Table on Criterion 5 Refinements

This table shows recommendations for refinements to the Montreal Process indicators, the rationales for the indicators, and in selected cases, approaches to measurement. These recommendations were reached through discussion and general agreement at three technical workshops coordinated by the USDA Forest Service and the Roundtable on Sustainable Forests in April 2005 to obtain high-quality input from a diverse set of forest stakeholders. Column 1 shows the location of the text in the *Draft Document: Excerpts from the Montreal Process Technical Notes Modified for the Series of C&I Refinement Technical Workshops*. Column 2 presents the original language with any deleted text underlined and struck out; column 3 presents the refined text with any additional text underlined. Column 4 includes any comments made on the refinement.

Summary of Refinements

Two indicators are added to highlight avoided fossil carbon emissions and the benefits of carbon management activities. Indicators 26 and 27 are combined and Indicator 28 is separated into two indicators – moving avoided carbon emissions into a separate indicator and adding carbon substitution to a new indicator.

Other Cross-cutting Issues

Consider putting new indicator XX in Criterion 6 or 7 as "Ecosystem Services," and include other ecosystem services such as water quality and quantity, air quality, and environmental mitigation—to be measured as level of activity.

Breakout Group: Criterion 5 - Indicators 26 - 28:

Participants: Fred Allen, USDA Forest Service; Richard Brinker, School of Forestry and Wildlife Science, Auburn University; Bob Fledderman, Environmental Regulatory Assurance, Forestry Division, Westvaco Timberlands Division; Alex Friend, USDA Forest Service, North Central Research Station; Jennifer Hayes, USDA Forest Service, Southern Research Station; Nathan McClure, Forestry Commission, State of Georgia; Reid Miner, Sustainable Manufacturing, National Council for Air and Stream Improvement; Ron Neilson, USDA Forest Service, Forest Science Laboratory; John Perez-Garcia, College of Forest Resources, University of Washington

Criterion Lead: Linda Heath, USDA Forest Service

Facilitator: Gerald Helton, USDA Forest Service, Cooperative Forestry

Text in the Montreal Process Technical Notes	Original Language with Recommended Deletions Underlined and Struck Out	Refined Language with Recommended Additions Underlined	Comments on Recommended Change
Indicator X Title		Avoided fossil fuel emissions by using harvested wood	This indicator was previously included as part of indicator 28. Indicator 28 will now be a measure of stock change, while this new indicator will highlight avoided fossil carbon emissions.
Indicator X Rationale		This indicator highlights the potential for woody biomass as a substitute for fossil fuels and energy-intensive materials. Forest harvest could result in a net reduction in carbon emissions, when the wood is used as a substitute for more fossil fuel intensive materials (e.g., steel, concrete, and plastic). In addition, when wood is used as a substitute for fossil fuels, there can be benefits to the global carbon budget. Reports on trends in this indicator are important because research shows that these substitution effects are a significant component of fossil fuels reduction. Shared estimates should be consistent with the UNFCCC/IPCC group on harvested wood. Some useful sources of information could include the UNFCCC national reports, which have an energy sector memo item that quantifies CO_2 emitted from biomass fuels (this measure could be used to address a portion of this indicator) and the Energy Information Administration, which keeps statistics of CO_2 emitted from biofuels.	

Text in the Montreal Process Technical Notes	Original Language with Recommended Deletions Underlined and Struck Out	Refined Language with Recommended Additions Underlined	Comments on Recommended Change
Indicator X Approaches to Measurement		Consistent measurement units should be used to measure the amount of carbon emitted to the atmosphere that is avoided by substituting woody biomass fuel for fossil fuel. Calculate the amount of avoided emissions by comparing the energy produced per unit of biomass carbon to the energy produced by unit of fossil fuel carbon. Similarly, calculating avoided carbon emissions related to the substitution of wood products (including recycled wood-based products) for fossil fuel-intensive products requires the comparison of total energy of production in the two approaches (e.g., life cycle analyses). Shared estimates should be consistent with those of the UNFCCC/IPCC group on harvested wood. Some useful sources of information could include the UNFCCC national reports, which have an energy sector memo item that quantifies CO2 emitted from biomass fuels (this measure could be used to address a portion of this indicator) and the Energy Information Administration, which keeps statistics of CO2 emitted from biofuels.	

