

There are two parts of the sinks negotiations, both of which have substantial implications for the stringency of the first period U.S. target:

- The definition of reforestation within Article 3.3, and
- The addition of further land use activities under Article 3.4.

Reforestation in Article 3.3

Article 3.3 of the Kyoto Protocol allows for limited carbon sequestration in forests. Three activities are included:

- Afforestation – the conversion of non-forest land to forest land,
- Deforestation – the conversion of forest land to non-forest land, and
- Reforestation – the replanting of a forest.

A fourth activity, harvesting, was included but then removed from the list. Considerable controversy has arisen over the definition of reforestation.

In the United States, reforestation most commonly means forest regeneration after a harvest. This is also the definition used by the Food and Agriculture Organization (FAO). Using this definition for the Kyoto accounting system would credit any carbon sequestered during the regrowth of harvested forests. Emissions from the first harvest after 1990 would not be debited, but emissions from subsequent harvests would be debited. For example, all carbon stock changes (positive and negative) during the commitment period (e.g., due to harvest or incremental forest growth) on land that was last harvested in 1992 would count.

This FAO definition of reforestation has generated criticism from environmental NGOs on the grounds that it is asymmetric and that it encourages early harvest of trees (because it excludes the first harvest after 1990).

Those opposing the FAO definition have proposed an alternative based on the IPCC glossary, which defines reforestation as forest establishment on land that has a history of forest cover but has been deforested for some extended period of time. Under this approach, reforestation is indistinguishable from afforestation – a conversion of land from non-forest to forest use. By requiring an extended period of deforestation, this definition renders the exclusion of harvesting irrelevant.

The choice of definition has a sizable impact on estimates of the amount of sequestration the United States would be able to count toward the fulfillment of the Kyoto target. USDA analysts estimate that the IPCC definition would give the US about 2 million metric tons of carbon equivalent (MMTCE) per year during 2008-2012 under business as usual. In contrast, the FAO definition would provide about 103 MMTCE per year under BAU. (The choice of definition might also affect the amount of sequestration above BAU. Unfortunately, we have little information about likely sequestration in excess of BAU so our quantitative analysis has focused on BAU sequestration.) For comparison, we expect that BAU emissions will be about 600 MMTCE per year above our Kyoto target. Thus by adopting the FAO definition, we could lower our target reductions by almost 17%.

Costs decline more than proportionately with target reductions. A 17% drop in target reductions could reduce the cost of reaching our Kyoto commitment by an estimated 30%. The following table reports illustrative results using cost curves for 2010 from the model used in the Administration's analysis of Kyoto. These cost estimates use only the BAU sinks numbers for the United States.

**Allowance Prices and Annual U.S. Economic Costs of Kyoto Compliance
With and Without 100 MMTCE per year in BAU sinks for US**

	Full Annex I Trading		Global trading	
	No US sinks	100 Mt US sinks	No US sinks	100 Mt US sinks
Allowance Price	\$51/ton	\$41/ton	\$21/ton	\$17/ton
US Compliance Cost	\$22.7 billion	\$15.4 billion	\$11.3 billion	\$7.8 billion

I have been arguing (based on conversations with Jon Gruber) that the negotiating history supports the FAO definition of reforestation. The asymmetry implied adopting this definition and excluding harvesting is definitely not full carbon accounting and may even appear to be illogical, but it is what was agreed to. I would like your guidance about whether I should continue to proceed in this way. As lead negotiator, your view of the negotiating history should carry significant weight.

Addition of further land use activities under Article 3.4

The United States has argued that definitional problems in Article 3.3 go away if "forest management" is added as an activity under Article 3.4. This broad activity could bring all managed forests into the "Kyoto land" base. We have argued that if we count carbon stock changes on all managed forest lands comprehensively, we need not worry about which stock changes accrue from afforestation, reforestation, and deforestation. We also would not need to separate out human-induced influences from natural influences, which scientists agree is nearly impossible. We have stressed that the problem should be solved for the long term, and that broad inclusion of land is most consistent with the long-term objectives of the Framework Convention.

Comprehensive accounting of US forests would give us about 217 MMTCE per year of BAU sinks. We have very little data on what it would mean for other countries, although the Forest Service is working on it. Obviously, reducing our target reductions by 217 MMTCE per year would significantly lower compliance costs to the United States – and everyone else (due to our lowered demand for imported allowances).

Negotiating dynamics

The United States, with its large and relatively fast growing forests, is especially sensitive to decisions on forest activity accounting. Knowing this, other countries are suspicious of our motives on this issue. For example, only Canada has supported the FAO definition of reforestation.

The United States has found few allies in support of our argument for comprehensive accounting of changes in carbon stocks in all managed forest. Feedback from other countries has, however, been vague. In order to address their concerns, we have indicated that might be willing to accept a negotiated limit on the number of BAU tons we would claim should a comprehensive approach be taken.

Finally, a number of environmental NGOs have opposed anything that reduces that stringency of first commitment period targets, viewing sinks as a big loophole. I am concerned that the combination of domestic NGO pressure and the lack of international support will combine to lead us to abandon efforts to secure a sinks agreement that results in a significant contribution to our Kyoto target.

A cost cap or “safety valve.” Interest in a cost cap has been revived in recent months. Doors may be opening to introduce a cost cap as part of a compliance mechanism. A pre-specified per-ton payment for non-compliance would cap compliance costs.

There appears to be growing international interest in a strict compliance mechanism that would introduce a level of predictability to compliance costs. The key details – e.g. whether the payment to achieve compliance would be voluntary or mandatory, the level of the per-ton payment, and the disposition of the funds – have been left open and agreeing on these details could be difficult.

Those in the Administration who are opposed to the idea of a safety valve are opposing it on the grounds (described above) that it would engender criticism from environmental groups without guaranteeing Senate support.

These and other issues will soon be elevated for discussion and decision. Your views will be particularly important as discussion proceeds. It might also be useful if you could convey your thoughts on these questions to Frank Loy in advance of the high-level meetings.

U.S. Sink/Source	Annual MMTCE Carbon Sequestration (+) or Emissions (-) during the budget period (BAU Case)		
	2008-2012	2013-2017	2018-2022
1: FAO definition (w/o first harvest) -- Include carbon on regenerated harvested forest lands; exclude carbon emitted at the time of the first harvest after 1990; include carbon stock changes from deforestation; exclude changes in forests that have not experienced an ARD activity.			
Afforestation (Established since 1990)	10	9	8
Reforestation (Forests replanted since 1990)	102	99	116
Deforestation	-8	-7	-7
Alternative 1 Total	103	101	118
2: IPCC New Forest Accounting Exclude existing forest lands; only count carbon stock changes from forests established since 1990 and deforested since 1990; exclude changes in forests that have not experienced an ARD activity.			
Afforestation and reforestation	10	9	8
Deforestation	-8	-7	-7
Alternative 2 Total	2	2	1
Reference: Comprehensive accounting of US Forests (Roughly what US would get by adding "forest management" under Article 3.4)			
	217	200	184

Note: Estimates are derived from data and analysis based on 1992 US Forest Statistics. 1997 US Forest Statistics will be available later this year. Updates in these data could change the magnitude and trends reported here.

COP-6 Sinks Decisions: General Approach

1. Introduction

Land use, land-use change and forestry activities (LULUCF) are addressed in Articles 3.3, 3.4 and 3.7 of the Kyoto Protocol.

- Article 3.3 requires that Parties, in meeting their targets, count emissions and removals from three specified land-use change and forestry activities: afforestation, reforestation and deforestation (ARD) since 1990.
- In addition, Article 3.4 allows the COP/MOP to include additional LULUCF activities – for example, conservation tillage – for the second and subsequent commitment periods. Parties may choose to apply any such decision to the first commitment period, for activities taking place since 1990.
- Finally, Article 3.7 provides that for states whose land-use change and forestry activities in 1990 were a net emission, the net land-use change emissions shall be included in the country's 1990 emissions baseline.

At COP-6, Parties will make a set of decisions regarding Articles 3.3 and 3.4. These decisions will likely include:

- definitions and accounting rules for ARD activities under Article 3.3;
- definitions of which additional LULUCF activities to include under Article 3.4, as well as accounting rules for these activities.

The package of COP-6 decisions could also include:

- limits on the degree to which Parties may count Article 3.4 activities in the first period
- a process for including additional LULUCF activities under Article 3.4 after COP-6
- elaboration of the land-use change elements of Article 3.7.

By August 1, 2000, Parties must submit their views and proposals concerning these Article 3.3 and 3.4 issues, including proposed definitions and accounting systems, along with national data and assessments of those proposals.

2. Definitions and accounting for afforestation, reforestation, and deforestation (ARD) activities under Article 3.3

The COP-6 decision package will likely include definitions of ARD activities, perhaps providing Parties the option of choosing among a set of possible definitions or accounting approaches. The definitions of "afforestation" and "deforestation" are relatively uncontroversial from a political standpoint, but involve important technical considerations.

Reforestation is the most controversial aspect of Article 3.3. Different definitions (and accounting rules) would have markedly different implications for the United States (see Table 1 below).

International and internal U.S. discussions have focused on two possible definitions of reforestation: the FAO and the IPCC definitions. The *FAO definition* defines reforestation as replanting after harvest. Under some accounting rules, the FAO definition would allow countries to count the sequestration resulting from replanting, but not the emissions due to the harvest that brings the land into the system. In contrast, the *IPCC definition* defines reforestation as a land-use change from non-forest to forest. Under this definition, reforestation is essentially the same as afforestation; the only difference between the two is that, in the case of afforestation, the land is out of forest use for a longer period of time. The IPCC definition would avoid the issue of counting carbon sequestered on lands replanted after harvest, since replanting after harvest would not represent a land-use change and hence would not count as "reforestation."

Table 1 sets forth the implications for the U.S. of the IPCC vs. FAO definitions, assuming business-as-usual. Under the IPCC definition, the U.S. would gain virtually no net credits from ARD under Article 3.3. In contrast, the U.S. would gain a credit of approximately 100 MMTCE (about 7% of our 1990 emissions) under the FAO definition, in combination with an accounting rule that includes carbon sequestered during the regrowth of forests regenerated since 1990, but excludes the emissions from the initial harvest after 1990.¹

¹ Note that during the first few years after harvest, land usually produces positive net carbon emissions because the slash left over from harvest is emitting at a rate greater than the sequestration from the new growth. This approach would count emissions from slash. Emissions from all harvests that occur after the first regrowth would count, but harvested carbon that goes into long-lived forest products would not be debited instantly.

3.3 - we believe negotiating history is for FAO but unsure about policy implications and would like to discuss in the context of a plenary
3.4

Table 1:
U.S. Emissions and Removals from Afforestation, Reforestation, and Deforestation

U.S. Sink/Source	Annual MMTCE Carbon Sequestration (+) or Emissions (-) during the budget period (BAU Case) for the U.S.		
	2008-2012	2013-2017	2018-2022
IPCC definition of reforestation			
Afforestation/reforestation	10	9	8
Deforestation	-8	-7	-7
Total of ARD	2	2	1
FAO definition of reforestation (include carbon on forest lands replanted after harvest; exclude carbon emitted at the time of the first harvest after 1990)			
Reforestation under FAO definition	102	99	116
Reference: Comprehensive accounting of carbon stock changes in US Forests	217	200	184

Note: Estimates are derived from data and analysis based on 1992 US Forest Statistics. The forthcoming 1997 US Forest Statistics could change the magnitude and trends reported here.

The negotiating history of the Kyoto Protocol contains some support for the FAO definition of "reforestation." Moreover, to the extent that the U.S. assumed the FAO approach in taking its target, adopting an approach such as the IPCC definition would represent a significant tightening of our target (a difference of approximately 100 MMTCE).

However, several arguments have been advanced by Parties and NGOs against the FAO definition. First, it credits regrowth without debiting the first harvest (this is one form of "asymmetrical" accounting). Thus it selectively brings land into the system as it is about to start accumulating carbon, without counting the substantial emissions occurring earlier in the commitment period resulting from harvests. Second, some are concerned that the FAO definition could encourage harvesting old growth forests and replacing them with tree farms, so as to count the sequestration from replanting but not the emissions from harvesting. Finally, some Parties argue that the definitional issue is already decided by Article 5.2 of the Kyoto Protocol, which mandates the application of the 1996 Revised IPCC Guidelines. We do not accept that legal interpretation of the effect of Article 5.2.

Many Parties, including a number of Umbrella Group countries, support the IPCC definition. Canada has been one of the few countries to publicly support the FAO definition. Finland

and Sweden may as well. Since Kyoto, we have been reluctant to take a position on the definitions of ARD under Article 3.3. On the one hand, adopting the IPCC vs. the FAO definition of reforestation would represent a significant tightening of our target. On the other hand, we have been reluctant to endorse the FAO definition, given the controversy surrounding it. In our August 1 submission, we could propose either the IPCC or FAO definition, one of the other alternatives elaborated by the IPCC in its recent Special Report, some other definition, or we could propose options as part of a package with Article 3.4 activities.

3. Definitions and accounting for additional activities under Article 3.4

(a) Full carbon accounting through broad activities

During the Kyoto Protocol negotiations, we supported including sinks in a comprehensive fashion, so as to give Parties the maximum incentive to reduce emissions and enhance sequestration from LULUCF activities. Since Kyoto, we have continued to advocate the comprehensive approach pursuant to Article 3.4

To provide for full carbon accounting, the LULUCF activities included under Article 3.4 would need to be broad activities, and the system would need to count all carbon stock changes on the land during the commitment period. Possible activities include:

1. Forest management
2. Cropland management
3. Grazing land management
4. Land degradation and land restoration (possibly a package of activities to be selected together)

With full carbon accounting on managed forests, cropland, and grazing lands, carbon stock changes during the first commitment period are projected to be in excess of 200 MMTCE per year, assuming business as usual.

(b) Possible "Walkback" for the first commitment period

Most Parties have opposed the comprehensive approach. Some believe that carbon stock changes cannot be adequately monitored and verified, although to some degree the recent IPCC Special Report allays that concern. Some are worried that the U.S. might try to take credit for large BAU sequestrations, possibly including the large "missing sink" (an unaccounted carbon sink that some scientists believe could be located in North America). Some also fear that LULUCF activities would undermine the emission reduction objectives of the Kyoto Protocol or create ancillary environmental problems.

One direction we are exploring for our August 1 submission is to propose full carbon accounting for all managed lands in the second and subsequent commitment periods, but claim only a share of the total carbon credits during the first commitment period. This is known as full carbon accounting with a "walkback" in the first commitment period.

4. Approach and future steps

In the next one to two months, we will need to decide the following key issues:

- (a) What is our bottom line on sinks for COP-6?
- (b) What positions on sinks should U.S. propose in its August 1 submission?

We propose the following general approach, as we proceed to address these two core issues:

- Continue to advocate full carbon accounting as the most environmentally sound approach for the long run.
- Do not take a position on the definition of reforestation under Article 3.3.

Instead of supporting either the FAO or the IPCC definition, we will continue to argue for addressing forestry (and other sink activities) in a more rational, comprehensive manner, through Article 3.4 decisions.

- Explore how to make up credits through Article 3.4, if we compromise by accepting the IPCC definition of reforestation under Article 3.3.

Potentially, Article 3.3 and 3.4 could be treated as a package, in which we would accept the IPCC definition of reforestation (or something similar) in return for a satisfactory decision regarding additional sink activities under Article 3.4. Such a package might provide credit for some BAU activities (as Article 3.3 already does), as well as provide incentives to take *additional* action that could help Parties meet their targets in a cost-effective way.

- Explore departures from full carbon accounting that could be applied in the first commitment period.

"Walkbacks" for the first commitment period could take the form of more narrowly defined activities under Article 3.4, or formulas that limit the applicability of full carbon accounts. We will outline various walkback options in a separate paper.

what are objectives?

*Conby - something for Ag
lot of talk
as close to comprehensive acct
as possible*

*Bowles - env integrity (climate)
keep enviro NGOs happy*

Hales - do no harm - other env issues

→ broad-based w a floor

baseline test

*eg, some minimum level of quality of
measuring/monitoring*

excl categories where measurement

capabilities are too poor

3.4 Options

① *limited activities (list of activities)*

② *project-based (CDM/JI-like, est, baselines, etc)*

③ *arbitrary cap on full carbon accounting*

④ *limit time (eg, % of tft, absolute #, additnality)*

⑤ *limit based on methodology - eg, some minimum level of quality of
measuring/monitoring*

excl categories where measurement

capabilities are too poor

For discussion purposes only: do not quote or distribute

USE OF OFFICIAL DEVELOPMENT ASSISTANCE AND THE CLEAN DEVELOPMENT MECHANISM

Issues:

1. Can government funds used to support projects under the Clean Development Mechanism in a manner which generates CERs that accrue to the financing government be counted as Official Development Assistance.
2. Would ODA used for CDM, especially ODA that result in CERs accruing to the donor, have to be new and additional?
3. Would the use of ODA to acquire CERs promote "good development"?

BACKGROUND:

Japan has proposed that government financing from ODA accounts be used to directly support CDM projects, and that donor governments be allowed to accrue CERs as a result of such support. Japan has made it clear that they do not believe that they can meet their Kyoto target for the first budget period without acquiring CERs from other countries. They feel that they would be heavily criticized domestically for funding projects that produced CERs that would not automatically accrue to them.

The Japanese proposal raises a number of issues. Resolution of many of these issues will require engagement of agencies and individuals not normally a part of the Sandalow group.

Most donors agree that ODA can and should be used in support of the CDM. Capacity building, policy and legal reform, development of CDM institutions, creating market infrastructure, and other expenditures generally in support of a developing country's ability to participate in the Mechanism are likely components of post-ratification ODA regimes. With the exception of project feasibility studies, however, direct project finance has not been seen as a likely target for ODA, for three fundamental reasons:

1. The large cost of projects would be a very large proportion of ODA budgets,
2. The use of ODA in this manner would potentially distort markets, and
3. For most donors it would require a diversion of funding from other ODA purposes.

Official Development Assistance is defined as grants and loans to developing countries on the DAC Part I list of aid recipients which:

- are undertaken by the government,
- promote economic development and social welfare as the primary objective,
- are concessional (grant component of at least 25%)

The Development Assistance Committee of the OECD determines levels of ODA *ex post facto* based on national submissions. A key consideration for DAC reporting and ODA qualification

is that CERs either are or will be recognized as economic assets that have value and are tradable. Under the United Nations System of National Accounts (SNA), the value of economic assets must be recorded as production flows in the economic accounts of the nation where they are created. International transactions in economic assets (sales or transfers) must be recorded in a nation's international accounts under the conventions of the IMF Balance of Payments Manual. The value of a sale or transfer of assets may be deducted from a donor's ODA flows.

ISSUE 1: Can government funds used to support projects under the Clean Development Mechanism in a manner which generates CERs that accrue to the financing government be counted as Official Development Assistance.

Two questions must be answered:

1. Does the donor expenditure meet the criteria for ODA? The most difficult test will be whether economic and social development of the recipient remains the primary purpose, particularly if donors expenditures shift substantially in a relatively short period of time?
2. Does the donor receive economic assets in return for its investment? The most difficult to analyze complication is caused by the intent to accrue CERs to the donor. The possibility of including CERs in DAC reporting has not been raised to date at either the DAC High Level Meeting or the DAC Statistical Working Party. It is unlikely, therefore, that the issue will be authoritatively addressed by COP6. If CERs are generated by ODA-funded projects, the value of the sale or transfer of the CERs to the donor may constitute a reduction in ODA. In addition, the methods of calculating "concessionality" may have to be adjusted to allow for the value of the CERs to the donor country.

ISSUE 2: Does ODA used for CDM, especially ODA that result in CERs accruing to the donor, have to be new and additional?

Raising the issue of the use of ODA to support CDM, with a focus on project support that generates CERs that accrue to the donor, insures that the question of "additionality" will be raised by developing countries and by NGOs. Developing countries are likely to insist on stipulating that ODA investments intended to produce CERs must be "new and additional" because CER generating activities could potentially divert ODA away from other objectives.

Donors may be constrained to argue that such investments are "additional" expenditures in order to meet the environmental additionality criteria. In addition, a direct financial interest on the part of major donors in the debate surrounding environmental additionality may affect the direction and dynamic of the emissions baselines debate. All of this is complicated by the lack of a baseline for determining ODA additionality.

With reductions in overall ODA levels, the political implications of OECD countries seeking

direct financial benefit from the ODA expenditures could have a negative effect on other aspects of the COP6 negotiations, especially those involving transfer of resources.

ISSUE 3: Does the use of ODA to acquire CERs promote "good development"?

Japan has argued that ODA use is justified because it promotes economic development and social welfare, and because it is necessary to support projects that are "not profitable on a commercial basis", and to promote the "equitable" distribution of CDM projects.

While the argument can be made that GHG reduction and sequestration projects support economic development and social welfare, and that such projects are already part of donors' portfolios, Japan's proposal to directly acquire CERs as a result of ODA investment calls into question whether these goals are the primary purpose.

Even for the Japanese, fully financing projects is relatively rare. Based on available information, it seems that fully financing projects will require a substantial increase in funding, which is likely to come at the expense of other development priorities unless there is a stipulation that such resources be "new and additional". (One Japanese response to this issue is that "all resources are 'new and additional' since the funds must be appropriated each year.")

Aside from difficult issues as to how private sector partners (winners) will be selected, the investment, per se, of donor capital in viable private sector projects will be very controversial with developing countries, and the investments themselves will compete with private sector capital. If the Japanese pick the most viable projects, impacts on markets could be considerable, and the overall flow of resources to developing countries may well be reduced.

In addition, the financing of large projects will require donors to decide whether to invest directly in private sector projects or public sector projects. If ODA is targeted at public sector projects, particularly economically non-viable projects, efforts by the United States and others to promote structural and market reform, including full cost recovery/reductions of subsidies, privatization, and decentralization could suffer.

The Japanese claim (apparently persuasive to some G-77 countries) that they will use ODA to promote the "concept of equity of opportunity for developing countries" seems difficult to substantiate. On one hand, countries with economically viable projects that will generate substantial numbers of CERs will have a ready market. On the other, it is difficult to believe that the Japanese, whose primary motivation is the acquisition of CERs, will really be willing to invest in countries that have few CERs to offer and where the generation of CERs will be more expensive.

Promoting "equity of opportunity" will require a shift away from Japan's traditional strategic targets for ODA, or increases in total ODA. Only one African or island nation is in the top 15 recipients of ODA from Japan, and no African or island nation receives more than one-percent

of Japanese ODA.

A more likely scenario is that the approval of the use of ODA to acquire CERs will result in investments in countries that are strategically and economically important to Japan (China, India, S.E.Asia) with potential long-term advantages to the Japanese private sector.

Moreover, the accrual of CERs to donor countries has implications for the issue of "tied aid". Tied Aid is loans, grants or financial packages that are conditional upon the procurement of goods or services from the financing country (i.e. practices that have direct economic benefit for the donor country). Tied Aid can only support projects that:

- have 35% grant element (50% for least developed countries),
- are financially non-viable, (coal gasification and renewable energy projects usually qualify)
- are in countries with per capita GDP < \$3,030.

At a minimum, the method of calculating the grant element will have to allow for the value of the CERs to the donor country. In addition, the very inclusion of CERs that can only be sold or transferred to the donor may well demand a revised definition of "tied aid" because of the obvious benefits to Japan.

Finally, depending on how the Japanese distribute the benefits domestically, WTO compliance issues may also arise.

OPTIONS:

Option 1: Restrict ODA use to capacity building actions and those that create enabling conditions.

The USG can support the use of ODA to support the CDM generally, and it may well be that such support could focus on specific projects, as long as that support does not result in the direct accrual of CERs. This option would require no revision of DAC guidelines, but would not meet Japanese goals and would have limited added value in negotiations.

If the US (or Japan) wants to acquire the CERs it could acquire them on the market, at fair value, with the proceeds going to the developing country partner. These proceeds could be targeted for development purposes. It could be that we could even argue that the value of the proceeds could be counted as ODA, and credited to the donor's ODA totals for the year in which the proceeds were received. A variant of this approach would be for donors to retain CERs, which would be monetized either at a negotiated amount, or at market price, with the proceeds going to the project host country as development assistance.

Option 2: Support the use of developed country government financing of CDM projects to generate CERs that would accrue to the developed country, with such financing not counting as ODA.

The Protocol is essentially silent on this point, and such investments would seem to be policy decisions of developed countries. If this funding were to divert funds from development assistance, and if new and additional funding were not made available, donor country ODA amounts would be substantially reduced, and potentially redirected geographically and among sectors. The potential for market distortions and policy impact would still have to be carefully considered. This approach is unlikely to be satisfactory to Japan.

Option 3: Support the development of DAC procedures that would allow donors to receive CERs, while subtracting the value of CERs from total ODA.

While Japan would prefer to receive full credit in both accounts, they have discussed the possibility of deducting the value of CERs from their ODA totals. Details as to how the CERs would be valued, and when deductions would be applied are not available. This option would require eventual approval of the DAC, and substantial procedural issues would have to be resolved. All of the concerns identified under Issue 3 would still have to be addressed.

Option 4: Support development of DAC procedures that allow ODA to be used to generate CERs without deduction of value from ODA.

While the Japanese would prefer this option, it would require a major redefinition of DAC ODA criteria and accounting procedures. All of the concerns identified under Issue 3 would still have to be addressed. This approach would be likely to divert ODA from current geographical and sectoral patterns, and would be unlikely to result in increased flow of resources to LDCs.

Discussion:

The USG has several criteria to meet in addressing this issue:

- maintain umbrella group cohesion
- support Japan where possible
- avoid undercutting development assistance commitments and policies
- avoid undercutting trade and investment commitments and policies
- finding creative ways to identify new and additional funds for developing countries

Crafting a substantive position that meets these policy criteria requires analysis by agencies and individuals not routinely participating in the Sandalow group. In addition, the information available from the Japanese does not respond to several potentially serious issues. Despite requests, no written proposal from the Japanese has been forthcoming, nor have they raised the issue with the appropriate OECD-DAC groups. The Japanese, while absolutely clear on the purpose or goal of the use of ODA via CDM to accrue CERs, have been exceptionally vague on the details.

It may be that the US can craft a position that generally supports the use of ODA for CDM support, subject to OECD definitions, and procedural determinations by the executive board of

the CDM, while avoiding the issue of CER accrual until after COP6. The USG could indicate that the appropriate forum for determining this issue is the High Level Meeting of the DAC. Simultaneously, we should formally seek a detailed proposal from Japan for analysis of State EB, USAID/ G, and PPC, Treasury, Commerce, OPIC, EXIM, and others.

ASSISTANT SECRETARIES LIST FOR CLIMATE MEETING
4:00pm – Wednesday, May 17, Room 7835

ALDY, Joe (CEA)	395-1455	395-6870
ANDERSON, Margot	586-5316	586-3047
BALLENTINE, Roger	456-1782	456-1736
BIERBAUM, Rosina	456-6077	456-6025
BOWLES, Ian	456-6540	456-9240
CUMBY, Bob	622-0572	622-2633
DELGADO, Linda	720-6158	720-5437
DONIGER, David	564-7401	501-0986
ENGLISH, Kate	586-5316	586-0861
GARDINER, David	395-2343	395-2311
HALES, David	712-1750	216-3174
LAWRENCE, Robert	395-5046	395-6958
STERN, Todd	622-0654	622-0073

Sinks

Kyoto language. Two key paragraphs address sinks. Article 3.3, according to the State Department's interpretation, limits sinks activities in the first budget period to afforestation, reforestation, and deforestation since 1990; Article 3.4 permits the definition of sinks to be expanded to include other activities. The USDA offers the following definitions of the key terms:

Afforestation means planting or other establishment of forests on lands not in forest cover.

Reforestation means planting trees or other human-induced regeneration of forests after harvesting or other disturbance. To meet this definition, tree planting might have to follow harvesting by at least [6 months].

Deforestation means the conversion of forest land to other uses, for example, harvesting trees and turning forest land into farmland.

IPCC has been asked for an interpretation of terms used in the convention, and an assessment of sinks in general. The results are to be made available before COP-6.

Within the USG, there is a consensus that reinterpretation of the Kyoto protocol's sinks provision should make our target at least somewhat easier to meet than would have been the case if sinks were not counted at all.

View of Treasury and CEA. We believe that the Kyoto treaty is clear about the treatment of sinks. If the already-agreed definitions are to be changed, then other aspects of the treaty should be reopened as well, including national targets.

Harvesting. In describing how sinks were to be counted, the delegates explicitly considered --and rejected -- the option to count sinks net of harvesting. Thus we conclude that the Kyoto treaty excludes harvesting. Our Kyoto commitment, including all 6 gases, is 1546 m tons of carbon-equivalent, per year, in the first budget period (source: EPA). Without additional policies, the expected gap between projected greenhouse emissions and our Kyoto target is 577 m tons of carbon-equivalent, including the effects of the Administration's CCAP measures (source: EIA). Changing the Kyoto definition to include harvesting would add about 109 million tons of carbon to the US burden, or about 7 percent of our obligation, or 19 percent of the gap, in the first budget period.

Project-by-project. The delegates also rejected the option of counting only explicitly identified sink projects, and instead adopted a broader measure. The US delegation had proposed three choices, one of which was counting sinks project-by-project. As the conference explicitly chose a different option, we cannot now claim that the delegates actually meant to chose the project-by-project definition. Compared to the agreement reached in Kyoto, moving to a project-by-project definition would add about 50 million tons to the US burden in meeting its Kyoto obligations for the first budget period -- about

3 percent of our obligation, or 9 percent of the gap, in the first budget period.

change from Kyoto	tons	% of commitment	% of gap
include harvesting	109	7%	19%
project by project	50	3%	9%

Note: *Commitment* refers to the annual US target for greenhouse gas emissions. *Gap* refers to required reductions from business-as-usual.

CDM. For the purposes of setting CDM ground rules, Treasury and CEA favor making the definition of sinks as broad as possible.

JA

DEPARTMENT OF STATE
OFFICE OF THE UNDER SECRETARY FOR GLOBAL AFFAIRS
2201 C Street, N.W., Room 7250
Washington, D.C. 20520

F A X C O V E R S H E E T

DATE: July 9, 1999

TIME: 5:46 PM

TO: Climate Group

FAX: As indicated

FROM: Nigel Purvis
Senior Adviser

PHONE: (202) 647-8745
FAX: (202) 647-0753

RE: SINKS MEETING ON MONDAY AT 4:00, ROOM 7250

Number of pages (including cover sheet):

Attached is a draft paper for the Monday meeting.

Scott Harbenye

482-1452

232 report

Sinks
(Draft: 7-9-99)

Issue for Decision

Environmental NGOs have questioned our approach to Article 3.4 of the Kyoto Protocol, fearing that we seek to change a 7 percent reduction commitment into a 5 percent increase by claiming credit for "business-as-usual" sequestration activities -- an Administration response is needed.

Article 3.4

- This provision allows for expanding the list of human-induced sink activities that may be used to offset emission limitation commitments (e.g., to sequestration in agricultural soils, land use changes, forest conservation practices), if Parties can agree on them by consensus.
- Any such decision would apply in the second commitment period and later (i.e., after 2012); but a Party could also choose to apply the decision to offset its commitment in the first budget period, if the activities claimed had taken place since 1990.

Near Term versus Long Term

- Environmental NGOs largely see the Article 3.4 issue in terms of how it will affect the U.S. target in the first budget period, and they oppose weakening that commitment through the addition of "business-as-usual" sequestration activities.
- There are two issues at work, and it may be useful to separate them: 1) what makes sense in terms of the development of the convention and our efforts to address climate change over the long term; and 2) how would decisions that make sense in that context affect commitments in the first budget period?
- It is important to "get it right" for the long term; separately, we can consider whether and to what extent Parties should be able to benefit from such a decision in the first commitment period.

Article 3.3

- This provision limits the human-induced sink activities that must be used to offset emission targets in the first budget period to afforestation, reforestation and deforestation since 1990.

- The Protocol does not provide for Parties to elaborate these terms, although the IPCC is examining various approaches now in use in its Special Report due later this year.

Near Term versus Medium Term

- Environmental groups have also raised concerns that a particular approach to Article 3.3 would allow Parties to claim credit for replanting trees without penalizing the harvesting of trees (an asymmetry)
- The asymmetry of Article 3.3 would benefit the United States, but we don't know to what precise extent.
- The negotiating history supports this asymmetry (Canada insisted in Kyoto that "harvesting" be deleted, and "reforestation" would allow Parties to benefit from replanting), but the IPCC Special Report will criticize it and Parties will likely be uncomfortable arguing for it internationally.
- Still, before rejecting Article 3.3's asymmetry, two things will be important:
 - 1) are there trade offs to be made internal to the Article 3.3/3.4 debate (e.g., drop the asymmetry in exchange for support on the inclusion of certain Article 3.4 activities)?
 - 2) are there trade offs between Article 3.3 and other issues (e.g., "supplementarity")

Timing Questions

- To preserve negotiating flexibility, it will be important that decisions on Article 3.3 and Article 3.4 are taken at the same time.
- The risk and greater likelihood is that there will be pressure to take decisions on Article 3.3 first, and to defer decisions on Article 3.4 until some later date.

**American Council for an Energy-Efficient Economy • Center for
International Environmental Law • Environmental Defense Fund •
Greenpeace • National Environmental Trust • National Wildlife
Federation • Natural Resources Defense Council • Ozone Action
• Seattle Audubon Society • Sierra Club • U.S. PIRG • Union of
Concerned Scientists • Woods Hole Research Center • World
Wildlife Fund**

May 25, 1999

Todd D. Stern
Assistant to the President
for Special Projects
Special Projects Office
The White House
Room G/WW
1600 Pennsylvania Avenue, NW
Washington, D.C. 20500

Frank E. Loy
Under Secretary
Global Affairs
Department of State
Room 7250
2201 C Street, NW
Washington, D.C. 20520

Dear Messrs. Stern and Loy:

Within the past several months the Administration has made known some of its views on land use, land use change, and forestry (LUCF) under the Kyoto Protocol. We are writing, first, to request that the Administration clarify its position with regard to certain critical issues, and second, if our present understanding of the Administration's position is correct, to express our concerns about that position.

It is clear from the U.S. submissions to the climate secretariat, as well as presentations and statements in recent briefings and workshops, that the Administration favors a "comprehensive" approach to LUCF under the Protocol. It appears that the Administration seeks to enable Parties to take credit for much, if not all, of the

sequestration attributable to biotic sinks that can be scientifically verified, regardless of whether this sequestration exceeds levels projected under "business-as-usual."

Presumably, the United States would seek credit for this sequestration during the first commitment period, by considering forest, agriculture and range management to be additional activities under Article 3.4 of the Protocol.

If this correctly characterizes the Administration's views on Article 3.4, we are deeply troubled. According to the most recent available U.S. government study, such an approach could give the United States 192 million tons of carbon equivalent credit each year during the first commitment period for "business-as-usual" activities, not including agricultural soils and rangeland.¹ This is equivalent to a 13% increase in the U.S. assigned amount during the first commitment period, or approximately a 40% reduction of the level of effort relative to reference case projections that would be required for the United States to meet its Kyoto target. Put another way, it is tantamount to converting the U.S. target from a 7% reduction to a 5% *increase* from 1990 levels. Such a result would be a substantially weaker commitment than President Clinton originally proposed prior to the Kyoto Conference.

In Kyoto parlance, the U.S. approach, as we understand it, amounts to a full "gross/net" accounting of sinks. The compromise adopted in Kyoto, however, was a *limited* gross/net approach. As evidence that the Administration understood and accepted the Kyoto bargain, we note that it announced immediately afterward that the sinks language in the Protocol would account for 3% of the U.S. target—not the 13% change that could result from a full gross/net approach.

In deciding which new activities should be adopted under Article 3.4, care must be taken to preserve the level of effort agreed for the first commitment period by each of the Annex I Parties. Allowing Parties to receive substantial additional credit for "business-as-usual" activities would undermine the Protocol and put the climate at greater risk.

If we have misstated the U.S. position on LUCF, or the impact it would have on the level of effort required of the United States during the first commitment period, we request clarification. If, on the other hand, our characterization of the U.S. position and its implications for the first commitment period is correct, we request that the position be revised to take account of our concerns.

Respectfully,

¹ Joyce, L.A. (ed.), *Productivity of America's Forests and Climate Change*, USDA Forest Service, General Technical Report RM-271. September 1995.

Howard Geller
American Council for an Energy-
Efficient Economy

Donald Goldberg
Center for International Environmental
Law

Annie Petsonk
Environmental Defense Fund

Gary Cook
Greenpeace

James Lyon
National Wildlife Federation

Daniel Lashof
Natural Resources Defense Council

Kert Davies
Ozone Action

Stephanie Matheny
Seattle Audubon Society

Ann Mesnikoff
Sierra Club

Katherine Silverthorne
U.S. PIRG

Emily Smith
National Environmental Trust

Peter Frumhoff and Darren Goetze
Union of Concerned Scientists

Kilaparti Ramakrishna
Woods Hole Research Center

Jennifer Morgan
World Wildlife Fund

cc: David Sandalow, CEQ
David Gardiner, EPA
Margo Anderson, USDA
Interagency "Sinks" Group

facsimile transmittal



CENTER FOR INTERNATIONAL ENVIRONMENTAL LAW

1367 Connecticut Avenue NW
Suite 300
Washington, DC 20036-1860

Phone: (202) 785-8700
Fax: (202) 785-8701
<http://www.econet.apc.org/ciel/>

To: Frank Loy, 647-0753
Roger Ballentine, 456-6468

From: Donald Goldberg

CC: David Sandalow
David Gardiner
Margo Anderson
David Doniger
Ken Andrasko
Bill Breed
Bill Hohenstein
Joe Ferrante
Rosina Bierbaum
Peter Backlund
Ann Kinzig
Adele Morris
Heather Huppe
Tom Peterson
Evan Bloom
Jeff Miotke
Mark Hambley

Date: July 8, 1999

Fax number:

No. of pages (incl cover): 6

Re: US LUCF policy - follow-up



CENTER FOR INTERNATIONAL ENVIRONMENTAL LAW

July 8, 1999

Roger Ballentine
Deputy Assistant to the President
for Environmental Initiatives
The White House
Room 107/EW
1600 Pennsylvania Avenue, NW
Washington, D.C. 20500

Frank E. Loy
Under Secretary
Global Affairs
Department of State
Room 7250
2201 C Street, NW
Washington, D.C. 20520

Dear Messrs. Ballentine and Loy:

On May 25, 1999 fourteen environmental organizations sent a letter to Frank Loy and Todd Stern requesting clarification of the U.S. position on sinks under the Kyoto Protocol and expressing our deep concern with the U.S. position as we currently understand it.

This letter was signed by the following groups: American Council for an Energy-Efficient Economy, Center for International Environmental Law, Environmental Defense Fund, Greenpeace, National Environmental Trust, National Wildlife Federation, Natural Resources Defense Council, Ozone Action, Seattle Audubon Society, Sierra Club, U.S. PIRG, Union of Concerned Scientists, Woods Hole Research Center, and World Wildlife Fund.

Representatives of two other organizations had intended to sign the letter, but due to a clerical error their names were omitted. These are:

Tia Nelson
The Nature Conservancy
Carol Werner
Environmental and Energy Study Institute

Subsequently, representatives of six additional organizations asked us to circulate their names as co-signers. These are:

Jim Jöntz
American Lands Alliance

Joan Reiss
California Wilderness Coalition

Jym St. Pierre
RESTORE: The North Woods

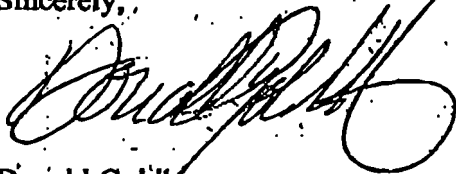
Rene Voss
Earth Island Institute

Laurie Wayburn
The Pacific Forest Trust

Randall White
Georgia Forest Watch

Finally, I note that we have not yet received a response to our letter and respectfully request that you clarify the issues raised in our letter at your earliest convenience.

Sincerely,



Donald Goldberg
Center for International Environmental Law

SINKS

Agenda

1. IPCC process recap - special report - no deadline
pr. 6 already ready for COP.6
- broad - 3.3, 2.4, 3.7, 3.12, others
→ solicited proposals for policy from forestry interests
2. Rome IPCC meeting
3. Domestic policy process - interagency analytical process
3 issues being addressed: 3.3
3.4
analyses of policies
4. Outreach
late Oct - econ analysis mtg
w/ tech people w/
ag interest groups
(wants to develop some policy options (bring in others)
meeting of "you bosses" on Tuesday



CLIMATE POLICIES AND PROGRAMS DIVISION
Office of Policy, Planning & Evaluation
U.S. Environmental Protection Agency
401 M Street SW, Washington, D.C. 20460

To: Rich Birdsey/Bill Breed/Joe Aldy
Organization: USDA/USFS
Phone: 610 975-4092
Fax: 610 975/4095/586-2062/395-6870

From: Bill Hohenstein
Phone: 202 260-7019
Fax: 202 260-6405
Date: July 30, 1998

Pages including cover sheet: 2

Rich, Bill, Joe:

Here is the draft Q/A we discussed. Any comments?

Bill
202 260-7019

Question: The economic analysis provided by the Council of Economic Advisors did not account for US implementation of forest and land use carbon sequestration actions. What benefits could the US potentially achieve through domestic forestry and agricultural carbon sequestration activities?

Answer: Carbon sequestration opportunities could reduce greenhouse gas emissions in the United States by roughly 30-40 million metric tons of carbon equivalent (MMTCE) annually during the first commitment period at costs of under \$25/ton. Cost effective actions include tree planting, improved forest management, paper recycling, forest conservation, and agricultural soil management. We recognize the importance of ensuring that all cost effective and verifiable actions receive credit under the Kyoto Protocol.

Supporting information

	Average Annual Reduction (2008-2012)
Tree Planting on Marginal Lands	7-12 MMTCE
Increased Recycling	10 MMTCE
Improvements in Forest Management	10 MMTCE
Forest Conservation	N/A
Agricultural Soil Carbon Improvements	
Winter cover crops	3.5
Increases in conservation tillage	2.5
Total	~30-40 MMTCE

Sources: (EPA/ USDA Forest Service, 1995), personal communication R. Birdsey

from Hiro
State Dept
mty

cc JY
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SINKS AND BUENOS AIRES

Issue: Are there any sinks issues that can be decided in Buenos Aires?

Background: The issue of sinks and their treatment is addressed in two key paragraphs in Article 3 of the Kyoto Protocol: Article 3.3, which limits sinks activities in the budget period to afforestation, reforestation and deforestation; and Article 3.4, which provides for the addition of new activities related to sinks.

At the most recent sessions of the Subsidiary Bodies, held in Bonn in June 1998, the SBSTA agreed to hold a joint SBSTA/IPCC workshop on Article 3.3 issues in September 1998. The SBSTA further agreed to hold a second workshop jointly with the IPCC to follow COP-4; this second workshop was to address additional activities pursuant to Article 3.4. Finally, SBSTA agreed to request the IPCC to prepare a Special Report on sinks issues – recognizing, although not explicitly stating – that such a report takes approximately two years to prepare.

The most recent IPCC Bureau and “scoping” meetings, held in early July in Germany, essentially decided that no formal products/FCCC recommendations would emerge from the two workshop – but that the ideas and questions raised in the sessions would be used as input to the Special Report. They also proposed a tentative schedule for the preparation of the report: it is to be released in late 1999 or early 2000 (in time for COP-6, but not COP-4, and probably not COP-5).