Text in the Montreal Process Technical Notes	Original Language with Recommended Deletions Underlined and Struck Out	Refined Language with Recommended Additions Underlined	Comments on Recommended Change
Indicators 26 and 27 (5.a and 5.b) Titles	**Indicator 26**: Total ecosystem ~~biomass and~~ carbon pool ~~and if appropriate, by forest type, age class, and successional stages~~ **Indicator 27:** ~~Contribution of forest ecosystems to the total global carbon budget, including absorption and release of carbon (standing biomass, woody debris, peat and soil carbon)~~	Total forest ecosystem carbon pools and changes in pools	Indicators 26 and 27 are combined because Indicator 26 is of interest for the trend over time, which is what Indicator 27 shows directly. In addition, the most significant information regarding the possible effect on the global carbon cycle is the change in pools. Thus, these indicators are so integrated that the separation into two indicators greatly degrades the information presented. The combined indicator retains the possibility for the direct flux measurement under Indicator 27.

Text in the Montreal Process Technical Notes	Original Language with Recommended Deletions Underlined and Struck Out	Refined Language with Recommended Additions Underlined	Comments on Recommended Change
Indicators 26 and 27 (5.a and 5.b) Rationale	**Indicator 26**: This indicator measures the ~~national carbon pool provided by forest ecosystems~~. Globally, forest ecosystems are one of the largest reservoirs of ~~both biomass and~~ carbon. Reports on trends in this indicator are important for determining national strategies in forest management as a means to help stabilise global climate. Stabilisation of global climate is, in turn, important to national strategies regarding sustainable forest management, as climate change can significantly disturb the ecological balances that have produced the kind and distribution of forest we have today. Global changes in climate could result in the reduction of area available for forests, and/or the reduced productivity of these forests in some countries, an increase in the extent of forests or their productivity in other countries, and a loss of forest biodiversity globally. **Indicator 27**: ~~This indicator assesses~~ the change in total forest ecosystem carbon stocks~~, as calculated in Indicator 5.a relative to the total carbon budget of the Earth.~~	This indicator measures the total forest ecosystem carbon stock, and the change in total forest ecosystem stocks. Globally, forest ecosystems are one of the largest reservoirs of carbon. Reports on trends in this indicator are important for determining national strategies in forest management as a means to help stabilize global climate. The trend in pool size is easier to see by also calculating and directly reporting changes in pools. Stabilization of global climate is, in turn, important to national strategies regarding sustainable forest management, as climate change can significantly disturb the ecological balances that have produced the kind and distribution of forest we have today. Global changes in climate could result in the reduction of area available for forests, and/or the reduced productivity of these forests in some countries, an increase in the extent of forests or their productivity in other countries, and a loss of forest biodiversity globally.	

Text in the Montreal Process Technical Notes	Original Language with Recommended Deletions Underlined and Struck Out	Refined Language with Recommended Additions Underlined	Comments on Recommended Change
Indicators 26 and 27 (5.a and 5.b) Approaches to Measurement	**Indicator 26**: Measurement approaches recommended for these indicators~~, at this time~~, are those proposed by the Intergovernmental Panel on Climate Change ~~(IPCC)~~ Reference Manual and Workbook (http://www.ipcc-nggip.iges.or.jp/public/gl/invs5.htm)~~-~~for Greenhouse Gas Inventories, published in 1996. ~~This preliminary work suggests that calculation of carbon pools at a national level can be done by using default values for a relatively small number of subcategories of forest type. More detailed information on the carbon status of forest ecosystems than have been used in the default values. The intent is to provide a calculation and reporting format which can accommodate the range of data available to different countries, yet allow them to present the results on a comparable basis. For example, some countries routinely collect forest biomass and inventory data, enabling relatively precise and direct measurement of changes in biomass stocks and environmental carbon.~~ **Indicator 27**: ~~Measurement protocols are described in indicator 5.a. It is suggested that the global carbon budget figures should come from the IPCC document Climate Change 1995 — The Science of Climate Change.~~	Measurement approaches recommended for these indicators are those proposed by the Intergovernmental Panel on Climate Change, National Greenhouse Gas Inventories Programme. Measurement approaches include changes in pool size and direct flux measures. Reference documents currently include: Reference Manual and Workbook for Greenhouse Gas Inventories, published in 1996, and the IPCC Report on Good Practice Guidance for Land Use, Land-Use Change, and Forestry (2003). The reference documents will be made antiquated by the Revision Guidelines, an activity with a planned document to be completed in 2006. For copies of this document, and the most up-to-date information, see http://www.ipcc-nggip.iges.or.jp. For comparison, it is suggested that a discussion of the total carbon budget be included for context, and these estimates should come from the latest IPCC science documents on climate change. Pools to be reported include above- and below-ground tree biomass, dead wood, litter (forest floor), and soil carbon including peat. For more details on pools, see the IPCC Report on Good Practice Guidance. If appropriate, carbon pools should be displayed by forest type, age class, and successional stages. These terms should be well-defined.	