Recommendation: Do not seek to conclude any specific decisions on defining the sink terms in Article 3.3, or seek to add any specific new activities related to sinks under Article 3.4 at the Buenos Aires COP-4 Meeting. In light of the timetable agreed by the IPCC, it will be difficult to get international agreement on any of these items while the IPCC technical work is proceeding. Furthermore, should any U.S. recommendation (either for definitions or additional activities) be undercut by the IPCC's technical work, it would be difficult (if not impossible) to sustain internationally.

In order to demonstrate movement on the sinks issue, several items may be proposed:

- (1) seek to lock in a timetable for making sinks recommendations (i.e., agree on definitions and at least a first tranche of additional activities no later than COP-6);
- (2) propose specific new activities that the IPCC would examine in its Special Report (note that this will necessitate a significant domestic effort to define), and work aggressively within the IPCC process to insure U.S. views are addressed;
- (3) offer to host technical meetings in support of IPCC sinks process (would require workshop costs to be met).

Coms to Sup Biniaz
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From 400
State Dept
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cc JY
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Formalizing the Umbrella Arrangement

Issue

Whether to seek to formalize the umbrella arrangement before or at COP and, if so, how.

Background

o During the Kyoto negotiations, a group of non-EU countries interested in emissions trading, and sharing similar views on what the emissions trading rules should be, formed the so-called "umbrella group."

o Members include the United States, Canada, Japan, Australia, New Zealand, Russia, and Ukraine.

o The umbrella group has met several times since Kyoto, both to develop common positions on emissions trading rules (which are reflected in a joint submission in Bonn) and to discuss various ways in which the members might actually engage in trading among themselves.

o During the Bonn meeting, it became clearer that it is going to be extremely difficult, if not impossible, to negotiate a set of globally acceptable emissions trading rules, particularly in the short term:

-- In terms of substance, the EU insists on placing limits on both sellers (by disallowing the sale of so-called "hot air") and buyers (by placing a quantitative limit on the amount of a Party's commitment that can be met through trading). The EU position on a "cap" is not technical, but political, and is unlikely to change. India, which opposed trading from the outset, has raised the need to reflect "equity" in the rules.

-- In terms of timing, developing countries are in no rush to agree on emissions trading rules and will likely seek outcomes that are unacceptable to us (such as related to compensation) in return for any rules.

o In recognition of such difficulties, the question has been raised whether there are ways in which the umbrella group might move forward with trading even in the absence of globally agreed trading rules. A paper outlining various options is attached.

o The two basic options include:

-- asserting the right under the Protocol to go forward with trading even in the absence of globally agreed rules;

-- trading within the framework of a "bubble" arrangement under Article 4 (the provision under which the EU will implement its burden-sharing arrangement), where globally agreed rules are clearly not necessary.

Why Formalize the Umbrella?

o There are at least three reasons why it might be desirable to move quickly to "formalize" the umbrella arrangement:

-- to solidify the umbrella group from a political point of view (in particular Russia and Ukraine, which have not been as involved as would be useful);

-- to codify the emissions trading rules that the like-minded umbrella group has already nearly agreed upon;

-- to gain leverage in the negotiation of the trading rules (i.e., because other countries believe they would be better off compromising on the rules than having a group of major countries operate under their own rules);

-- to put the United States and other like-minded countries in an offensive, rather than defensive, posture;

-- to symbolize progress before or at Buenos Aires, given that progress in other areas is likely to be limited.

o On the other hand, moving now could be counter-productive:

-- It might be difficult to achieve formalization, in which case it might appear as a set-back for the United States.

-- Even if it were possible to achieve formalization, it might be criticized by other countries and make it more difficult to work cooperatively on other climate change issues.

-- Particularly with respect to the option of trading under Article 17 but not under globally agreed rules could have the appearance of rejecting global approaches in favor of approaches among limited groups of countries.

-- Formalizing the umbrella group could have the effect of making very clear U.S. reliance on Russian/Ukrainian tons to comply with the Protocol target.

If So, How?

o If, on balance, it were considered desirable to move now to "formalize" the umbrella arrangement, it would have to be considered what form such "formalization" would take.

o It is assumed that, at a minimum, the formalization would include the expression of the umbrella members' intent to trade as a group.

o Additional issues that would arise would include, for example:

-- whether the expression of the intent to trade as a group would state that this would be on an exclusive basis or leave open whether others might be able to join;

-- whether the expression of the intent to trade as a group would be coupled with some or all of the rules agreed upon within the umbrella group (note that umbrella group paper submitted in Bonn left certain issues open, such as buyer vs. seller liability issues);

-- whether the expression of the intent to trade as a group would take the form of a political commitment or a legal commitment (note that it would not appear that we have the necessary authority to enter into such a legal commitment); and

-- whether the expression of the intent to trade as a group would make clear whether the group would ultimately be proceeding under Article 4 (the "bubble" article) or Article 17 (the emissions trading article), or leave this issue open.

o There would also be timing issues associated with formalization:

-- Near-term options include: pre-Buenos Aires; at Buenos Aires; or shortly following Buenos Aires.

-- It is difficult to imagine both reaching substantive agreement and creating the proper venue before Buenos Aires.

-- An important consideration is whether to leave enough flexibility so that positive movement on flexibility mechanisms could allow us the option of not making the announcement.

from 4:00
STATE DEPT
mtg.

cc JY
JA
SP

Allocation of Risk under International Emissions Trading

Introduction

- To comply with the Protocol, each Annex I Party has the obligation to hold enough tonnes of carbon dioxide equivalent at the end of the first commitment period to cover its net emissions during that period.
- Rules under Article 17 should indicate clearly from the outset what will happen to tonnes that a Party has previously transferred if it has excess emissions at the end of the commitment period. (This paper focuses on excess emissions; however, failure to comply with measurement and reporting obligations also needs to be addressed.)
- Different approaches to the allocation of risk as between the selling and buying Parties could produce substantially different prospective incentives for selling and buying Parties and other entities (e.g., private sector firms) involved in international emissions trading.
- Because those incentives have potentially large implications for the economic and environmental consequences of the trading system, careful consideration must be given to the various advantages and disadvantages created by the different approaches before one is chosen.
- This paper briefly outlines possible approaches, but much more analytical work is necessary to explore the options.
- In addition, consultations with potential private sector participants could help us understand the effects of the risks and uncertainties associated with different approaches, as well as the extent to which they may impede the development of the trading system.

Basic Options

- The rules could provide that previously transferred tonnes are unaffected, placing total responsibility for the excess emissions on the selling Party.
 - Under this option, a selling Party could be required to make up its shortfall, by acquiring tonnes from others or by deducting its excess emissions, with a penalty, from its assigned amount for the second commitment period.

- Alternatively, the rules could provide that previously sold tonnes will be applied to cover the selling Party's excess emissions, effectively shifting non-compliance risks to the buying Party of those tonnes.
- Hybrid approaches could be possible.

Discussion

1. Selling Party Bears Risk

- As noted above, under such an approach, the rules would provide that any tonnes transferred by a party may be used (or re-transferred) by the acquiring Party at their full value (i.e., a tonne is always equal to a tonne), regardless of whether the originating Party had retained enough tonnes to cover its own net emissions at the end of the commitment period.
- The selling Party would be solely responsible for its excess emissions.
- While further sales of tonnes could be prohibited once the selling Party's emissions had used up its entire assigned amount after adjustments for trading, past sales would be unaffected.
- Consequences for the selling Party would depend upon the trading rules and the more general non-compliance rules. The rules could require the selling Party to make up the excess emissions -- by acquiring that number of tonnes from others within a specified period of time after the end of the commitment period, by deducting that number of tonnes (with a penalty) from its assigned amount for the following commitment period, or by some other means. They could also preclude the Party from participating in trading in the subsequent commitment period.

Implications

- Likely to be the simplest system, providing relative certainty for buyers.
 - Buying Parties (and their entities) could acquire and use tonnes from any Annex B Party at face value and treat them as completely interchangeable. Buyers would bear no added costs to evaluate or purchase additional tonnes to protect against the possibility of the selling Party's non-compliance.
- To the extent that a selling Party with market power oversells, thereby reducing the price of tons, the market itself would provide an incentive for that Party to comply.

- Unless trading or non-compliance rules create consequences for a Party that oversells, this approach may not provide sufficient incentive for a selling Party to retain enough tonnes to cover its own emissions.

-- As such, there could be negative environmental consequences.

- Others?

2. Buying Party Bears Risk

- Under such an approach, the rules would provide that if a selling Party does not possess enough tonnes to cover its emissions at the end of the commitment period, tonnes that the Party had previously sold would be applied to cover the shortfall.

-- In other words, tonnes sold abroad would be applied to the excess emissions of the selling Party rather than the buying Party.

- There are several approaches to how (and which) tonnes could be devalued (reclaimed) to cover the excess emissions, for example, all tonnes could be devalued by an equal share or tonnes could be devalued on the basis of their transfer date.
- To the extent that buyers may not be able to apply their tonnes purchased from a non-complying Party, the tonnes from different Parties would potentially trade at different prices, reflecting buyers' assessment of the risk of the originating Party's non-compliance.

Implications

- Selling Parties would have a price incentive to demonstrate compliance, because buyers would pay more for tonnes from Parties with solid compliance assurances (although the magnitude of the price incentive is uncertain).
- Would create risks for buyers, who would not know whether the tonnes they acquired are fully valid until the end of (or perhaps after) the commitment period.

-- However, buyers might manage risk in numerous ways, such as: creating portfolios of tonnes from different Parties, trading through contracts that are contingent on the performance of the selling Party, using the services of risk-raters (akin to Moody's bond ratings), etc.

- Such an approach could impede development of the trading system by: overburdening a fledgling market with excess risk; raising transaction costs (e.g., to get risk information); potentially requiring buyers to buy extra tonnes to guard against a shortfall.

- Even if the selling Party gets only a discounted price, it might still have an incentive to oversell.
- The approach creates complex interdependencies, under which market prices for a Party's *own* tonnes may be weakened if it holds large numbers of tonnes from risky sellers.

-- Private sellers could be adversely affected by the purchasing decisions of private buyers in the same country. In other words, a buyer of tonnes from Party A, in deciding how much to pay for tonnes from Party B, would need to take into account whether Party B was likely to comply. To the extent that Party B (including through its private sector) had acquired tonnes from Party C (a compliance risk), tonnes from Party B could be devalued.

- Others?

3. Hybrid Options

- Hybrid options could be possible.
- There appear to be at least three ways in which a hybrid approach might work:
 - The mixed allocation could be decided up front.
 - A pure buyer or seller allocation could apply initially, but could later switch under certain circumstances (such as under a "yellow light" scheme).
 - A selling Party could be given the option to choose, including up front: 1) to make up its excess emissions by either acquiring tonnes or deducting them from the next commitment period (in which case previously transferred tonnes would retain their full value), or 2) not to make up its excess emissions (in which case the risk would switch to the buying Party).
- Further consideration would need to be given to ensure that hybrid options were designed to mitigate concerns raised by pure buyer/seller options.

Methodological Issues Related to Land Use Change and Forestry and the Kyoto Protocol
U.S. Submission to the FCCC
August 1998

At the eighth session of the Subsidiary Body for Scientific and Technological Advice in Bonn, Germany, the Parties agreed in FCCC/SBSTA/1998/CRP.3, paragraph 5,

The SBSTA invites Parties to submit information related to: (a) The implementation of Article 3.3, particularly on data and methods, and questions and issues identified in FCCC/SBSTA/1998/INF.1, by 15 August 1998 for compilation into a miscellaneous document by approximately August 30, 1998;

The U.S. notes the progress made in Bonn regarding LUCF activities, in particular, the decisions to: 1) clarify Article 3.3 (FCCC/SBSTA/1998/CRP.3, paragraph 2); invite parties to submit information relating to LUCF activities; 3) task the IPCC with a special report; and 4) request SBSTA to organize workshops on LUCF activities.

This U.S. submission covers the following general areas:

- 1) Kyoto Protocol language related to forests, land use, and land use change;
- 2) Recommendations for the IPCC Special Report;
- 3) Guidance on the Article 3.3 workshop, September, 1998;
- 4) Recommendations for the workshop to focus on Article 3.4; and
- 5) A timetable for moving forward on Articles 3.3 and 3.4 of the Kyoto Protocol

1) Kyoto Protocol language related to forests, land use, and land use change:

The United States continues to seek full and comprehensive treatment of all anthropogenic emissions and sinks of greenhouse gases under the Framework Convention and under the Kyoto Protocol. Comprehensive treatment of forests and other lands uses, including agriculture, range, and pasture lands, is necessary to ensure that:

- all human activities that influence the concentration of greenhouse gases in the atmosphere are adequately addressed; and
- the most cost-effective mitigation strategies are pursued.

The U.S. recognizes the limited set of activities outlined in Article 3.3 are a step in that direction. However, many questions remain regarding the current language. The informal document FCCC/SBSTA/1998/INF.1 prepared by the FCCC Secretariat, outlines many of the technical and policy questions that we face. The document prepared by the Secretariat goes beyond summarizing the issues regarding land use change and forests in the Kyoto Protocol and offers

interpretations of the language. The United States believes that ultimately, the job of interpretation of the text is best left to the Parties. We recognize that, while not explicit in the Kyoto Protocol, it is desirable to seek a common approach among Parties in defining the activities referred to in Articles 3.3 and 3.4 of the Kyoto Protocol. We also recognize the value of the planned IPCC Special Report on LUCF activities and acknowledge that the IPCC's technical work is important to meet the aim of a consistent, scientifically based approach to implementing Articles 3.3 and 3.4 of the Kyoto Protocol. A number of options are available with regard to the language in Articles 3.3, 3.4 and 3.7 especially with respect to key terms. An examination of these options must be guided by the following:

1. **Interpretations should be consistent with the level of commitment Parties agreed to for the first commitment period.** Interpretations adopted for the first commitment period should not produce a departure from the targets negotiated in Kyoto.
2. **Interpretations of key LUCF terms should be based on sound science.** Terms in the Kyoto Protocol should have grounding in the scientific and technical literature. Countries should employ the best practicable technical methods for measuring carbon and other greenhouse gas emissions and sequestration on land use and forestry, and ensure that the emissions and sequestrations reported are monitorable and verifiable. Where data gaps and uncertainties exist, countries should seek to improve understanding and measurements of greenhouse gas emission activity.
3. **Interpretations should promote other environmental objectives related to land use, recognizing tradeoffs and complementarities among environmental goals.** Land use changes and forestry have significant environmental impacts beyond their effects on greenhouse gases. Parties should be alert to creating incentives that affect the broader environment. For example, activities should implicitly encourage sound forest and agricultural management practices along with carbon sequestration. To the extent that optimizing carbon sequestration conflicts with, say, improvements in biodiversity, appropriate balances should be considered and addressed.
4. **Interpretations of land use and forest activities should create appropriate incentives.** To a large extent, the only way to provide the proper environmental and economic incentives is to have an accounting system for sinks that is as comprehensive as possible. Important cost savings may be lost if certain land use activities sequester carbon more cheaply than others, but are excluded from the treaty.

2) ***Recommendations on the IPCC Special Report:***

In FCCC/SBSTA/1998/CRP.3, paragraph 7, SBSTA requested the IPCC to prepare and provide information to the SBSTA and the Conference of Parties, in particular a Special Report as

defined by IPCC procedures, on land use, land use change and forestry. The focus of the Special Report should be on the methodological, scientific, and technical implications of alternative interpretations of the relevant articles of the Protocol, particularly Articles 3.3 and 3.4. The special report should use full anthropogenic carbon stock accounting as the reference point for consideration of key terms in the Protocol related to land use, land use change and forestry activities.

In order to meet the needs of the Parties, the special report should include assessments of:

- The overall contributions (short and long run) from land use activities, land change and forestry;
- The implications of the potential approaches for key terms in Article 3.3 of the Kyoto Protocol (including forests, afforestation, reforestation, and deforestation);
- Other activities that should be considered under Article 3.4, including: soil carbon management on forest lands, crop lands, range lands, and pasture lands; improvements in forest management; and conservation;
- Inventory and data availability to report these activities; and
- Shortcomings and limitations of only counting these activities versus full and comprehensive accounting.

To assist in the task of developing potential interpretations, we have provided a compilation of definitions used in the United States and internationally for the terms deforestation, afforestation and reforestation (Lund, 1998; attached). The potential interpretations of the other key forest and land use terms and implied in the Kyoto Protocol are characterized in Section B (1) of FCCC/SBSTA/1998/INF.1. These terms include: direct human-induced; activities; carbon stocks, and forests.

The IPCC should use a set of objective questions as part of the evaluation of alternative interpretations of key terms. For each potential interpretation, the IPCC should address:

- Can inventory methods and reporting guidelines be developed and made available (or are they already available)?
- What are the data requirements and uncertainties for the inventory methods and reporting guidelines?
- What structural problems and accounting gaps exist?

- What are the greenhouse gas mitigation options that are included and excluded?
- What uncertainties exist in our scientific understanding of the effect of LUCF on the carbon cycle?
- Can discounting systems be developed to adjust estimates for uncertainty and risk?

The process of developing this Special Report should provide for close coordination with the SBSTA and allow the SBSTA to provide interim feedback and direction during its development. Mechanisms to facilitate this include: comments provided by the Parties to the Secretariat by 15 August, 1998; additional comments by the Parties in their October 30, 1998 submissions to the FCCC Secretariat; the September workshop; and the workshop on Article 3.4 scheduled for January or February of 1999. A discussion of progress and the need for interim feedback on the IPCC special report should be placed on the agenda of upcoming SBSTA meetings.

3) Guidance on the Article 3.3 workshop, September, 1998

We appreciate the efforts of the FCCC Secretariat and the IPCC in preparing for the workshop scheduled for September 23-25, 1998. The primary outcome of this workshop should be a draft of a detailed outline for the IPCC Special Report (to be forwarded to the IPCC Plenary); agreement on the process for completing and reviewing the special report; and an initial discussion of the specific terms and implications of alternative interpretations between Parties. It should be noted that there will be links between issues raised at the September 1998 workshop, issues that will be raised at the 1999 workshop and the IPCC special report. Workshop preparations should take into account such linkages.

Key items that would be useful as input to the September workshop include:

- A compilation of the August 15, 1998, submissions of Parties by the FCCC Secretariat. The Secretariat should make a presentation of the compilation at the September workshop. This presentation should include, if appropriate, a summary of potential interpretations of key terms offered by the Parties and additional activities proposed under Article 3.4. This presentation should also include a compilation of the views from the Parties on the scope and nature of the IPCC Special Report.
- A presentation by the IPCC on the proposed outline under development for the Special Report on Forests and Land Use Change and the Kyoto Protocol.
- Presentations by 3-5 Parties on the implications of various interpretations of key terms outlined in FCCC/SBSTA/1998/INF.1.

4) *Recommendation for a Workshop to focus on Article 3.4. Issues:*

The U.S. strongly supports holding a discussion at the September SBSTA workshop to plan the second workshop on LUCF activities, focusing on activities that could be added under Article 3.4. The U.S. has offered to support and host such a workshop in February or March, 1999 and would be pleased to provide additional logistical information at the September workshop about the 1999 workshop. A discussion in September could facilitate ensuring appropriate balance in the Special Report, in particular recognizing that there will be links between issues raised at the Article 3.4 workshop and issues raised at the September 1998 workshop.

5) *A timetable for moving forward on Articles 3.3 and 3.4 of the Kyoto Protocol:*

To maintain forward movement on LUCF activities, the US has identified a timetable and actions to be taken toward making operational the relevant LUCF articles in the Kyoto Protocol.

- | | |
|---------------------|--|
| August 30, 1998: | Secretariat compiles submissions on Article 3.3. This MISC. document will be available to the Parties at the September Workshop and delivered to SBSTA and COP4. |
| September 23, 1998: | Workshop on Article 3.3 – discuss alternative interpretations of LUCF activities, identify data needs and gaps; provide guidance for the IPCC Special Report; scope workshop on 3.4. |
| September 25, 1998 | IPCC Plenary , Vienna, Austria. Continue to scope Special Report with input from workshop and submissions by Parties. Approve draft IPCC workplan for special report on Land Use and Forestry under the Kyoto Protocol, noting emendations likely to emerge from Article 3.4 workshop and related submissions. |
| October 1, 1998 | Deadline for submission by Parties on modalities, rules and guidelines for Article 3.4, which may include information on additional categories. |
| October 30, 1998 | Secretariat compiles submissions on Article 3.4. This MISC. document will be available for the Parties at the February/March Workshop and delivered to SBSTA and COP4. |
| November, 1998: | COP 4—Approve plan of work regarding IPCC Special Report. Deliver MISC. document from September Workshop. |

- | | |
|-----------------------------|---|
| February or
March, 1999: | Workshop on Article 3.4. Continue process of identifying additional LUCF activities. |
| November, 1999: | COP 5—IPCC provides progress report on Special Report or delivers Special Report on LUCF activities. If delivered, Parties should be prepared to agree on 3.3 interpretations and additional activities under Article 3.4 that would be included in the first commitment period (2008-12) |
| June, 2000: | SBSTA—IPCC delivers Special Report on LUCF activities. Parties should be prepared to agree on operationalizing Article 3.3 and additional activities under Article 3.4 that would be included in the first commitment period. |
| November, 2000 | COP 6 – Parties agree on operationalizing Article 3.3 and additional activities under Article 3.4 that would be included in the first commitment period. |

UNITED STATES DEPARTMENT OF COMMERCE
Economics and Statistics Administration

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Phone No.: 482-3028

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Interagency Working Group on Global Climate
August 19, 1998
Department of State
Room 6824

Agenda

1. Preparations for upcoming meetings
 - Argentina/Chile Meetings
 - Brazil Proposal - Bilaterals and Workshop
 - Umbrella Meeting, Wellington, September 7-8
 - Annex I Experts Group Meeting - Sur 12/11
 - Tokyo Ministerial, September 17-18
 - IPCC/UNFCCC Carbon Sinks Workshop (Rome September 23-25)
 - CDM Ministerial, Ottawa, September 24-26
 - IPCC 14th Plenary, Vienna, September 28-October 3
2. Submissions to the FCCC
 - Methodologies
 - Technology
 - Others - 4.2(a) and (b), Inventory issues
3. Congressional taskers: McIntosh, Hagel, Sensenbrenner
4. Other Business

There will be no IWG meeting next week due to scheduling conflicts.

Documents:

- Draft Responses to the G-77/China Questions on Flexibility Mechanisms
- Draft Liability paper (from New Zealand)
- Draft Market Power Issues paper (from New Zealand)
- Sensenbrenner Questions (Volume II)
- Invitation to IPCC/FCCC Sinks Workshop
- McIntosh subpoena
- Announcement of UNCTAD CDM Meeting
- Invitation for FCCC Workshop on Baselines, Monitoring and Verification
- Draft Submission on Land-Use Methodological Issues
- Draft Submission on Technology

Draft U.S. Submission on Methodological Issues Related to Land-Use Change and Forestry and the Kyoto Protocol

At the eighth session of the Subsidiary Body for Scientific and Technological Advice in Bonn, Germany, the Parties agreed in FCCC/SBSTA/1998/CRP.3, paragraph 5

The SBSTA invites Parties to submit information related to: (a) The implementation of Article 3.3, particularly on data and methods, and questions and issues identified in FCCC/SBSTA/1998/INF.1, by 15 August 1998 for compilation into a miscellaneous document by approximately August 30, 1998;

The US notes the progress made in Bonn regarding LUCF activities, in particular, the decisions to: 1) clarify the structure of Article 3.3 (FCCC/SBSTA/1998/CRP.3, paragraph 2); invite parties to submit information relating to LUCF activities; and 3) task the IPCC with a special report; and 4) requesting SBSTA to organize workshops on LUCF activities. (2)

US submission covers three general areas: 1) principles to guide countries in evaluating the language in the Kyoto protocol regarding land use, land use change, and forestry; 2) initial recommendations for the scope and organization of the IPCC Special Report; 3) guidance on the upcoming SBSTA workshop; and 4) recommendations for the schedule for the process for moving forward with Articles 3.3 and 3.4 of the Kyoto Protocol.

1) *Principles for evaluating the Kyoto Protocol language related to forests, land use, and land use change:*

The United States continues to seek full and comprehensive treatment of all anthropogenic emissions and sinks of greenhouse gases in the Framework Convention and under the Kyoto Protocol. Comprehensive treatment of forests and other lands uses, including agriculture, range, and pasture lands, is necessary to ensure that:

- all human activities that influence the concentration of greenhouse gases in the atmosphere are adequately addressed and furthermore
- the most cost-effective mitigation strategies can be pursued.

We recognize the limited set of activities outlined in Article 3.3 are a step in that direction. However, many questions remain regarding the current language. The informal document FCCC/SBSTA/1998/INF.1 prepared by the FCCC Secretariat, outlines many of the technical and policy questions that face us. The document prepared by the Secretariat goes beyond summarizing the issues regarding land use change and forests in the Kyoto Protocol and offers interpretations of the language. The United States believes that ultimately, the job of interpretation of the text is best left to the Parties. We recognize that, while not explicit in the

Annex I or Annex B?

Kyoto Protocol, it is desirable to seek a common approach among Annex I Parties in defining the activities referred to in Articles 3.3 and 3.4 of the Kyoto Protocol. We also recognize the value of the planned IPCC Special Report on LUCF activities and acknowledges that the IPCC's technical work is important to meet the aim of a consistent, scientifically based approach to interpreting Articles 3.3 and 3.4 of the Kyoto Protocol. The U.S. recognizes a number of options for interpreting the language in key sections of Articles 3.3, 3.4, and 3.7, especially in regard to the definitions of key terms. Our examination of these options will be guided by the following principles:

Interpretations of key LUCF terms should be based on sound science. Terms in the Kyoto Protocol should have grounding in the scientific and technical literature. Countries should employ the best practicable technical methods for measuring carbon and other greenhouse gas emissions and sequestration on land use and forestry, and ensure that the emissions and sequestrations that we report are monitorable and verifiable. Where data gaps and uncertainties exist, countries should improve the ability to understand and measure GHG activity.

Interpretations of land use and forest activities should create appropriate incentives. To a large extent, the only way to provide the proper environmental and economic incentives is to have an accounting system for sinks that is as comprehensive as possible. Important cost savings may be lost if certain land use activities sequester carbon more cheaply than others, but are excluded from the treaty.

Interpretations should promote other environmental objectives related to land use, recognizing tradeoffs and complementarities between environmental goals. Land use changes and forestry have significant environmental impacts beyond their effects on greenhouse gases. Parties should be alert to creating incentives that affect the broader environment. For example, activities should implicitly encourage sound forestry and agricultural management practices along with carbon sequestration. To the extent that optimizing carbon sequestration conflicts with, say, improvements in biodiversity, appropriate balances should be considered and addressed.

Interpretations should be consistent with the level of commitment Parties agreed to for the first commitment period. Interpretations adopted for the commitment period should not produce a sharp departure from the targets we understood were being negotiated in Kyoto. Interpretations should not make the target more stringent for countries that have net sequestration from all forest and land use activities.

2) Initial recommendations on the organization of the IPCC Special Report

In FCCC/SBSTA/1998/CRP.3, paragraph 7, SBSTA requested the IPCC to prepare and provide

information to the SBSTA and the Conference of parties, in particular a special report as defined by IPCC procedures, on land-use, land-use change and forestry. The focus of the special report should be on the methodological, scientific, and technical implications of alternative interpretations of the relevant articles of the Protocol, particularly Article 3 ~~rather than generic issues related to forests and land use~~. The special report should use full anthropogenic carbon stock accounting as the reference point for consideration of key terms in the Protocol related to land-use, land-use change and forestry activities. ?

In order to meet the needs of the Parties, the Special report should include assessments of:

1. The overall contributions from land use activities, ^{use} land change and forestry;
2. The implications of the potential approaches for key terms in Article 3.3 of the Kyoto Protocol (including forests, afforestation, reforestation, and deforestation);
3. Other activities that should be considered under Article 3.4, including: soil carbon management on forest lands, crop lands, range lands, and pasture lands; improvements in forest management; and conservation;
4. Inventory and data availability to report these activities; and
5. Shortcomings and limitation of only counting these activities versus full and comprehensive accounting.

To assist in the task of developing potential interpretations, we have provided a compilation of definitions used in the United States and internationally for the terms deforestation, afforestation and reforestation (Lund, 1998). The potential interpretations of the other key forest and land use terms and implied in the Kyoto Protocol are adequately characterized in Section B)(1) of FCCC/SBSTA/1998/INF.1. These terms include:

- direct human-induced activities
- carbon stocks, and
- forests

The IPCC should use a set of objective questions should be addressed as part of the evaluation of alternative interpretations of key terms. *auth*

For each potential interpretation:

- Are inventory methods and reporting guidelines feasible and available?
- What are the data requirements and uncertainties for the inventory methods and reporting guidelines?

- What structural problems and accounting gaps exist?
- What are the greenhouse gas mitigation options that are included and excluded?

The process of developing this special report should provide for close coordination with the SBSTA and allow the SBSTA to provide interim feedback and direction during the development of this report. Mechanisms to facilitate this include: comments provided by the parties to the secretariat by 15 August, 1998, additional comments by the Parties in their October 30, 1998 submissions to the FCCC Secretariat, the September workshop, a workshop on Article 3.4 scheduled for January or February of 1999. A discussion of progress and the need for interim feedback on the IPCC Special Report should be placed on the agenda of upcoming SBSTA meetings.

3) Guidance on the Article 3.3 FCCC Secretariat workshop, scheduled for September, 1998

We appreciate the efforts of the FCCC Secretariat and the IPCC in preparing for the workshop scheduled for September 23-25, 1998. Key issues that should be addressed at this event include:

A. A compilation of the August 15, 1998 submissions of Parties by the FCCC Secretariat. This presentation should include a summary of potential interpretations of key terms offered by the Parties and additional activities proposed under Article 3.4. This presentation should also include a compilation of the views from the Parties on the scope and nature of the IPCC Special Report.

B. A presentation by the IPCC on the proposed outline under development for the Special Report on Forests and Land Use Change and the Kyoto Protocol.

C. Presentations by 3-5 Parties on the implications of various interpretations of key terms outlined in FCCC/SBSTA/1998/INF.1.

The primary outcome of this meeting will be a draft of a detailed outline for the IPCC Special report (to be forwarded to the IPCC Plenary); an initial discussion of the specific terms and implications of alternative interpretations between Parties; and agreement on the process for completing and reviewing the Special Report.

4) Recommendation for a Workshop to focus on Article 3.4. Issues.

The US supports holding a discussion at the September SBSTA workshop to plan the second workshop LUCF activities, focusing on activities that could be added under Article 3.4. The US has offered to host a workshop in January or February of 1999.

5) Guidance on creating a process for moving forward to implement Articles 3.3 and 3.4 of the Kyoto Protocol

To maintain forward movement on LUCF activities, the US has identified a timetable and actions to be taken toward implementation of the relevant LUCF articles in the Kyoto Protocol.

- August 30, 1998: Secretariat compiles submissions on Article 3.3. This MISC document will be available to the Parties at the September Workshop and delivered to SBSTA and COP4.
- September 23, 1998: Workshop on Article 3.3—discuss alternative interpretations of LUCF activities, identify data needs and gaps; provide guidance for the IPCC Special Report; scope workshop on 3.4 IPCC Plenary—continue to scope Special Report with input from Workshop, and submissions by Parties.
- September 25, 1998 IPCC Plenary, Vienna, Austria. Approval of IPCC workplan for Special Report on Land Use and Forestry under the Kyoto Protocol
- October 1, 1998 Deadline for submission by parties on modalities, rules and guidelines for Article 3.4, which may include information on additional categories.
- October 30, 1998 Secretariat compiles submissions on Article 3.4. This MISC document will be available to the Parties at the February/March Workshop and delivered to SBSTA and COP4.
- February or March, 1999: Workshop on Article 3.4. Continue process of identifying additional LUCF activities.
- November, 1998: COP IV—Approve plan of work for IPCC Special Report. Deliver MISC document from September Workshop.
- November, 1999: COP V—IPCC provides progress report on Special Report or delivers Special Report on LUCF activities. If delivered, Parties should be prepared to agree on 3.3 interpretations and additional activities to be included in the first budget period.
- November, 2000: COP VI—IPCC delivers Special Report on LUCF activities. Parties should be prepared to agree on 3.3 interpretations and additional activities to be included in the first budget period.

Nature - recent sink article *U. Ca*

**Options for the US Position on Article 3.3 at the Fourth
Conference of the Parties in Buenos Aires, Argentina, November, 1998**

The US was successful in Bonn (June 1998) in meeting its near-term objectives on land use change and forestry activities that may be counted toward meeting GHG commitments. We negotiated a process for resolving technical issues related to the Kyoto Protocol's treatment of forests and land use by tasking the Intergovernmental Panel on Climate Change (IPCC) to write a Special Report on these issues. The report is scheduled to be completed in the Spring/Summer of the year 2000.

Question: What should be the US position at COP4 regarding land use and forestry activities in Article 3.3?

Option 1. Maintain current position (Prefer to include all activities creditable toward Assigned Amounts in the first commitment period. Pursue technical consensus through the SBSTA and IPCC and COP/MOP decision after 2001).

Pros

- Will allow the US to use information gained through the IPCC process in the development of our position. The quantitative estimates developed to date of the implications of various interpretations are highly uncertain and based on limited and preliminary analyses.
- The risks of an unfavorable interpretation are small given that an interpretation that is negative to the US would also hurt several Annex B countries (e.g. NZ, Russia, Ukraine, Canada, Sweden, Japan).
- Building technical consensus among countries will reduce controversy and will facilitate the consistency needed for international trading and monitoring and verification of compliance.
- Legitimate technical and policy issues were raised in Protocol negotiations that the US has not yet addressed (e.g. what if the "missing sink" is discovered in temporal or boreal forests).

Cons

- Will delay the resolution of the issue until the IPCC report is completed in the Year 2000.
- The solution will be negotiated with countries that are reluctant to allow a large role for forests and land use in the Protocol (e.g. the EU, AOSIS)

Option 2a-e: Develop a unilateral interpretation of Article 3.3.

Under this set of options, the US would adopt a specific interpretation of the Kyoto Protocol language regarding forests and land use.

General Pros

- Will give certainty regarding the US position to those undertaking domestic action and allow questionable actions to be started sooner.
- Will allow the US to assert an interpretation of Article 3.3 without compromise. (As well as what should be included under Article 3.4)

General Cons

- Other countries will interpret Article 3.3 differently. This will generate controversy and ill will that may thwart US objectives on this issue as well as others.
- Allowing countries to use the ambiguity of the language will undermine the environmental protection offered by the agreement.
- A unilateral interpretation will be viewed as undermining a science-based process to develop a better technical consensus on the issues.

Option 2a: Unilaterally define reforestation to include the regeneration of harvested forest lands, exclude carbon harvested from existing forest lands. (50 MMTCE offset in 2010)

Pros:

- This set of definitions produces the biggest carbon bonus
- Consistent with forestry terminology used in the United States
- Consistent with agreement to exclude harvesting (negotiated in contact groups during the negotiations)
- Allows some activities on existing forest lands (e.g. regeneration) to be given credit

Cons:

- Does not accurately represent the impact of activities on the environment. Carbon emissions/sequestration from some significant forest activities are excluded.
- Creates national incentives to prematurely harvest lands to get lands into the post-1990 base.
- Lands that are partially cut may not update land into the post-1990 base, whereas lands that are clear cut definitely will, thus penalizing more environmentally sensitive practices.

Option 2b: Unilaterally define reforestation to include the regeneration of harvested forest

lands, but include the carbon emissions from harvesting the forest. (Increases baseline emissions by 59 MMTCE in 2010)

Pros:

- The national incentive to prematurely harvest forest lands is lowered
- System recognizes changes in what happens to carbon in harvested wood

Cons:

- Is inconsistent with negotiations that explicitly rejected including carbon from harvesting.
- May still provide incentives to clear cut (if lands that are sustainably managed do not qualify).
- By not counting aggregate regrowth of pre-1990 forests, sinks are negative in first two commitment periods

Option 2c: Unilaterally exclude activities on existing forest lands by defining reforestation as the conversion of lands that were once forested, but currently not in forests back to forest cover. (Increases baseline emissions by 9 MMTCE in 2010)

Pros:

- Eliminates the national incentive to harvest since regeneration of harvested lands is not considered "reforestation" under this definition
- Eliminates the loophole from counting carbon sequestered by replanted harvested lands, but not subtracting the carbon that is harvested
- Focuses only on baseline changes in forest cover to be credited.

Cons:

- Not all existing forest lands are included.
- Does not accurately represent the impact of activities on the environment. Carbon emissions/sequestration from most commercial forest activities are excluded.
- Sinks are negative, but small, in the first two budget periods.

Option 2d: Unilaterally define "Activities" as "Projects" (Has no impact on baseline emissions)

Under this interpretation, the US would essentially disregard baseline trends in forest and land use change and focus on specific actions that will increase carbon sequestration. This approach is consistent with US delegation discussions in Kyoto toward the US target of a 7% reduction from 1990 levels.

Pros:

- Allows for forest carbon sequestration projects
- Greatly simplifies what we need to account for
- Only provides positive sinks, albeit small

Cons:

- Probably allows the least sequestration credit in the commitment period as each project must be reviewed and approved
- Possibly inconsistent with negotiating history
- Doesn't count baseline trends
- No disincentive to emit carbon from sinks, e.g. harvest and deforestation
- Ignores the effect of projects on non-project lands (e.g. leakage)
- Hard to measure as "verifiable changes in stocks" as required by Article 3.3

Option 2e: Announce intention to decide to amend language (per Article 3.4) before US implementation to include more activities. (Impact on baseline would depend on the activities added)

In Buenos Aires, the U.S. may propose to add additional activities to the list of qualifying forestry activities, whose net contribution to sinks may be positive or negative. The primary purpose of including additional land use and forestry activities would be to (1) make the accounting more comprehensive and scientifically sound, and (2) to eliminate perverse national incentives created by leaving out key carbon-influencing activities. Some examples of possible additional activities:

1. Forest management, including aggregate regrowth of existing forest
2. Change the "since 1990" to "since 1900", or some other date
3. Conservation
4. Agricultural soil management
5. Harvesting (only if we can get other changes to account for sequestered carbon)

Pros:

- If done well, it could be the most technically correct and politically desirable outcome
- Is consistent with pre-Kyoto US position

Cons:

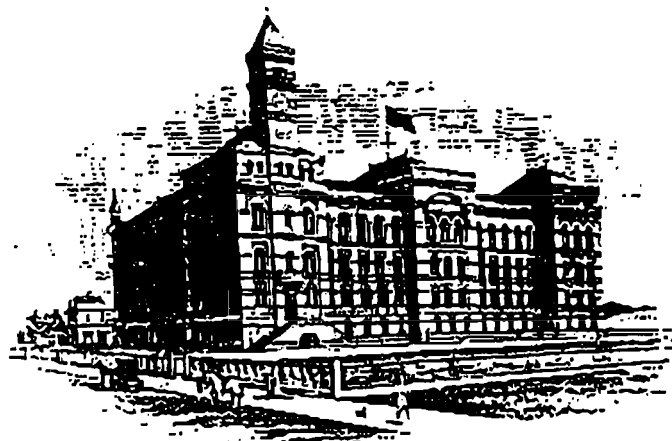
- If not done well, amended language could be just as bad if not worse.
- Provides no guidance on provisional definitions until language is amended.



OFFICE OF THE CHIEF

(202) 205-1661

(202) 205-1765 - Fax

DATE: 7/22/98TO: Matt Weinzierl

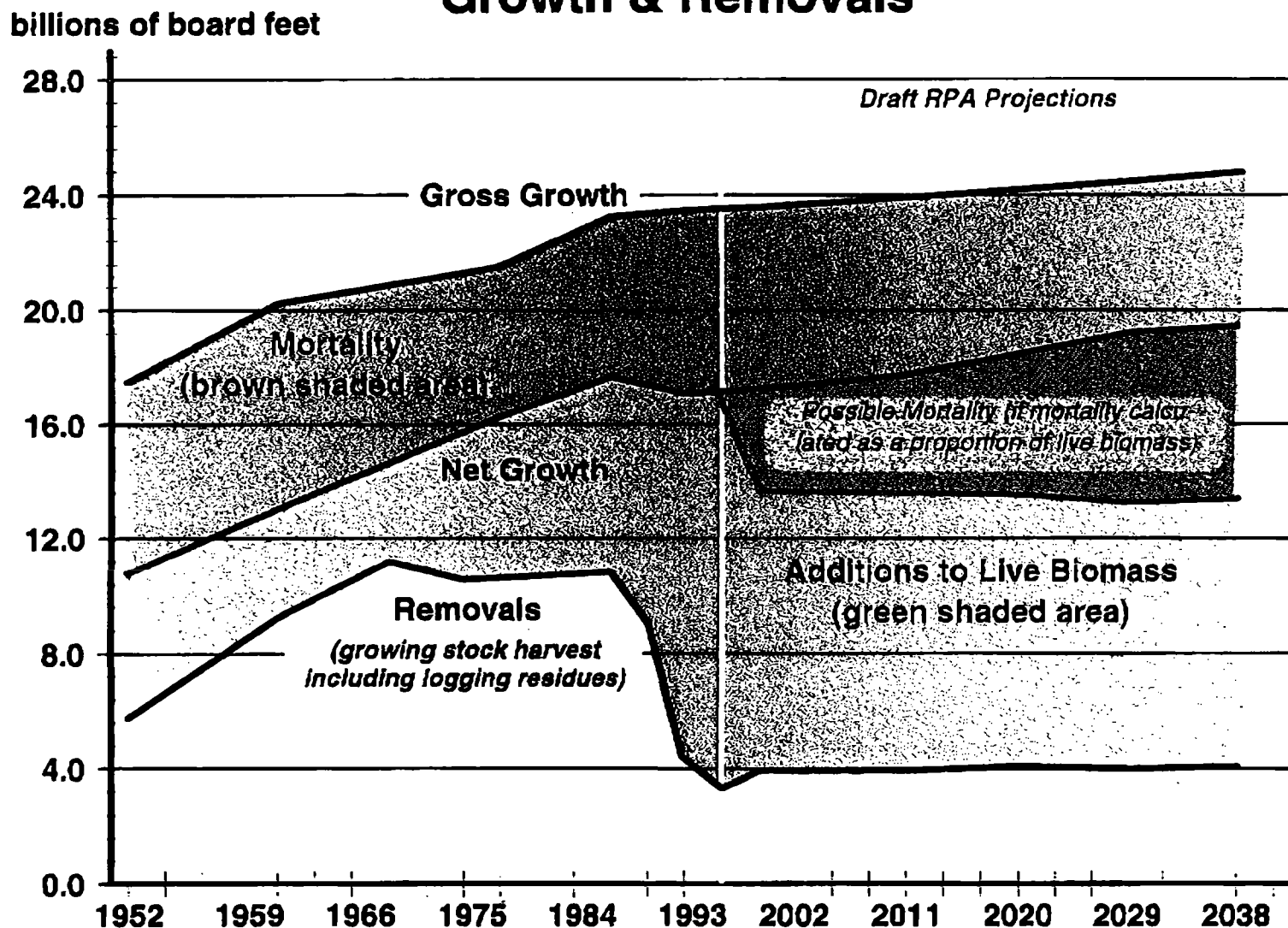
FROM: Chris WoodPHONE:

FAX:

COVER SHEET + 1 PAGESSUBJECT/ MESSAGE:

To confirm receipt, call (202) 205-1661

National Forest Timber Growth & Removals



Conversions from cubic foot to board foot measures are approximate; gross growth beyond 1993 is estimated.
Data Source: Forest Service Cut & Sold Reports and "The 1993 Timber Assessment Update" (RM-GTR-259)

Options for Incorporating Forests and Land Use Change

In EMF Post-Kyoto Analyses

Bill Hohenstein
EPA Office of Policy

DRAFT

Kyoto Protocol: Article 3

- ◆ Article 3.1 Omits forests and land use change from Parties' Assigned Amounts (budgets)
- ◆ Article 3.3
 - Provides limited inclusion of forestry activities
 - Requires Parties to count: afforestation, reforestation, and deforestation since 1990 in meeting commitments
- ◆ Article 3.4 Allows for additional forest and land use change activities to be included (with agreement of the Parties)

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Structure of the US Target

Emissions budget (assigned amount)

5 X (1990 Emissions of CO₂, CH₄, N₂O, excluding forests + 1995 Emissions of synthetic greenhouse gases) X 93%

$$5 \times 1,665 \text{ MMTCE} \times 93\% = 7,740 \text{ MMTCE}$$

Commitment Period

2008 -2012 emissions of CO₂, CH₄, N₂O, synthetic GHG
+/- (afforestation, reforestation, and deforestation since 1990)
- CDM Offsets
+/- Trades with other Annex B Parties

Article 3.3

....The net changes in greenhouse gas emissions by 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 carbon stocks in each commitment period

shall be used to meet the commitments.....