Text in the Montreal Process Technical Notes	Original Language with Recommended Deletions Underlined and Struck Out	Refined Language with Recommended Additions Underlined	Comments on Recommended Change
Indicator 28 (5.c) Title	~~Contribution of~~ forest product~~s to the global~~ carbon ~~budget~~	Total forest product carbon pools and changes in pools (products in use and landfills)	The original indicator was separated into two parts. This change moves avoided carbon emissions into a separate indicator and adds carbon substitution to the newly created indicator. Doing this makes this indicator a measure of stock change only, allowing avoided emissions to be highlighted in its own indicator.
Indicator 28 (5.c) Rationale	This indicator measures the role that forest products play in the sequestration, cycling, or emission of carbon. Harvested wood releases its carbon at rates dependent upon its method of processing and its end-use; for example, ~~waste wood may be burned immediately, paper usually decays in up to five years~~ (although landfilling of paper can result in longer-term storage of the carbon and eventual release as methane or CO2), and lumber ~~decays in up to~~ 100 or more years. ~~Provided the forest is fully regenerated, forest harvesting could result in a net reduction in carbon emissions if the wood that is harvested is used for long-term products such as lumber, and particularly where wood is used as a substitute for higher energy materials. In addition, where wood is used as a substitute for fossil fuels, there can be positive benefits to carbon cycles.~~ ~~There is still scientific uncertainty and debate on accounting methodologies regarding wood products. The default assumption is that all~~	This indicator measures the role that forest products play in the sequestration, cycling, or emission of carbon. Harvested wood releases carbon at rates dependent upon its method in processing and its end use. For example, paper may decay in only a few years (although the landfilling of paper can result in longer-term storage of the carbon and eventual release as methane or CO2), and lumber may decay in 100 or more years.	

Text in the Montreal Process Technical Notes	Original Language with Recommended Deletions Underlined and Struck Out	Refined Language with Recommended Additions Underlined	Comments on Recommended Change
	~~carbon in harvested biomass is oxidized in the removal year. The net change in stocks of forest products should be a better indicator of a net removal of carbon from the atmosphere than the gross amount of forest products produced in a given year. New products with long lifetimes processed from current harvests frequently replace existing product stocks, which are in turn discarded and oxidized.~~		

Text in the Montreal Process Technical Notes	Original Language with Recommended Deletions Underlined and Struck Out	Refined Language with Recommended Additions Underlined	Comments on Recommended Change
Indicator 28 (5.c.) Approaches to Measurement	~~If detailed data are available to confirm that the stocks of long-term forest products are increasing or decreasing, the forest and other woody biomass stocks calculation undertaken for indicator 5.a should be modified to account for such changes. This includes accounting for imports and exports of forest products during the inventory period. The IPCC Expert Group on Harvested Wood Products is presently addressing this topic.~~	Measurement should be accomplished by tallying changes in the forest product pool size, as recommended by the Intergovernmental Panel on Climate Change, National Greenhouse Gas Inventories Programme. Reference documents currently include: Reference Manual and Workbook for Greenhouse Gas Inventories (1996), and the IPCC Report on Good Practice Guidance for Land Use, Land-Use Change, and Forestry (2003). The reference documents will be made antiquated by the Revision Guidelines, an activity with a planned document to be completed in 2006. For copies of this document, and the most up-to-date information, see http://www.ipcc-nggip.iges.or.jp. Since forest products have various lifetimes, their amount of harvest is not a good indicator of the total amount of carbon sequestered in the forest products pools. The net change in stocks of forest products includes emissions from decomposition of products from previously harvested forests and the increase in stocks of products transferred from newly harvested forests.	

Text in the Montreal Process Technical Notes	Original Language with Recommended Deletions Underlined and Struck Out	Refined Language with Recommended Additions Underlined	Comments on Recommended Change
Indicator XX Title		Level of participation (number of participants, area of forest, amount of carbon sequestered by those participants) in forest ecosystem carbon management activities	The arena for carbon—as well as other ecosystem services—is fast-moving. Opportunities exist today that did not exist five—or even two—years ago. The topic of ecosystem services deserves special attention due to the potential for developing markets. Suggestion: Put this indicator in Criterion 6 or 7 as "Ecosystem Services," and include other ecosystem services such as water quality and quantity, air quality, and environmental mitigation—to be measured as level of activity.
Indicator XX Rationale		There are multiple benefits (e.g., carbon sequestration, economic and biological maintenance, maintenance of industrial capacity) to sustaining forests by participating in carbon management activities. Monitoring the capacity to capture those benefits is important to decision makers and policy makers, as well as the public that is interested in greenhouse gas reduction and possible climate change stabilization.	
Indicator XX Approaches to Measurement		Obtain lists from registries, for example, those of state or federal government. Ensure that participants are not double-counted in more than one registry.	