Questions over the structure of the commitment

- ◆ FCCC Secretariat Paper presents three options:
- ◆ Option One: Changes in stocks from activities during the Commitment Period
- ◆ Option Two: Change in the average level of activity between 1990 and the Commitment Period
- ◆ Option Three: Cumulative change in stocks from 1990 through the Commitment Period from the activities

Questions regarding the definition of terms

- ◆ Activities -- All activities or specific activities taken to avoid GHG emissions?
- ◆ Forests -- Minimum stocking (tree cover)?
- ◆ Afforestation -- conversion of lands to forests from other land uses -- overlap with reforestation?
- ◆ Reforestation -- Regeneration of forest after harvest or returning lands to forests from other uses (minimum time period?)
- ◆ Deforestation -- Minimum stocking? Forest degradation? Activities to avoid deforestation?

EMF Assumptions blur distinctions between baseline and actions

- ◆ Annex B Countries will account for limited forest and land use change activities in their baselines
- ◆ Annex B Countries can also take actions to increase carbon sequestration (or reduce emissions) in activities covered under the Kyoto Protocol
 - These actions will be limited in the first commitment period
 - \$/ton need to be accounted for
 - Timing?
- ◆ Developing country forestry activities under the CDM could either be limited or have no limits.
 - Project costs
 - Transaction costs
 - Timing?

EMF Initial Post-Kyoto Scenarios

Maximum Sink Potentials (MMTC)

	MAX	1/6	2/3
Annex B			
United States	300	50	200
EU/Western Europe	150	25	100
Japan	0	0	0
Can/Aus/NZ	240	40	160
EE/FSU	600	100	400

Developing Countries

China	300	50	200
India	300	50	200
Mexico and OPEC	300	50	200
ROW	1000	167	667
Total	3,190	532	2,127

SELINE 1990 and 2010 Net Carbon Emissions and Sequestration from Land Use and Forests for Annex B Countries

Country	Forest MMT 1990	Forest MMT 2010	Data Sources
AUSTRALIA	24	15	2010 est. not available assumed constant at 1995 levels
NEW ZEALAND	-6	-6	National communication
CANADA	-88	-88	Apps et. al. via Andrasko assumed to be constant at 1990 levels
JAPAN	-23	-15	National communication
U.S.A.	-311	-227	US 1997 Draft GHG Inventory data supplemented from USDA
RUSSIA	-107	-150	US Country Studies Reports
BULGARIA	-2	-1	1990 National Communication, projections US Country Study Report
HUNGARY	-1	-1	US Country Studies Reports
SLOVAKIA	-1	-2	National Communication
CZECH REPUBLIC	-1	-1	National Communication
POLAND	-0.4	0	1990 data from national communication, projections from US Country Studies Report
ROMANIA	-1	0	RIVM
UKRAINE	-14	-19	Data derived from US Country Studies Report
ICELAND	0	0	National Communication
NORWAY	-3	-4	National Communication
SWITZERLAND	-1	-1	National Communication
AUSTRIA	-4	-4	National Communication est. remain constant from 1990 through 2010
BELGIUM	-1	-1	National Communication
DENMARK	-1	-1	RIVM
FINLAND	-7	-6	National Communication
FRANCE	-9	-13	National Communication
GERMANY	-8	-5	National Communication
GREECE	0	0	RIVM
IRELAND	-1	-2	National Communication
ITALY	-10	-13	RIVM
NETHERLANDS	0	0	National Communication
SWEDEN	-9	-6	National Communication
PORTUGAL	0	0	RIVM
SPAIN	-1	-1	RIVM
U.K.	5	2	National Communication
Total	-582	-550	

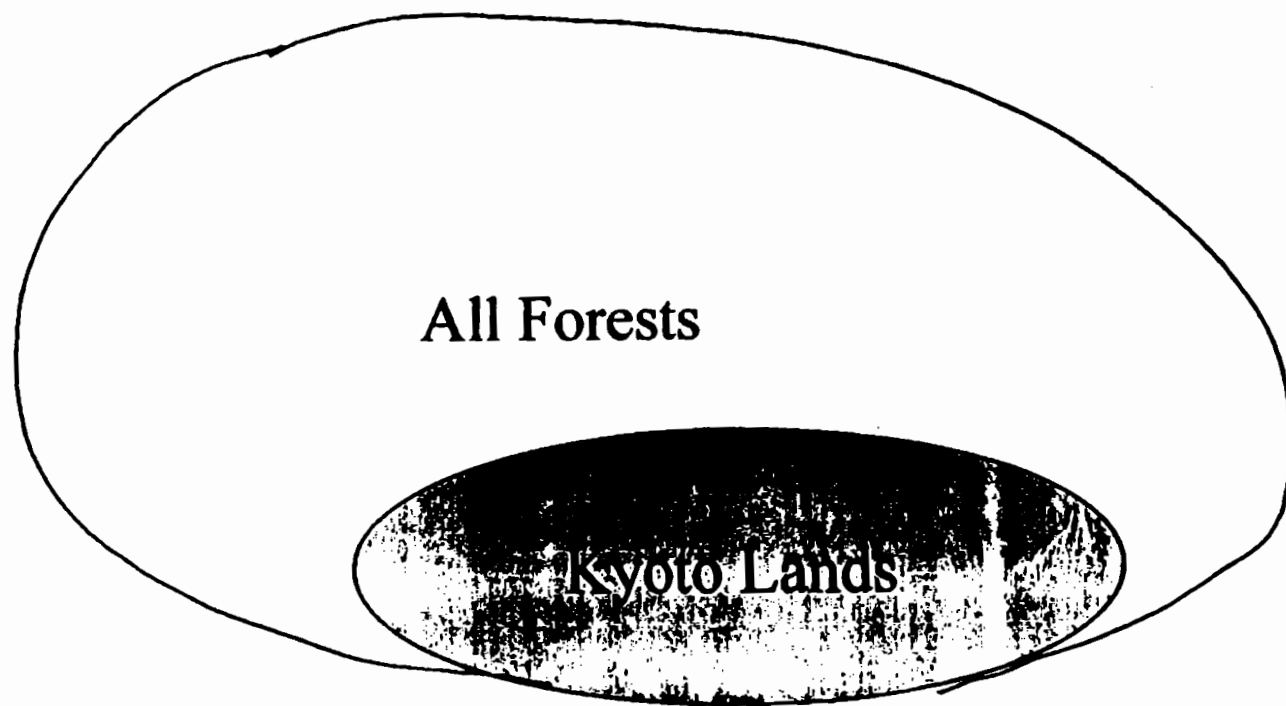
Maximum Potential Carbon Sequestration -- Summaries of Baseline National communications and EMF Post-Kyoto

	2010 Regional Totals MMTC	2010 EMF Assumed Potential MMTC
AUSTRALIA *	-9	*
Canada/Australia/New Zealand	-94	-240
JAPAN	-15	0
U.S.A.	-227	-300
Eastern Europe/Former Soviet Union	-174	-600
European Union/Western Europe	-55	-150

Estimate for Australia accounts for reductions in emissions from 1990

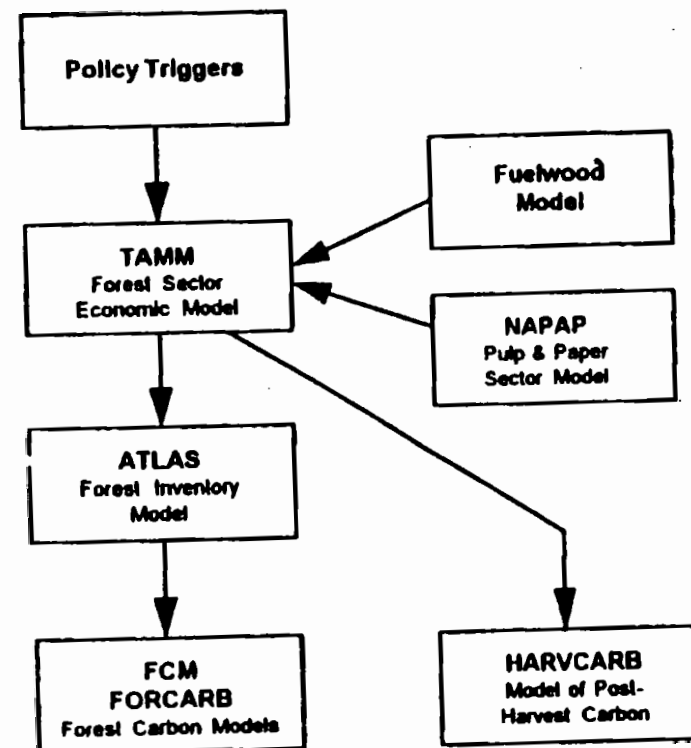
P.12

The Kyoto Protocol limits the treatment of forests and land use change



Domestic Forest Sector Models

- ◆ Economic models
 - TAMM/ATLAS
 - FASOM
- ◆ Questions evaluated
 - Variety of tree planting policies (various levels of funding)
 - Increased recycling (demand side management)
 - Reduced Federal timber sales (forest conservation)
 - biomass energy feedstock production



Domestic Opportunities to Sequester Carbon

- ◆ IAT analysis
- ◆ Tree planting on marginal agricultural lands
 - Assumed \$110 Mil per year for 10 years
 - Enrolled 7 million acres
- ◆ Sequestered 4.1 MMTC in the first 10 years
- ◆ 9.6 MMTC in the second 10 years
- ◆ Cost per ton ranged from \$6.90 to \$15.70 per ton

- ◆ Other analysis indicates 20-60 million acres are potentially available for tree planting without substantially affecting agricultural productivity

Loblolly Pine Plantation

1,000 lb C/acre

kg C/m²

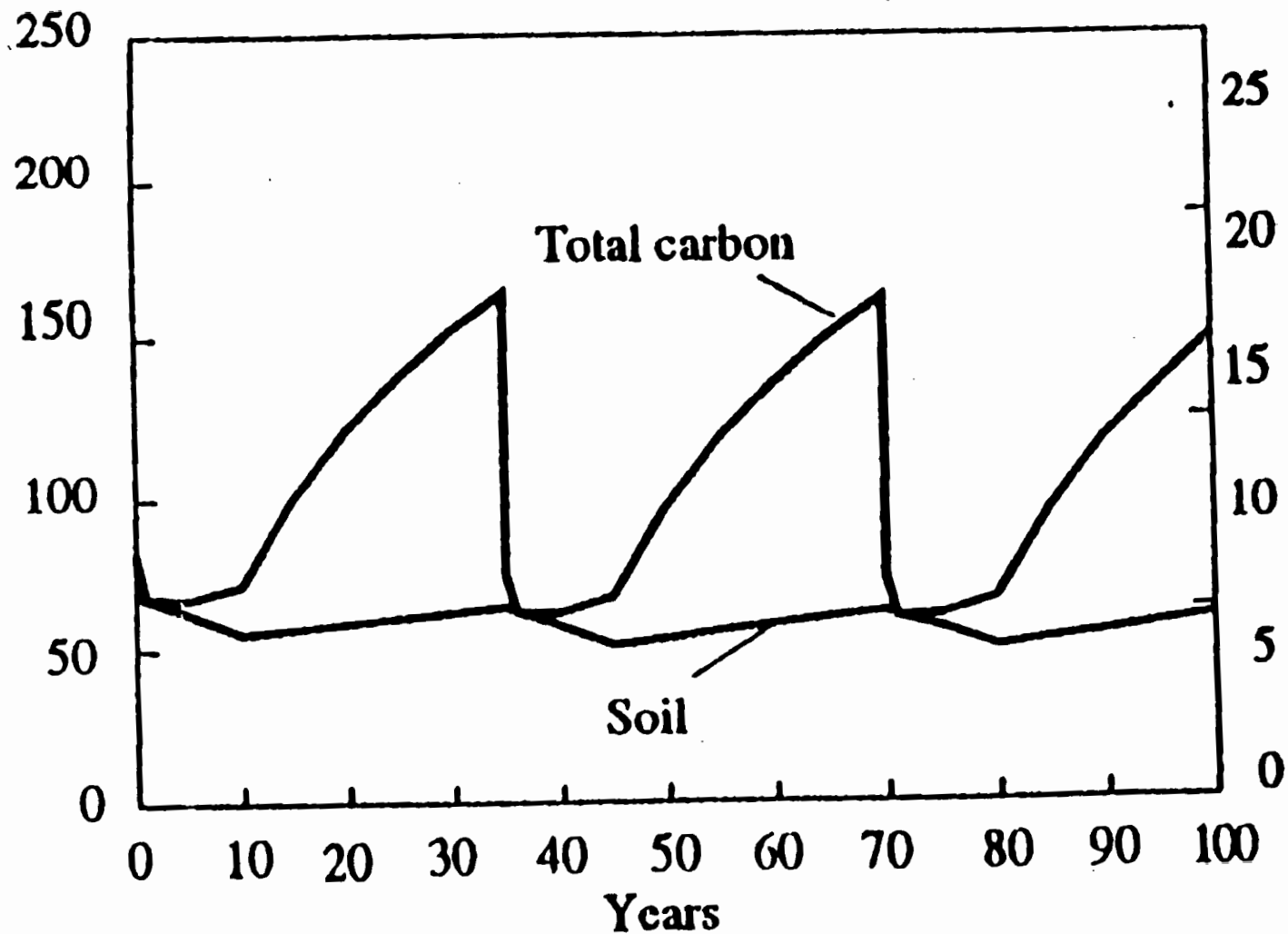


Table 24-8: Initial cost of expanding carbon sinks by different regions and practices.

Region/Country	Practice	Cost ¹ (US\$/t C)	Source
Boreal	Natural Regeneration ²	5 (4–11)	Dixon <i>et al.</i> , 1994b
	Reforestation	8 (3–27)	
Temperate	Natural Regeneration ²	1	Dixon <i>et al.</i> , 1994b
	Afforestation	2 (1–5)	
	Reforestation	6 (3–29)	
Tropical	Natural Regeneration ²	1 (1–2)	Dixon <i>et al.</i> , 1994b
	Agroforestry	5 (2–11)	
	Reforestation	7 (3–26)	
Central America	Regeneration	4	Swisher, 1991
	Agroforestry	4	
	Plantations	13	
Argentina	Reforestation	31	Winjum <i>et al.</i> , 1993
	Afforestation	18	
Australia	Reforestation	5	Winjum <i>et al.</i> , 1993
Brazil	Reforestation	10	Winjum <i>et al.</i> , 1993
	FLORAM	3–8 ³	Andrasko <i>et al.</i> , 1991
Canada	Reforestation	11	Winjum <i>et al.</i> , 1993
	Regeneration	6	
China	Reforestation	10	Winjum <i>et al.</i> , 1993
	Forest Management	3–4	Xu, 1995
	Eucalypt Plantations	8	
	Agroforestry	6–21	
Germany	Reforestation	29	Winjum <i>et al.</i> , 1993
India	Reforestation	15	Winjum <i>et al.</i> , 1993
	Regeneration	2	Ravindranath and Somashekhar, 1995
	Teak Plantations	3	
	Agroforestry	9	
Malaysia	Reforestation	5	Winjum <i>et al.</i> , 1993
Mexico	Reforestation	4	Winjum <i>et al.</i> , 1993
	Plantations	5–11	Masera <i>et al.</i> , 1995
	Forest Management	0.3–3	
South Africa	Reforestation	9	Winjum <i>et al.</i> , 1993
Thailand	Teak Plantation	13–26	Wangwacharakul and Bowonwiwat, 1995
	Eucalypt Plantation	5–8	
	Agroforestry	8–12	
USA	Reforestation	5	Winjum <i>et al.</i> , 1993
	Afforestation	2	
	Various Options	5–43 ⁴	Moulton and Richards, 1990
	Various Options	19–95 ⁵	Adams <i>et al.</i> , 1993
FSU	Reforestation	6	Winjum <i>et al.</i> , 1993
	Regeneration	5	
Russia	Plantations	1–8	Krankina and Dixon, 1994

¹ Forest components for sequestering C vary by source: Dixon *et al.* (1994b), Krankina and Dixon (1994), and Winjum *et al.* (1993) include only C in vegetation; Xu (1995), Ravindranath and Somashekhar (1995), Wongwacharakul and Bowonwiwat (1995), and Masera *et al.* (1995) include vegetation and soil C; Swisher (1991), Moulton and Richards (1990), and Adams *et al.* (1993) account for C in vegetation, soil, and litter.

² Values in parentheses are interquartile ranges.

³ Figures vary depending on land rental costs per ha from \$400 to 1,000; FLORAM = Floresta Amazonia.

⁴ Marginal costs include planting and land rental costs.

⁵ Includes land rental costs.

Recommended Changes to EMF Initial Sink Assumptions

- ◆ Having a range of options appropriate
- ◆ Maximum potential amounts from EMF Scenarios appear high
 - 2008-2012 budget period will constrain opportunities
- ◆ Annex B Countries may receive benefits from how forests are defined in the baseline (sub-set of overall forest sequestration)
- ◆ Australia will receive benefits if emissions from land clearing decline (as expected)
- ◆ Actions will have costs that need to be included

Next Steps

- ◆ Evaluate alternative interpretations and definitions for forests and land use change under the Kyoto Protocol
 - US
 - Other Annex B Countries
- ◆ Evaluate potential mitigation opportunities
 - US
 - Other Annex B countries
 - Developing countries (under the CDM)
 - Additional activities?
- ◆ Thorough review of existing literature -- with application to Kyoto Protocol questions is a good place to start

United States Senate

WASHINGTON, DC 20510

May 22, 1998

JLY
JAF
RL
AM
(JA)
HJ

The Honorable Bill Clinton
President
The White House
Washington, D.C.

Dear Mr. President:

The latest protocol to the climate change treaty that was negotiated in Kyoto was an important step towards international collaboration in addressing the environmental effects of rising concentrations of greenhouse gases in the atmosphere. It could be improved, however, by encouraging investment in the natural mitigation capacity of forestry and agricultural sinks. In a market-based system that encourages the most cost-effective methods for reducing net emissions of carbon, forestry and agricultural carbon sinks are a profitable pathway to reducing excess atmospheric concentrations of greenhouse gases.

Forestry and agriculture play a significant role in sequestering atmospheric carbon and economic analysis shows these strategies to be cost-effective. With costs of \$2-\$20 per ton of carbon, domestic forest conservation and management strategies achieve not only greenhouse gas mitigation but, a host of other environmental benefits such as protection of watersheds, water supplies, and critical wildlife and fish habitat, increased soil conservation, and reduction of storm water runoff and landslides.

Unfortunately, ambiguous language in the Kyoto Protocol appears to foreclose the highly effective, credible, and low-cost option of reducing carbon dioxide emissions through improved forestry and agricultural management and conservation practices. Without clarifying existing language, the treaty may have unintended negative impacts on vital forest resources and actually increase forest-based carbon emissions, both in this country and abroad. Such incentives are contrary to a number of national policies and international programs such as the Northwest Forest Plan, the Clean Water Act, the Endangered Species Act, the International Tropical Timber Agreement, the Montreal Process, the Gore-Chernomyrdin agreements and the recently convened Intergovernmental Forum on Forests. Consequently, the effectiveness of the treaty can be enhanced by simplifying the language to enable the use of forestry and agricultural practices.

We urge you to promote domestic policy initiatives and seek clarifications to existing Protocol language that would establish comprehensive accounting for forestry and agriculture and enable the issuing of credit for domestic forest and agriculture management and conservation strategies. Furthermore, we recommend directing the Environmental Protection Agency and the Department of Agriculture to work with forest products, agriculture, research, and conservation groups to help develop standardized carbon stock methodology and accounting principles for carbon

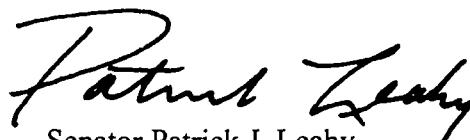
sequestration which are key to establishing the credibility of any action undertaken to mitigate excess atmospheric greenhouse gases. To this end, we strongly encourage development of pilot projects investigating the effectiveness of management approaches in selected forests and fields of the United States. As reflected by the sense of the United States Senate and expressed in a Wyden amendment to the FY 1999 Senate Budget Resolution, these elements should be among our initiatives to foster cost-effective and performance-based methodologies to reduce greenhouse gasses.

We appreciate your attention to our call for expanding the role of forests and agriculture in the scientific strategy for mitigating atmospheric greenhouse gases and look forward to working with you on this important matter.

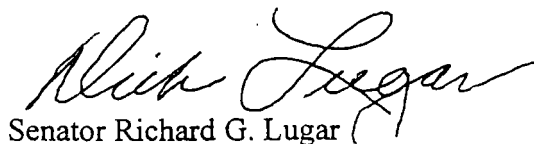
Respectfully,



Senator Ron Wyden



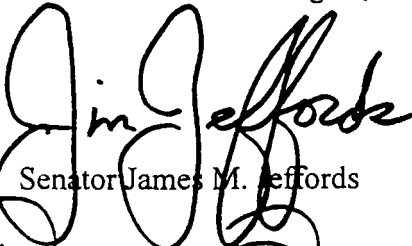
Senator Patrick J. Leahy



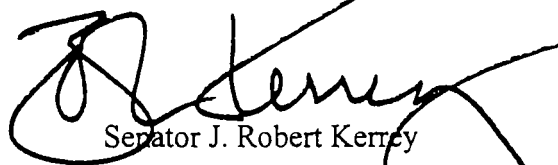
Senator Richard G. Lugar



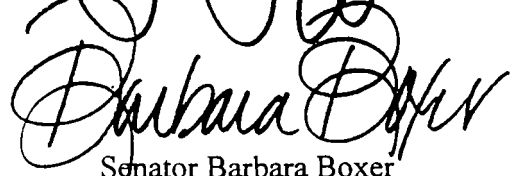
Senator Tom Harkin



Senator James M. Jeffords



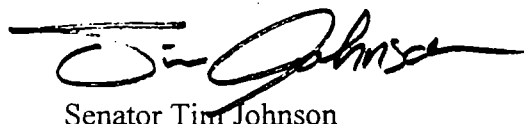
Senator J. Robert Kerry



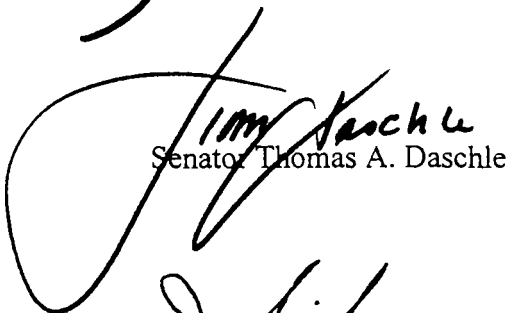
Senator Barbara Boxer



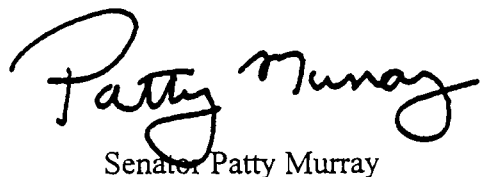
Senator Dianne Feinstein



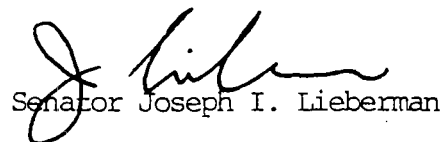
Senator Tim Johnson



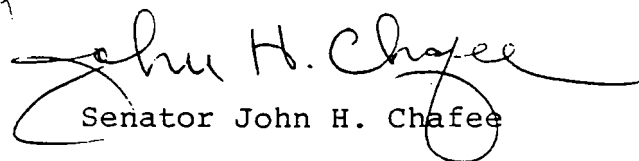
Senator Thomas A. Daschle



Senator Patty Murray



Senator Joseph I. Lieberman



Senator John H. Chafee

U.S. Position Paper

Sinks

Sinks come up in three ways in the Protocol: the three existing sink activities are set forth in Article 3.3; additional activities can potentially be added through the process set forth in Article 3.4; and the mechanisms of emissions trading, joint implementation, and the Clean Development Mechanism all have sink components.

As a result of time pressures, compromises, and unclear provisions, the overall treatment of sinks in the Protocol is not very satisfying. There is no question that, in the longer term (i.e., the second budget period and thereafter), the U.S. should seek a coherent approach that is ~~environmentally~~ and scientifically sound.

Concerning the first budget period -- for which our target is already set -- the U.S. should seek to achieve the positions outlined below.

Existing Sink Activities

- Regarding the three existing sink activities, the U.S. has somewhat conflicting goals. On the one hand, we have an interest in having uniform, internationally agreed definitions of the three existing sink activities. On the other hand, unqualifiedly handing this issue over to an international process for resolution could result in interpretations with a substantial adverse impact on our ability to reach our target.
- As such, the U.S. should ultimately be seeking a uniform approach, while at the same time not conceding that the COP has the authority to decide on the interpretation of the terms, in case the international process goes off in an unfavorable direction.
- Consequently, at the June 1998 meetings of the Convention's subsidiary bodies, the U.S. should urge that the Subsidiary Body on Scientific and Technological Advice (SBSTA) request the IPCC to prepare a technical paper looking at various options for implementing the three activities (reforestation, afforestation, and deforestation), identifying the ways in which States are currently doing their sink inventories, and reporting back on the implications of various options in time for a decision to be taken at COP-5 (i.e., the technical report should be completed for SBSTA consideration well before COP-5). We should emphasize that the paper should be technical, provide a range of possible definitions and be completed well before COP-5 so as to be able to take a decision there.

Additional Activities

- Per the U.S. position leading up to Kyoto, the U.S. should, pursuant to Article 3.4, support the addition of sink activities related to sustainable forest management. As such, at the June meetings of the Convention's subsidiary bodies, the U.S. should urge that the SBSTA request the IPCC to undertake a Special Report, *inter alia*, to consider methodologies for inventorying emissions related to sustainable forest management, and report back as soon as possible (which could be later than COP-5).

Sinks in Trading, JI, CDM

- Regarding emissions trading, the issue has been raised how exactly sinks are to be incorporated into the trading system. Technically, they are not part of "assigned amounts." At the same time, they can clearly be used to offset emissions during a commitment period and, as such, can become *de facto* additions to assigned amounts. To date, the United States has supported the ability of Parties to trade emissions derived from sink projects. The limitations contained in Article 3.3 would apply to any such trading.
- Regarding the CDM, the relevant Article does not expressly refer to the limitation on allowable sink activities contained in Article 3.3 (i.e., reforestation, afforestation, and deforestation). Further, it does not logically follow that the limitations in Article 3.3, which were put in to address concerns with including other activities on a countrywide basis, should apply to individual projects, where the same measurement concerns do not necessarily arise.
- Bearing in mind the strong U.S. interest in not excluding sustainable forest management projects (such as forest conservation) from CDM, the U.S. should take the position in Bonn and Buenos Aires that:
 - any restrictions applicable to sink projects should be pursued through the CDM rules (such as through the "additionality" requirement), rather than through a linkage between CDM and Article 3.3; and
 - we must reject the potential argument, on both legal and policy grounds, that no sink projects are allowed under CDM.

DRAFT U.S. POSITION PAPER SINKS

ISSUE: What action should the US delegation take with respect to sinks – noting that policy decisions are needed to inform our positions at the FCCC Subsidiary Bodies meetings in Bonn in June 1998, in Buenos Aires in November 1998, at the IPCC plenary sessions, and in other intersessional meetings such as the umbrella group, bilateral discussions?

BACKGROUND: The issue of sinks (as it may apply to U.S. circumstances) comes up in three ways in the Kyoto Protocol:

- First, the list of accepted sinks activities are included in Article 3.3 (i.e., reforestation, deforestation, and afforestation). We anticipate that these activities may not be interpreted the same way by all Parties.
- Second, Article 3.4 provides for the COP/MOP to be able to add additional activities for purposes of the second commitment period (which may be voluntarily applied by a Party to the first commitment period).
- Third, the mechanisms of emissions trading, joint implementation, and Clean Development Mechanism all have sink components.

Existing Activities:

The United States has somewhat conflicting goals when it comes to dealing with existing sinks activities. On the one hand, we have an interest in having uniform, internationally agreed definitions of the three activities – such an approach would ensure that other countries are not taking a less stringent approach than we are (and avoid providing others with a comparative advantage). It should be noted that even with a common international interpretation of these activities, national circumstances will yield different effects in different countries; for example, including harvesting would significantly alter the U.S. commitment, but have little effect in Spain. In addition, uniform treatment would assist in assessing compliance. Finally, we may be able to avoid a confrontation in which the sole argument for our domestic interpretation might be cost rather than environmental protection.

On the other hand, we have two compelling reasons for wanting to avoid internationalizing the interpretation of the three activities in the short term:

- First, handing this issue over to the international process to reach agreement could result in interpretations with a substantial adverse impact on our ability to reach our target. Differences between various approaches to counting sinks have enormous implications for the U.S. emissions budget -- depending upon the approach, we could be liable for up to an additional [4 percent or 59 MMTCE] in the commitment period (e.g., an approach that requires countries to count emissions from harvesting during the commitment period). To the extent we wish to retain flexibility domestically and internationally (e.g., in the forest debates) in terms of how to interpret these activities, it may not be advisable to seek international definitions for the first commitment period. (Note: Although a decision on definitions would not be legally binding, as it is not expressly called for or authorized under the Protocol, it could be politically difficult to take an approach different from that internationally agreed upon.) Furthermore, it is not clear that a decision could be easily reached on such definitions. Existing international fora, such as the CSD, the IPCC, the FAO, and the ITTO all have working views on these issues, but no common agreed text exists – and a definition in the climate change context could “box us in” in these other arenas.

DRAFT U.S. POSITION PAPER SINKS

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The United States has somewhat conflicting goals when it comes to dealing with existing sinks activities. On the one hand, we have an interest in having uniform, internationally agreed definitions of the three activities – such an approach would ensure that other countries are not taking a less stringent approach than we are (and avoid providing others with a comparative advantage). It should be noted that even with a common international interpretation of these activities, national circumstances will yield different effects in different countries; for example, including harvesting would significantly alter the U.S. commitment, but have little effect in Spain. In addition, uniform treatment would assist in assessing compliance. Finally, we may be able to avoid a confrontation in which the sole argument for our domestic interpretation might be cost rather than environmental protection.

On the other hand, we have two compelling reasons for wanting to avoid internationalizing the interpretation of the three activities in the short term:

- First, handing this issue over to the international process to reach agreement could result in interpretations with a substantial adverse impact on our ability to reach our target. Differences between various approaches to counting sinks have enormous implications for the U.S. emissions budget -- depending upon the approach, we could be liable for up to an additional [4 percent or 59 MMTCE] in the commitment period (e.g., an approach that requires countries to count emissions from harvesting during the commitment period). To the extent we wish to retain flexibility domestically and internationally (e.g., in the forest debates) in terms of how to interpret these activities, it may not be advisable to seek international definitions for the first commitment period. (Note: Although a decision on definitions would not be legally binding, as it is not expressly called for or authorized under the Protocol, it could be politically difficult to take an approach different from that internationally agreed upon.) Furthermore, it is not clear that a decision could be easily reached on such definitions. Existing international fora, such as the CSD, the IPCC, the FAO, and the ITTO all have working views on these issues, but no common agreed text exists – and a definition in the climate change context could “box us in” in these other arenas.

- Second, seeking internationally agreed definitions could set a bad precedent for the issue of "supplementarity" in the emissions trading discussions. Regarding emissions trading, we are taking the position that the COP/MOP does not have the authority to quantify the term "supplemental," given that Article 17 does not so provide. Similarly, Article 3.3 and 3.4 do not provide for the COP/MOP to take a decision on definitions (as opposed to adding new activities). By seeking to create an authority that does not expressly exist, we could end up undermining our position in the trading context.

New Activities:

During the Protocol negotiations, the United States supported an expansive approach to sinks, noting its environmental effectiveness and its implications for additional low-cost sequestration opportunities. We opposed taking an activity by activity approach, which ended up excluding important areas of sustainable forest management such as harvesting, forest conservation, forest management, and soil conservation. In fact, as a consequence of the existing text, in Kyoto we noted there may be a perverse incentive to harvest land in order to claim reforestation credit. In spite of such objections, and in order to reach agreement, a more limited list was agreed in Kyoto.

We continue to have a strong environmental interest in pursuing the addition of new activities, initially by seeking the methodological work that will necessarily underlie any decision to add new activities. Such work will also help overcome concerns (that we too share) that uncertainty in certain sinks activities preclude their inclusion in national compliance programs. The Protocol text provides for the COP/MOP to decide upon "modalities, rules and guidelines as to how, and which, additional human-induced activities related to changes in greenhouse gas emissions by sources and removals by sinks ... shall be added to, or subtracted from, the assigned amounts for Parties included in Annex I". Alternatively, if we conclude that the Article 3.3 list approach is inherently flawed, we might want to actually amend Article 3.3 as part of the amendment containing second period commitments.

Perhaps the only down-side of adopting new activities is that we may inadvertently create an incentive to delay the adoption of certain sequestering efforts until the next commitment period. Such an incentive would depend on the nature of the credit granting system and how marginal sequestration declines with time. We also have the option of structuring our agreement in ways that might minimize such impacts.

Emissions Trading, JI and CDM

In emissions trading, the issue has been raised (including at the ACAP and umbrella group meetings) how exactly sinks are to be incorporated into the trading system. Technically, they are not part of "assigned amounts." At the same time, they can clearly be used to offset emissions during a commitment period and, as such, can become *de facto* additions to assigned amounts. To date, the United States has supported the ability of Parties to trade emissions derived from sink projects. (Note: One of the papers being prepared by the umbrella group process is on this issue.)

Concerning the CDM, the Protocol articles governing this mechanisms is not expressly linked to the limited activities contained in Article 3.3. Further, it does not logically follow that the limitations in Article 3.3, which were put in to address concerns with including other activities on a country-wide basis, should apply to individual projects, where the same measurement concerns do not necessarily arise. The United States has a strong interest in not excluding sustainable forest management projects (such as forest conservation) from the CDM, even if those activities have not yet been added under Article 3.4. At the same time, it would not appear environmentally or diplomatically sound to argue that there should be no restrictions on sink projects under the CDM. Rather, restrictions should be pursued through the rules governing this mechanism (such as through the "additionality" requirement).

Note that if the CDM treatment is extended to that of JI, a consequence may be that a foreign country could fund forest projects in the United States that U.S. companies could not receive credit for! Thus, we may need to consider a slightly different treatment of JI projects – or confine any JI projects to activities listed in Article 3.3.

U.S. OBJECTIVES:

- We should not seek decisions that could make it more difficult to meet our first commitment period target .
- In the longer term (i.e., with respect to the second commitment period and beyond), we should seek an approach to sinks that creates appropriate environmental and economic incentives to promote sustainable forest management and the overall goal of the Convention/Protocol – and does not create incentives for unsound behavior. In this context, any decision should be consistent with sound science, employ the best available methods for monitoring and accounting, and be open to revisions as the science changes.
- In addition, over the longer term, we should seek as consistent an approach as makes sense between Article 3 commitments and trading/JI/CDM. However, in the short term, we should seek a bifurcated approach that will preserve the option to undertake forest management/conservation projects through CDM for the first commitment period (with further consideration to be given to JI).

Recommendations

The United States should:

1. Endorse the IPCC proposal to examine the issue of sinks in a Special Report to be completed by late 1999, and assess the implications of alternative definitions of “afforestation,” “reforestation” and “deforestation.” Call for this issue to be considered, and a decision taken by the COP/MOP in 2001 (COP 6) – for purposes of the second and subsequent commitment periods – in light of that Report. The IPCC should particularly be requested to consider these issues in light of an overall objective to both reduce greenhouse gas emissions from the forestry sector, and to promote sustainable forest management.
2. Support the addition of activities related to sustainable forest management . Recommend that the IPCC be asked by SBSTA to consider methodologies for inventorying emissions related to sustainable forest management (including harvesting and forest conservation, and soil conservation) in its assessment. Request an update on progress on this work at COP 5.
3. Call for sink issues under CDM to be treated under that mechanism, rather than through application of Article 3.3. Substantively, pursue rules that will yield clear and unambiguous net greenhouse gas emissions reductions that are verifiable and can be independently monitored. This will allow, for the first commitment period, for sink-related projects to go forward even in the absence of internationally agreed sinks definitions.

The adoption of these recommendations by the Parties would insure that U.S. commitment levels for the first commitment period need not be changed through a simple decision of the Parties – although project activities could be used to supplement initial assigned amounts. Adopting these recommendations would also leave open to Parties the potential to incorporate new activities into their first commitment allocations. Note that the timing of the IPCC Report would provide ample opportunity for Parties to assess the implications of any new sink definitions in the negotiation of

second commitment period targets. It will be critical that we make a clear distinction between the policy role of the SBSTA (to advise the COP/MOP to decide on the appropriate definition), and the technical assessment role of the IPCC; not to do so would inappropriately politicize the IPCC. We must also recognize that even though there would be no legally binding obligation to follow the IPCC/SBSTA recommendation, it may be difficult to ignore it in the first commitment period – even if the interpretation adopted is not in the U.S. interest. Finally, this proposal does not speak to our domestic implementation strategy – where we could provide disincentives for early harvesting, or improper forest management procedures regardless of the international regime adopted. Our ability to indicate our domestic preferences could be helpful in winning support for these recommendations.

STRATEGY:

Several objections may be raised to the proposal; each of these may be successfully countered:

1. Concerns that the current language in Article 3.4 creates an inappropriate incentive to prematurely harvest forests; some countries sharing this concern will seek to include harvesting in definition of “afforestation,” “reforestation” and “deforestation” (perhaps as a COP-4 decision). Few in this group will be concerned with the effects such a change might have on U.S. commitments – some might welcome the additional burdens this would impose on us. Others may seek to use the threat of such a decision to obtain other equally undesirable outcomes – for example, linking a decision on sinks to decisions on emissions trading or on developing countries. The most effective counter to such objections may lie in the text itself – which does not include harvesting. We may also note that there is no express authority to take a decision on this issue in any case (see above). Using the promise of the IPCC report, and noting that any new activities would not apply until the second budget period we may at least postpone this debate for some time. We may also seek to gain support for our position by working with these countries to ensure that the IPCC process – and the subsequent consideration of the issue in SBSTA, take account of the very real concern that incentives to prematurely harvest are not perpetuated.
2. Objections to counting any sustainable forest management project under CDM or JI, and even stronger objections to allowing such activities to count under Article 3.3. Much will hinge on positions of countries such as Brazil, which have in the past strongly objected to the inclusion of sinks projects in JI or AIJ. However, given the adoption in Kyoto of the Clean Development Mechanism, and the support (even by Brazil) for project specific criteria, it may be possible to overcome this objection. The strongest case can be made on this issue by seeking to separate the discussion of sinks from that of the CDM and JI. We may further strengthen our case by arguing that project criteria must be suitably stringent to insure that only reasonable projects are counted, and that any guidelines also make explicit that a country has the final say on which projects to accept. This position has been endorsed by some of our domestic NGOs, as well as some in the private sector interested in undertaking sinks projects.
3. The desire to immediately add new sink activities – and to have such activities available for use in the first budget period. This concern may also find a domestic roost – domestic objectors to the Protocol may claim that the omission of any sink category unfairly penalizes certain constituencies. The strongest counter to such objections may lie in the uncertainty of the data (particularly for soil carbon). Thus, obtaining support for an IPCC report will be important – and we can note that concluding such a project by 1999 will still allow Parties to adopt new activities, and allow those that wish to include such new activities in their budgets. However, we must at the same time be careful not to provide an excuse to delay ratification until such a report is completed, and additional activities are added, or prematurely establish expectations that activities that are not currently included in the Protocol will receive credit in the first commitment period.

Key players internationally on the sinks issue will include:

- Brazil (whose support on the CDM aspect will be critical; the bilateral session in late March should be used to explore common approaches – inasmuch as possible – on this issue);
- Philippines (which in Kyoto was asked to chair the sinks discussion, and may continue to play a pivotal role in the negotiations);
- Latin American countries, where the majority of US JI projects are located, with which we can work to promote project specific acceptance of sinks;
- The EU, which has significant internal disagreements over sinks policy, but has a majority of members opposed to including sinks in national budgets, and has also been opposed to undertaking sinks projects through JI. In addition, any flexibility on the sinks issue could be offset by a corresponding rigidity on strict and limiting rules for our market mechanism proposals;
- Umbrella group, which broadly agrees that additional activities for sinks should be encouraged, and that the CDM should be divorced from 3.3 decisions. Within the group, decisions on how to count harvesting may be of particular concern to both Australia and New Zealand; both may be expected to oppose an international interpretation of the existing activities for the first budget period.
- Japan, which has sought to include new activities and expects U.S. support for its proposals on this issue at COP-4. To date, Japan has not provided much detail about which activities would be included, or how they would be counted.

File: h:/egc/sinks/DRAFT position paper 3-25-98.doc

Draft COP-4 Decision on Sinks

The Conference of the Parties, at its fourth session,

Recalling Article 3.3 of the Kyoto Protocol, which provides that “[t]he 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 carbon stocks in each commitment period, shall be used to meet the commitments under [Article 3] of each Party included in Annex I...,”

Recognizing the desirability of promoting a uniform approach among Annex I Parties to the scope of the activities referred to in that provision,

1. Requests the IPCC, with respect to the activities referred to in Article 3.3 of the Kyoto Protocol:

- (a) to identify various approaches to the scope of such activities;
- (b) to note the extent to which States are currently using particular approaches in compiling their national greenhouse gas inventories relating to sinks;
- (c) to analyze the implications of using various approaches to Article 3.3; and
- (d) to report back to SBSTA by 1999, in order to enable the [COP][COP/mOP] to prepare a recommendation to Parties concerning a uniform approach to Article 3.3.



United States Department of State

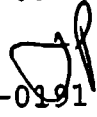
Bureau of Oceans and International
Environmental and Scientific Affairs

Washington, D.C. 20520

cc: RL
JF
JA
AM & orig

J.P. is preparing a New Draft for 3/25/98 Sandalow Mtg
→ March 23, 1998

TO: Bill Hohenstein fax: 260-6405
Adele Morris fax: 395-6870

FROM: OES/EGC - Jonathan Pershing 
tel: 647-4069 fax: 647-0191

SUBJECT: Sinks Paper

Attached is a draft of the sinks paper that is being prepared for the A/S group. I am circulating it to you informally - as you were responsible for most of the initial work. I need to pass this up within State by COB today, and so seek your input as soon as possible (by 3:00 p.m. if at all feasible). It will then be revised, and sent forward. You will have an additional opportunity to comment on a revised version later this week. I look forward to hearing from you; if you have any questions, please call.

- See attached comments I sent,
with very fast turnaround.

DRAFT U.S. POSITION PAPER ON SINKS
(rev 3-22-98)

ISSUE: What action should the US delegation take with respect to sinks at the FCCC Subsidiary Bodies meetings in Bonn in June 1998, and in Buenos Aires in November 1998?

BACKGROUND: The issue of sinks comes up in three ways in the Kyoto Protocol:

- First, the sinks categories that are included in Article 3.3 (i.e., reforestation, deforestation, and afforestation) may not be interpreted the same way by all Parties.
- Second, Article 3.4 provides for the COP/MOP to be able to add additional categories for purposes of the second commitment period (which may be voluntarily applied by a Party to the first commitment period).
- Third, the mechanisms of emissions trading, joint implementation, and Clean Development Mechanism all have sink components.

Existing Categories:

The United States has somewhat conflicting interests when it comes to dealing with existing sinks categories. On the one hand, we have an interest in having uniform, internationally agreed definitions of the three categories – such an approach would ensure that other countries are not taking a less stringent approach than we are. In addition, uniform treatment would assist in assessing compliance.

On the other hand, we have two compelling reasons for wanting to avoid internationalizing the interpretation of the three categories in the short term:

- First, handing this issue over to the international process to reach agreement on could result in interpretations with a substantial adverse impact on our ability to reach our target. Differences between various approaches to counting sinks enormous implications for the U.S. emissions budget – depending upon the approach, we could be liable for up to an additional [3 percent or 59 MMTCE] in the commitment period (e.g., an approach that requires countries to count emissions from harvesting during the commitment period). To the extent we wish to retain flexibility domestically in terms of how to interpret the categories, it may not be advisable to seek international definitions for the first commitment period. (Note: Although a decision on definitions would not be legally binding, as it is not expressly called for or authorized under the Protocol, it could be politically difficult to take an approach different from that internationally agreed upon.) Furthermore, it is not clear that a decision could be easily reached on such definitions. Existing international fora, such as the CSD, the IPCC, the FAO, and the ITTO all have working views on these issues, but no common agreed text exists.
- Second, seeking internationally agreed definitions could set a bad precedent for the issue of “supplementarity” in the emissions trading discussions. Regarding emissions trading, we are taking the position that the COP/MOP does not have the authority to quantify the term “supplemental,” given that Article 17 does not so provide. Similarly, Article 3.3 and 3.4 do not provide for the COP/MOP to take a decision on definitions (as opposed to adding new categories).

By seeking to create an authority that does not expressly exist, we could end up undermining our position in the trading context.

New Categories:

During the Protocol negotiations, the United States supported an expansive approach to sinks. We opposed taking a category by category approach, which ended up excluding important areas such as harvesting, forest conservation, forest management, and soil conservation. In fact, as a consequence of the existing text, in Kyoto we noted there may be a perverse incentive to harvest land in order to claim reforestation credit. In spite of such objections, and in order to reach agreement, a more limited list was agreed in Kyoto. We thus have a strong environmental interest in pursuing the addition of new categories, initially by seeking the methodological work that will necessarily underlie any decision to add new categories. Such work will also help overcome the objections (ones that we too share) that uncertainty in sinks categories preclude their inclusion in national compliance programs.

Emissions Trading, JI and CDM

In emissions trading, the issue has been raised (including at the ACAP and umbrella group meetings) how exactly sinks are to be incorporated into the trading system. Technically, they are not part of "assigned amounts." At the same time, they can clearly be used to offset emissions during a commitment period and, as such, can become *de facto* additions to assigned amounts. To date, the United States has supported the ability of Parties to trade emissions derived from sink projects. (Note: One of the papers being prepared by the umbrella group process is on this issue.)

Concerning JI and CDM, the Protocol articles governing these mechanisms are not expressly linked to the limited categories contained in Article 3.3. Further, it does not logically follow that the limitations in Article 3.3, which were put in to address concerns with including other categories on a country-wide basis, should apply to individual projects, where the same measurement concerns do not necessarily arise. The United States has a strong interest in not excluding forest conservation and management projects from JI and CDM, even if those categories have not yet been added under Article 3.4. At the same time, it would not appear environmentally or diplomatically sound to argue that there should be no restrictions on sink projects under JI or CDM. Rather, restrictions should be pursued through the rules governing those mechanisms (such as through the "additionality" requirement under CDM).

U.S. OBJECTIVES:

- We should not seek decisions that could make it more difficult to meet our first commitment period target.
- In the longer term (i.e., with respect to the second commitment period and beyond), we should seek an approach to sinks that creates appropriate environmental and economic incentives to promote sustainable forest management and the overall goal of the Convention/Protocol – and does not create loopholes for unsound behavior. In this context, any decision should be consistent with sound science, employ the best available methods for monitoring and accounting, and be open to revisions as the science changes.

- In addition, over the longer term, we should seek as consistent an approach as makes sense between Article 3.3 and trading/JI/CDM. However, in the short term, we should seek a bifurcated approach that will preserve forest/management conservation in JI/CDM.

Approach to Bonn/COP 4:

1. Endorse the IPCC proposal to examine the issue of sinks in a Special Report to be completed by late 1999, and recommend that definitions of "afforestation," "reforestation," and "deforestation" be considered by the COP/MOP in 2001 (COP 6) – for purposes of the second and subsequent commitment periods – in light of that Report. Also recommend that the IPCC be asked by SBSTA to consider methodologies for inventorying emissions related to forest management (including harvesting and forest conservation, and soil conservation in its assessment. Request an update on progress on this work at COP 5. The adoption of this position by the Parties would insure that U.S. commitment levels need not be changed through a decision of the Parties; it would also leave open to other Parties the potential to incorporate new categories into their first commitment allocations.
2. Call for sink issues under JI and CDM to be treated under those mechanisms, rather than through application of Article 3.3. Substantively, pursue rules that will yield clear and unambiguous net greenhouse gas emissions reductions that are verifiable and can be independently monitored. This will allow, for the first commitment period, for sink-related projects to go forward even in the absence of internationally agreed sinks definitions.

STRATEGY:

Several objections may be raised to the proposal; each of these may be successfully countered:

1. Concerns that the current language in Article 3.4 creates an inappropriate incentive to prematurely harvest forests; some countries sharing this concern will seek to include harvesting in definition of "afforestation," "reforestation" and "deforestation" (perhaps as a COP-4 decision). Few in this group will be concerned with the effects such a change might have on U.S. commitments – in fact, for many in this group, the additional burden we might bear will be welcome. Others may seek to use the threat of such a decision to obtain other equally undesirable outcomes – for example, linking a decision on sinks to decisions on emissions trading or on developing countries. The most effective counter to such objections may lie in the text itself – which does not include harvesting. We may also note that there is no express authority to take a decision on this issue in any case (see above). Using the promise of the IPCC report, and noting that any new categories would not apply until the second budget period we may at least postpone this debate for some time. We may also seek to gain support for our position by working with these countries to insure that the IPCC process – and the subsequent consideration of the issue in SBSTA, take account of the very real concern that incentives to prematurely harvest are not perpetuated.
2. Objections to counting any forest conservation projects under CDM or JI, and even stronger objections to allowing such activities to count under Article 3.3. Much will hinge on positions of countries such as Brazil, which have in the past strongly objected to the inclusion of sinks projects in JI or AJI. However, given the adoption in Kyoto of the Clean Development Mechanism, and the support (even by Brazil) for project specific criteria, it may be possible to overcome this objection. The strongest case can be made on this issue by seeking to separate the discussion of sinks from that of the CDM and JI. We may further strengthen our case by arguing that project criteria must

be suitably stringent to insure that only reasonable projects are counted, and that any guidelines also make explicit that a country has the final say on which projects to accept. This position has been endorsed by some of our domestic forest NGOs, as well as those in the private sector interested in undertaking sinks projects.

3. The desire to immediately add new sink categories – and to have such categories available for use in the first budget period. This concern may also find a domestic roost – domestic objectors to the Protocol may claim that the omission of any sink category unfairly penalizes certain constituencies. The strongest counter to such objections may lie in the uncertainty of the data (particularly for soil carbon). Thus, obtaining support for an IPCC report will be critical – and we can note that concluding such a project by 1999 will still allow Parties to adopt new categories, and allow those that wish to include such new categories in their budgets. However, we must at the same time be careful not to provide an excuse to delay ratification until such a report is completed, and additional categories are added.

Key players internationally on the sinks issue will include:

- Brazil (whose support on the CDM aspect will be critical; the bilateral session in late March should be used to create a common position – inasmuch as possible – on this issue);
- Philippines (which in Kyoto was asked to chair the sinks discussion, and may continue to play a pivotal role in the negotiations);
- Latin American countries, where the majority of US JI projects are located, and can be broadly expected to support project specific acceptance of sinks;
- The EU, which has significant internal disagreements over sinks policy, but has a majority of members opposed to including sinks in national budgets, and has also been opposed to undertaking sinks projects through JI;
- Umbrella group, which broadly agrees that additional categories for sinks should be encouraged, and that the CDM/JI should be divorced from 3.3 decisions. Within the group, decisions on how to count harvesting may be of particular concern to both Australia and New Zealand; both may be expected to oppose an international interpretation of the existing categories for the first budget period.
- Japan, which has sought to include new categories – although has been unclear as to exactly which categories would be included, or how they would be counted – and still expects U.S. support for its proposals on this issue at COP-4.

To: Jonathan Pershing
From: Adele Morris
Re: Comments on draft position paper on sinks

I like how you have structured this paper. You've outlined the tradeoffs well. Thanks for the opportunity to comment.

Issue statement: We need a general policy for all kinds of contexts such as the umbrella group and bilateral discussions, contacts with interested industry people, and discussions with modelers, scientists and the IPCC crowd who want to know the implications of the treaty for sinks. So, this strategy could go way beyond Bonn and BA, however that extension may be implicit in these diplomacy documents.

Background points:

A minor addition to your list -- Article 3.7 also includes sinks in the calculation of Australia's target.

Existing categories: (you may want to call these activities)

Bullet One: I agree very much with your first point about needing discretion to avoid adverse effects on our ability to meet our target, and this was very poorly reflected in the EPA draft paper. If EPA objects to your language, we'll support you. By the way, EPA has backed off of any interpretation that would lead to negative sinks in the first budget period.

Bullet Two: Good point.

New categories: the economic point here is that new categories increase low cost sequestration opportunities. The more comprehensive the system, the better the environmental and economic incentives are. One perverse incentive that we potentially create by adding activities is that there may be an incentive to delay the adoption of certain sequestering activities until the commitment period, depending on the credit-granting system and whether marginal sequestration declines with years of adoption.

Let's make a distinction somewhere between conservation and management. It's not clear which you mean here. The first reduces deforestation from a baseline, and the latter could actually increase stocks. They are quite different operationally in that conservation requires the difficult process of constructing a baseline. I don't think conservation needs to be included as an activity for Annex I countries because it implicitly counts for a Party in the reduction of their forestry-related emissions. Conservation projects at CDM risk not qualifying as "verifiable change[s] in stocks." I think it's fairer to say we support more comprehensive accounting than management and conservation, or any other specific activity as of yet until we do some more analysis.

Emissions trading, JI, and CDM

Are you referring to Annex I JI? Could sink projects under Annex I JI ever produce tradable

emissions credits unless produced under Article 3.3 activities? Those other activities don't count against the emissions of the country, so how could those credits be transferred to another Party? By that logic, we could do forest conservation JI in the U.S. and generate huge credits. We haven't talked about this at all.

Objectives:

See previous remarks on conservation. I don't think we're in agreement on this yet.

Consistent with earlier parts of your paper, I'd like to be clear to charge IPCC with technical questions only, not the policy decision of interpreting the protocol. We'll need to talk about what those technical questions should be.

Strategy:

1. There's a clear difference between the national incentives for protocol compliance and the domestic implementation that creates incentives for individual land owners. That disconnect works in our favor in that we can claim that our domestic implementation will be designed to avoid perverse incentives regardless of the national accounting system.

CC: JF
RL
JAC
A Meorig.



CLIMATE POLICIES AND PROGRAMS DIVISION
Office of Policy, Planning & Evaluation
U.S. Environmental Protection Agency
401 M Street SW, Washington, D.C. 20460

To: David Sandalow / Adele Morris
Organization: CEQ /CEA
Phone:
Fax: 456-2710 395-6870

From: Bill Hohenstein
Phone: 202 260-7019
Fax: 202 260-6405
Date: March 13, 1998

Pages including cover sheet: 7

David:

Here is a draft "Strategic Option" paper for forests and land use change. We have not yet circulated it. Your thoughts would be greatly appreciated.

Bill

DRAFT

Predecisional draft. Do not cite or distribute.

Draft: March 13, 1998

SINKS

The U.S. government will need to make decisions in the near future about what it seeks to achieve at COP4, and in the longer term, regarding use of sequestration to meet GHG commitments (Articles 3.3 and 3.4). In this context, how the U.S. decides to move forward on these provisions will influence other priority issues for the U.S., including progress on trading and CDM provisions, as well as on perceptions domestically and internationally of the Administration's aggressiveness in addressing climate change. This paper identifies several key concerns and, then, three options for how and when to improve certainty on the land use and forest language.

I. Policy objectives relating to sinks:

1. Base policies on sound science.

The U.S. should employ the best practicable scientific methods for monitoring our carbon and other greenhouse gas activity in land use and forestry, and ensure that the emissions and sequestrations that we report are scientifically verifiable. Where data gaps and uncertainties exist, we should move to improve our ability to understand and measure GHG activity. We should work with other countries through the IPCC and other fora to spread the adoption of rigorous measurements and methodologies, and where feasible, the treaty implementation should provide incentives to obtain and report good quality measurements. Policies should adapt to new science and technology, and be designed with the expectation that they will be updated.

2. Be consistent with the level of commitment the US agreed to for the first commitment period. Establish subsequent targets knowing the role sinks will play in making those targets more or less difficult to achieve.

Sink policy for the first commitment period should not produce a sharp departure from the targets we understood were being negotiated in Kyoto. Our interpretations should also be fully consistent with recent public statements. Targets for subsequent periods should also be based on net emissions. We should have a clear understanding of the effect sinks will play in the calculation of our net emissions and the consequent economic implications of our new targets.

3. Create appropriate environmental and economic incentives.

To a large extent, the only way to provide the proper environmental and economic incentives is to have an accounting system for sinks that is as comprehensive as possible. The Kyoto Protocol limits sinks in several ways. Eligible sinks must result from:

- 1) afforestation, reforestation and deforestation
- 2) direct, human-induced activities

Predecisional draft. Do not cite or distribute.

Draft: March 13, 1998

- 3) activities since 1990
- 4) measured as verifiable changes in stocks

Important cost savings may be lost if certain land use activities sequester carbon more cheaply than others, but are excluded from the treaty. Likewise, activities that emit carbon but do not count as emissions, e.g. harvesting, will not be discouraged by the treaty.

Similar incentive problems are created by the Protocol's limitation of counting only sinks on lands that have experienced the activities since 1990. Countries have the incentive to undertake those activities, potentially including harvesting to replant, in order to get the sequestration on those lands into the accounting system. Excluding non-human-induced sink activity, while not penalizing Parties for circumstances beyond their control, may lower the incentive to prevent natural disturbances that emit carbon. By counting sink effects as comprehensively as possible, an accounting system would naturally produce the right incentives.

[Legal question: Would harvest-related emissions already count under Article 3.3 as "emissions from sources?" Bill: Is going beyond human-induced unthinkable?]

4. Promote other environmental objectives related to land use, recognizing tradeoffs and complementarities between environmental goals.

Land use changes and forestry have significant environmental impacts beyond their effects on greenhouse gases. In our domestic implementation, we should be alert to creating incentives that affect the broader environment. For example, our implementation should implicitly encourage sound forestry and agricultural management practices along with carbon sequestration. To the extent that optimizing carbon sequestration conflicts with, say, improvements in biodiversity, our policy should strike appropriate balances.

5. Implement sink policies that promote trading, joint implementation, and CDM forest activities.

Implementation of the Kyoto Protocol should allow GHG sequestration to produce new credits, either in the form of tradable credits, or as CDM credits from verifiable projects outside Annex B. Sinks are the only avenue through which to "print new currency" in Annex B countries. If such currency is to be tradable internationally, sink credits from each country should be equivalent. This suggests a strong advantage to forming a common interpretation of eligible sink activities and a common accounting methodology across countries. CDM projects, on the other hand, may not be limited to the activities in Article 3.3, which raises the issue of whether those credits can be treated as equal to tradable credits generated under Article 3.3. This issue is dealt with in another paper, but we flag it here for its importance. Another advantage to a common approach to sinks is that no Party can enjoy especially lenient targets by unilaterally interpreting sinks to its particular advantage.

However, the current language does not meet all of these criteria. Problems with the current

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language include:

- There could be potential "perverse" incentives to prematurely harvest lands;
- Some actions (e.g. agriculture soils, forest conservation, forest management) have not been included;
- The magnitude of the benefits from sinks is open to interpretation; and
- Lands managed sustainably may not qualify for credit.

II. Options for Moving Forward

1. Ask COP4 to Decide on an Interpretative Statement

- Options: The U.S. could seek a COP4 Decision to interpret Art.3.3 language regarding the definitions of "afforestation, reforestation and deforestation." Four interpretations have been evaluated by the technical sinks sub-group. However, none of the alternatives meet all of the U.S.'s objectives.
- Process: Clarity and consensus among the Parties is desirable to facilitate use of forest offsets in international trading and the CDM, and to have certainty regarding how compliance will be judged (affecting the stringency of commitments). However, a Decision could be overturned by future Decisions more easily than an amendment.
- Timing: A number of other Parties have expressed reticence to reopen this issue at COP4, prior to gaining more technical consensus, for example through the SBSTA and IPCC. A Decision to interpret the language could occur at any time, or the US could unilaterally express its own interpretation, although the latter would not necessarily prevent difficulties in approval of trades or compliance reviews.

2. Addition of activities to the list

- Options: Include the all or some of the following activities: forest management; forest conservation; and soil conservation. It is unclear that we could achieve all of the objectives above by simply adding activities to the list.
- Process: Since the FCCC COP and the Protocol COP/MOP may have different rules for adopting decisions, there may be benefits to waiting until the Protocol enters into force to add activities. Under COP rules, additional activities would require a consensus decision by the Parties FCCC. If we waited until after ratification, decisions made by the MOP require only the agreement of 3/4 of all Parties to the Protocol. However, if changing the activities list changes the nature of the US commitment, we would need to send the

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changes to the Senate for ratification.

- Timing: Should we initiate substantive discussions on adding new activities under COP rules? Alternatively, should we wait to add activities until the agreement enters into force? The tradeoff is that if we choose to add additional activities before the Protocol is ratified, we would be required to reach consensus with all Parties to the Convention. If we wait until the Protocol enters into force, we will only need a 3/4 majority to adopt new activities, but we will most likely need to send the changes back to Congress for ratification.

3. Modify the language

- Options: There are several alternatives to the "activity list" approach that are more comprehensive and more technically sound. Comprehensive accounting of all human induced changes in carbon stocks would be the most scientifically defensible approach. However, since some countries (with large land-bases) have large amounts of carbon sequestration, this type of accounting will change the nature of commitments for these countries in the first budget period. Without changes to Parties' first budget period commitments, this approach would reduce the overall environmental protection offered during the first budget period. Also, these changes would alter the relative commitments of Annex B countries.
- Process: These changes would (most likely) require an amendment to the Protocol.
- Timing: A modification of the language is more complicated than either of the first two options and could be difficult to apply to the first budget period. We could pursue an amendment either before or after ratification (see the above discussion regarding COP vs. MOP procedures for amendments). It may be difficult to apply these changes to the first commitment period. However, we could pursue a hybrid strategy that uses simple interpretations in the first budget period, while pushing to resolve the issues in subsequent budget periods.

III. The Time frame for Moving Forward

There are several questions that need to be resolved that will help to gauge when we need to act.

- Which issues need to be resolved before the Protocol can be sent to the Senate for Ratification?
- How will decisions we want resolved regarding emissions trading and CDM rules be affected by uncertainties in how forests and land use change are accounted for? Can we implement early CDM actions without resolution to forest sink issues?

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•Are there domestic reasons for acting quickly to resolve uncertainties on forests and land use change? Possible reasons for this include the relatively high level of concern over activities that have been left off of the list.

The decisions on these issues will help determine what we need to accomplish this year, prior to and at COP IV, and what we should accomplish over the next 2 years.

Key upcoming meetings:

- Bi-laterals with Russia, Japan in March
- Umbrella Group meeting
- ACAP, planning meeting by ACAP in April
- IPCC Forest Inventory Sub-group meeting in Senegal, May 3-6
- Non-annex I countries, use bilaterals with key countries to further a mutual understanding on the principles that should guide future decision making on sinks.
- Brazil was a key advocate for the "activity list" approach.- what are their concerns? How can they be addressed?
- Bonn Climate Subsidiary body meetings in June to move a common view forward.
- November, COP IV Buenos Aires

IV. The Process for Moving Forward

•The role for Bilateral Discussions and informal meetings: The ACAP, Umbrella, and bilateral meetings offer the earliest and most informal opportunities for assessing where other countries stand on sinks. We are currently in the mode of listening to other parties but we could also use these meetings to forge a coalition of Parties to adopt an certain approach, interpretation, or process.

•The role for SBSTA: Japan has proposed a standing contact group be formed to address definitional issues. Do we support this idea? What technical issues should the SBSTA task to the IPCC (or other group)? When should this happen? When is additional technical information needed? The full SBSTA is a cumbersome body and negotiations on forests and land use change have gone slowly with a great deal of misunderstanding along the way. The Japanese proposal to create a policy/technical standing committee could provide a way to address policy/definitional issues. It has the advantage of being more informal than a full SBSTA meeting and could allow for a fuller exchange of ideas. It also could address policy/politically relevant questions – the types of issues that the IPCC cannot (and should not) address.

•The role for the IPCC: The IPCC has proposed addressing the following: terminology (definitions of Protocol language); uncertainties; stocks and flows; verification. The IPCC proposed producing a short report on a 1-2 year time line. The IPCC plans to brief the next session of SBSTA on these issues. The current role for the IPCC is limited to providing GHG inventory methods and guidelines. The IPCC is a scientific and technical organization and is not

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the appropriate organization to evaluate how the Kyoto Protocol language should be interpreted. The IPCC has, in the past, had great difficulty in assessing policy-significant issues (e.g. they were unable to develop a workable definition of "what constitutes anthropogenic?"). They also tend to work on the time frame of 1-2 years (at a minimum). Some of the more policy relevant questions may need to be addressed sooner than that. The IPCC would also need to work in close coordination with the SBSTA to ensure that they receive sufficient guidance and feedback. Given that these problems can be addressed, the IPCC could help in the following areas:

- Continue to develop comprehensive forest and land use change emissions and sequestration methodologies and guidelines.
- Guidance on how/if activities can be measured;
- Identify structural problems with some interpretations;
- Could address the issue of leakage at the project and country level (WG III has addressed energy related leakage between Annex I and Non-Annex I countries);
- Evaluate uncertainties in emissions and sequestration estimates; and
- Assess the need and operation of monitoring and verification systems for forests and land use change emissions and sequestration estimates.

**Carbon Sinks:
Analysis of the Kyoto Protocol**

U.S. Sink Source	Annual MMTCE Carbon Sequestration or Emissions during the budget period (BAU Case)		
	2008-2012	2013-2017	2018-2022
Alternative 1: Harvest uptake only: Include carbon absorbed from regrowth of harvested forests, exclude carbon emitted when those forests are cut down.			
Afforestation (Established since 1990)	31	33	33
Reforestation (Forests replanted since 1990)	59	97	137
Deforestation	-40	-40	-33
Alternative 1 Total	50	90	137
Alternative 2: Harvest uptake and emissions: Include carbon absorbed from regrowth of harvested forest and carbon emitted when those forests are cut down.			
Afforestation (Established since 1990)	31	33	33
Reforestation, includes harvest (Forests replanted since 1990)	-50	-14	26
Deforestation	-40	-40	-33
Alternative 2 Total	-59	-21	26
Alternative 3: New forests only: Exclude all forests existing as of 1990. Count only carbon absorbed by forests added or emitted by forest land converted to other uses after that date.			
Afforestation and reforestation (New forests established since 1990)	31	33	33
Deforestation	-40	-40	-33
Alternative 3 Total	-9	-7	0
Alternative 4: Define "activities" as new and additional projects (BAU impact = 0)			

Alternative 5: Explicitly add more activities to list in future negotiations**Introduction -- the scope of our commitment**

Under the Kyoto Protocol, the United States must reduce net greenhouse gas emissions to an average of [about 1494] million metric tons of carbon equivalent (MMTCE) over the 2008 to 2012 budget period. These emissions represent an average annual departure from the 1990 base year of about 560 MMTCE annually in the five years of the first commitment period.

Emissions Budget = 5 years × (1990 Emissions of CO₂, CH₄, N₂O + 1995 Emissions of HFC, PFC, and SF₆) × 93% [excludes land use change and forestry]

2008-2012

Commitment = [Total emissions of CO₂, CH₄, N₂O, HFC, PFC, SF₆ 2008-2012] - [net changes carbon stocks from forests due to afforestation, deforestation and reforestation]

The accounting system for forests and land use change in the Kyoto Protocol is significantly different from accounting methods previously used by the US in establishing the initial aims of the Framework Convention on Climate Change, domestic goals under the Climate Change Action Plan, and the President's position going into Kyoto. Other countries preferred various accounting methods, including some similar to ours. The new approach has significant implications for the magnitude of baseline US emissions growth and for defining actions that can be used to offset emissions.

The most significant change is that Parties are no longer required to subtract carbon sequestration that occurred in the base year in determining their budgeted amount of emissions. This change provides a credit to the US of 55 MMTCE in 2010 (3% of our overall emissions), relative to the President's original plan. In addition, the Kyoto Protocol requires that forest and land use change activities be included in a Parties net emissions but limits activities to: afforestation, reforestation and deforestation on forests affected since 1990. Under the agreement, Parties must count greenhouse gas emissions and removals that...

“[result] 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.”

The Parties to the protocol could interpret the activity list (afforestation, reforestation, and deforestation) several different ways with potentially with very different contributions of sinks in the baseline, as well as different opportunities to credit increases in sinks with targeted forest policies. The purpose of this paper is to explain the Kyoto sinks language and evaluate alternative interpretations and, where possible, net sequestration effects for the U.S. We will be working on analogous numbers for other key countries.

This paper describes four alternative sets of definitions for the activity list, and an additional strategy to offset concerns about a literal interpretation. Each set of definitions has pros and cons. Each alternative has problems that can only be addressed in the context of long-term changes to the Kyoto Protocol language, which may necessitate amending the forest and land use activity list (as allowed in Article 3.4 of the Protocol). It is expected that this issue will be a top priority of negotiators at the upcoming Meeting of the Parties (MOP) in Buenos Aires, in November, 1998.

Strategic Decisions on how to implement Kyoto Protocol Commitments for Land Use Change and Forestry

Our interpretation of the land use change and forestry language should be done in the context of decisions that need to be made on other provisions of the Protocol, among other considerations. For example, if the US commitment is made significantly less stringent through a literal interpretation of the land use change and forestry activities language, other countries (e.g. EU and developing countries) may push for restrictive rules on international trading and the CDM, which remain to be negotiated.

It is also important to ensure all Parties to the Protocol interpret the forest and land use language consistently. A common interpretation of the forests and land use change language is essential to:

- establish the capability to trade permits internationally;
- develop CDM forestry projects;
- ensure consistency in reporting, monitoring, and verification; and
- ensure that commitments made in Kyoto are implemented equitably

The US has already expressed strong reservations to the "activity list" approach adopted in the agreement. We have the opportunity to recommend changes that can improve environmental protection. We have three strategies to move forward with implementing the provisions on forests and land use change, should we choose to do so:

- Unilaterally announce a US interpretation of the language.
- Bi-laterally engage key countries in a discussion of the pros and cons of various approaches
- Unilaterally announce that the current language is flawed and offer improvements.

Options for Defining Forest and Land Use Activities

Note that any of the definitions in Alternatives 1 through 4 could be chosen as our current position, but considered provisional until the Protocol language can be amended in Buenos Aires or subsequent meetings. Alternative 5 looks at ways in which the language could be changed to

address concerns with Alternatives 1 through 4.

Alternative 1: Harvest Uptake Only.

Include regeneration of harvested forest lands, exclude carbon emitted from harvested forest lands.

Afforestation: planting or other human-induced forest establishment on lands not in forest.

Reforestation: planting or other human-induced forest regeneration after harvest of other forest disturbance.

Deforestation: conversion of forest lands to other uses.

Pros:

- This set of definitions produces the biggest carbon bonus
- Consistent with forestry terminology used in the United States
- Consistent with agreement to exclude harvesting (negotiated in contact groups during the negotiations)
- Allows some activities on forest lands (e.g. regeneration) to be given credit

Cons:

- Does not accurately represent the impact of activities on the environment. Carbon emissions/sequestrations from some significant forest activities are excluded.
- Creates national incentives to prematurely harvest lands to get lands into the post-1990 base.
- Lands that are partially cut may not update land into the post-1990 base, whereas lands that are clear cut definitely will, thus penalizing more environmentally sensitive practices.

Alternative 2: Harvest uptake and emissions.

Include regeneration of harvested forest lands in definition of reforestation, but also include carbon emitted from harvesting forest lands. Account for emissions from harvested wood.

Afforestation: planting or other human-induced forest establishment on lands not in forest.

Reforestation: planting or other human-induced forest regeneration after harvest or other forest disturbance, including carbon emissions from harvesting activities.

Deforestation: conversion of forest lands to other uses.

Pros:

- The national incentive to prematurely harvest forest lands is lowered
- System recognizes changes in what happens to carbon in harvested wood

Cons:

- May be inconsistent with negotiations that explicitly excluded carbon from harvesting.
- May still provide incentives to clear cut (if lands that are sustainably managed do not qualify).
- By not counting aggregate regrowth of pre-1990 forests, sinks are negative in first two commitment periods

Alternative 3: New forests only.

Exclude all forests existing as of 1990. Count only carbon absorbed by forests added or emitted by forest land converted to other uses after that date.

Pros:

- Eliminates the national incentive to harvest since regeneration of harvested lands is not considered "reforestation " under this definition
- Eliminates the loophole from counting carbon sequestered by replanted harvested lands, but not subtracting the carbon that is harvested
- Focuses only on baseline changes in forest cover to be credited.

Cons:

- Not all existing forest lands are included.
- Does not accurately represent the impact of activities on the environment. Carbon emissions/sequestration from most commercial forest activities are excluded.
- Sinks are negative, but small, in the first two budget periods.

Alternative 4: Define "Activities" as "Projects"

Under this interpretation, the US will essentially disregard baseline trends in forest and land use change and focus on specific actions that will increase carbon sequestration. This approach is consistent with the interpretation used in Kyoto that allowed the US to agree to a 7% reduction from 1990 levels -- which took no credit for forest and land use change carbon.

Pros:

- Allows for forest carbon sequestration projects
- Greatly simplifies what we need to account for

- Only provides positive sinks, albeit small

Cons:

- Possibly inconsistent with negotiating history
- Doesn't count baseline trends
- No disincentive to emit carbon from sinks, e.g. harvest and deforestation
- Ignores the effect of projects on non-project lands (e.g. leakage)
- Hard to measure as "verifiable changes in stocks" as required by Article 3.3

Alternative 5: Plan to revise the Protocol language to include more activities.

In Buenos Aires, the U.S. may propose to add additional activities to the list of qualifying forestry activities, whose net contribution to sinks may be positive or negative. The primary purpose of including additional forestry activities would be to (1) make the accounting more comprehensive and scientifically sound, and (2) to eliminate perverse national incentives created by leaving out key carbon-influencing activities. Some examples of possible additional activities:

1. Forest management, including aggregate regrowth of existing forest
2. Change the "since 1990" to "since 1900", or some other date
3. Conservation
4. Agricultural soil management
5. Harvesting (only if we can get other changes to account for sequestered carbon)

Pros:

- If done well, we could fix a number of the problems mentioned above.

Cons:

- If not done well, amended language could be just as bad if not worse.
- Provides no guidance on provisional definitions until language is amended.

Appendix A -- Key Word Analysis of Forest and Land Use Change Language

- **“since 1990”**

This phrase restricts the sources of carbon sequestration to only those that result from the listed forestry activities that took place since 1990. For instance, the carbon sequestered in the budget period by 50 acres of forest planted in 1989 cannot be included in our positive sinks since the trees were planted before 1990. As the budget period commences, each annual cohort of trees planted in the years after 1990 sequesters an amount of carbon based on its acreage, age, and other characteristics.

Since the overwhelming majority of U.S. forests were established before 1990, the phrase “since 1990” severely limits the carbon sequestration we may count as positive sinks. Other countries, such as New Zealand, Canada, and Sweden, have experienced much more rapid forest turnover (a shorter forest harvest cycle) or much greater reforestation and afforestation since 1990 than the U.S. For those countries, the share of their net actual sequestration that “counts” under the protocol is much higher than for the U.S., making the U.S. relatively disadvantaged by this language.

- **“measured as verifiable changes in stocks”**

This language may exclude future consideration of “conservation” activities as a positive sink, either in the current language or under an amended list. Conservation activities protect current stocks, and would be most accurately reflected in higher levels of stock or lower rates at which they decline.

- **“in each commitment period”**

This phrase restricts qualifying sinks to those that occur in the budget period. So, for example, if we deliberately burned down 1000 acres in 1998, those negative sinks (emissions) would not count against us at any time. Likewise, if we replanted the forest as soon as we burned it down in 1998, the carbon sequestered by the growth of the young forest over the budget period would count as positive sinks. If we burned down 1000 acres in a budget period, the negative sinks would count against us in that five year commitment period, but no other.

“In each commitment period” appears to rule out accounting approaches that annualize the aggregate expected sinks from a given forestry activity, rather than counting the marginal sequestration on a year by year basis.



United States Department of State

*Bureau of Oceans and International
Environmental and Scientific Affairs*

Washington, D.C. 20520

CC: AM
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February 13, 1998

TO: *Distribution

FROM: OES/EGC - Daniel A. Reifsnyder *JAR*

SUBJECT: Discussion Paper on Sink Options

Attached is a paper on "Options for Sinks under JI/CDM" which will be discussed at an upcoming meeting that David Sandalow will convene.

Attachment:
As stated.

6 pages total

Options for Sinks under JI/CDM

Background

- o Strictly speaking, neither Article 6 (Joint Implementation among Annex I Parties) nor Article 12 (Clean Development Mechanism) includes the limitations on sinks that are specified in Article 3.3.
 - Article 6 (JI) refers to projects "enhancing anthropogenic removals by sinks of greenhouse gases...".
 - Article 12 (CDM) provides that emission reductions from project activities are to be certified on the basis of "real, measurable, and long-term benefits related to the mitigation of climate change" (emphasis added), which would include sink projects.
- o At the same time:
 - It could be argued that, because Article 3.3 only permits certain categories of sinks-related activities to be used "to meet the [target] commitments," this provision applies both domestically and to any sink-related emission reduction units that might be obtained through JI or the CDM.
 - At least in the early stages of negotiating the CDM, it was understood that the treatment of sinks under the CDM would track whatever result was reached under Article 3 (even though this intent was not ultimately reflected in the Protocol).

Options

- o There appear to be several options for the approach to sinks under JI and the CDM:
 - 1) We could take the position that the treatment of sinks under JI/CDM should track Article 3.3.
 - 2) We could take the position that sink projects under JI/CDM are not subject to the limitations under Article 3.3 and that any limitations are those found in the Articles governing JI and CDM, respectively.
 - 3) We could take the position that it is premature to take a position on the relationship between Article 3.3 limitations and JI/CDM until it is clearer what is covered under Article 3.3.

Option 1

- o Under this option, the treatment of sinks under JI/CDM would track the limitations under Article 3.3.
- o Advantages of this option are:
 - that it is probably the result that other countries would find most consistent with the intent of the negotiators.
- o Disadvantages of this option are:
 - that, because forest conservation and management would not be included (at least for now), we could end up excluding projects from JI/CDM that are of importance to the U.S. private sector/Congress;
 - that, because of the technical fix that the Secretariat has now made to Article 3.4 to clarify that the COP/MOP is to determine additional categories, not decide the scope of the existing categories, it is not clear that there will be any agreed scope for the existing categories;
 - that, notwithstanding the technical fix that the Secretariat has now made to Article 3.4 to clarify that the COP/MOP is to determine additional categories, not decide on the scope of the existing categories, this option would nevertheless take us down the road of having to negotiate the breadth of "afforestation, reforestation, and deforestation" internationally;
 - that certain elements of Article 3.3 would be difficult to apply in the JI/CDM context (for example, how would the requirement of measuring credit in terms of changes in stocks "in each commitment period" apply to the CDM, where reductions can be obtained from 2000 up to the first commitment period?)
 - it could lead to unclear results, assuming new categories were added and embraced by some Parties, but not others, for purposes of the first commitment period.

Option 2

- o Under this option, sink projects under JI/CDM would not be subject to the limitations under Article 3.3 and any limitations would be those found in the Articles governing JI and CDM, respectively:
 - Under both Article 6 (JI) and Article 12 (CDM), there is a requirement of approval by the host country and a requirement of additionality. Pursuant to these requirements, host countries could exclude from JI/CDM any sink project they did not want to include. Further, the additionality requirement under both JI and CDM could serve to limit the types of sink projects that qualified.
- o Advantages of this option are:
 - that it could avoid disadvantages of Option 1 such as excluding important projects and the confusion that would result from applying Article 3.3's terms to the JI/CDM context (see Option 1's disadvantages above).
- o Disadvantages of this option are:
 - that it could be harder to negotiate; and
 - that it could provide an incentive for the U.S. private sector to engage in projects abroad that would not count domestically (although such a result could be mitigated by seeking to broaden the categories under Article 3.3 or possibly by other means).
- o A variation on this option that might be more acceptable internationally would be to take the position that, beyond the requirements of host country approval and additionality, the COP/MOP could adopt additional rules concerning qualifying sink projects. This would avoid the rigidity and confusion of blindly following Article 3.3 but allow for more quality control than an ad hoc approach.

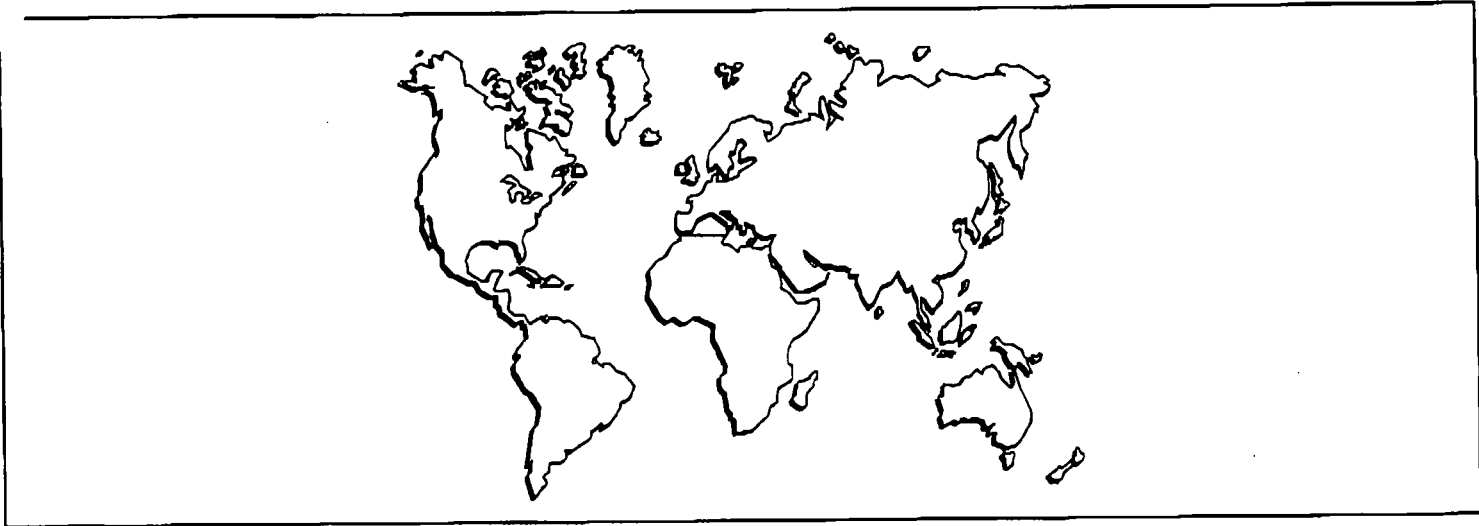
Option 3

- o Under this option, we would say that it is premature to take a position on the relationship between Article 3.3 limitations and JI/CDM until it is clearer how Article 3.3 would be applied.

- o The rationale for such a position is that:
 - the extent of permissible sink projects under JI/CDM is extremely important to the United States; it must include forest conservation and management projects;
 - there is no clear answer as to whether Article 3.3 limitations apply to JI/CDM;
 - even if Article 3.3 limitations do apply, it is not clear how such limitations would apply to the JI/CDM contexts (see above);
 - in the face of such uncertainty, the U.S. would need to be clearer as to what the implications of applying Article 3.3 limitations would be before agreeing that they should apply, particularly given that textually it is not dictated that they do apply.
- o Advantages of this option are:
 - that we would avoid locking ourselves into a position that could turn disadvantageous; and
 - that it would force other countries to engage in an open, substantive discussion of the issues noted above.
- o Disadvantages are:
 - that others may make it impossible to hold off on this issue.

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Joe:

Estimates of carbon sequestration opportunities from the USDA Forest Service. Note: The afforestation estimates are 20-30 in the future. The benefits that could be accrued in 2010 are significantly smaller. It is also unclear if all of the improvements in forest management are allowable (given the language of the Kyoto protocol). I am reviewing this with Rich Birdsey.

Bill

Summary of forestry options to increase carbon storage. Each option would be phased in over a 10-year period (from Birdsey et al. 1998 Review Draft).

Option	Size of Program	Change in C storage (MMTC/yr)	Annual cost (\$million)	Years to achieve target
Afforestation of marginal cropland and pasture ¹	23-45 million ac	50	350-770	20-30
Reforestation and improved forest management ¹	30-50 million ac	50	40-80	0-10
Reduce harvest	220 million cu ft	50	?	0-10
Increase recycling of fiber	from 40 to 45% of all fiber used	10	?	0-10
Increase C in durable wood products	Increase by 50%	10	?	0-10
Urban forestry ²	Plant 100 million trees	10	50-250	20-30
Increased use of biomass energy ²	1.25 million ac of plantations	30	?	10-20

¹Acceptable under Kyoto terms for forestry sinks.

²Acceptable under Kyoto terms for energy emissions reduction.