A Report on the Key Findings from the IPCC Special Report on Land-Use, Land-Use Change and Forestry

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It is a pleasure to be here today to present the key findings from, and formally submit to SBSTA, the recently approved IPCC Special Report on Land-Use, Land-Use Change and Forestry (LULUCF). My report to you today is short given that we have distributed copies of the IPCC Special Report and conducted a four hour workshop last Wednesday.

A basic conclusion of the report is that LULUCF activities provide an opportunity to reduce greenhouse gases emissions into the atmosphere by avoiding deforestation, and to increase the uptake of carbon from the atmosphere into the terrestrial biosphere through afforestation, reforestation and improved forest, cropland and range-land management activities. However, it will be critical to develop an internally consistent set of definitions and accounting procedures, coupled with a measuring and monitoring system, if governments want a system which accurately reflects the exchanges of carbon between the terrestrial biosphere and the atmosphere from applicable LULUCF activities. Well designed LULUCF activities also have the potential of contributing to sustainable development goals.

Global Carbon Cycle

Human activities are disturbing the global carbon cycle through the combustion of fossil fuels and through LULUCF activities: There is no doubt that human activities, the combustion of fossil fuels and LULUCF activities, have significantly modified the carbon cycle over the past few hundred years with the atmospheric concentration of carbon dioxide increasing by about 28% since 1850. All carbon pools, i.e., above- and below-ground live biomass, decomposing organic matter and soils, in all terrestrial ecological systems, including forests, agricultural- and range-lands, are being disturbed by human activities.

Globally, terrestrial ecosystems are currently a small net sink for carbon dioxide because improved land-use management practices, carbon dioxide fertilization, nutrient deposition and a warmer climate are enhancing the uptake of carbon, thus offsetting carbon emissions from deforestation in the tropics: Terrestrial ecological systems globally are currently a small net sink of carbon between 0.2 and 0.7 GtC per year. This represents an approximate balance between emissions from tropical deforestation (about 1.6 to 1.7 GtC per year) and uptake (about 1.9 to 2.3 GtC per year) in the tropics, mid- and high-latitudes, because of improved land-use management practices, carbon dioxide fertilization, nutrient deposition and a warmer climate.

Newly planted or regenerating forests will continue to uptake carbon for decades assuming no major human or environmental disturbance: While the capacity of terrestrial ecosystems for continued additional carbon uptake may be limited for a number of reasons, newly planted or regenerating forests will continue to uptake carbon for decades assuming no major human or environmental disturbances. Hence, LULUCF activities under Articles 3.3 and 3.4 have significant potential for carbon uptake or for reducing emissions by avoiding deforestation.

Definitions

Full carbon accounting on all lands in Annex I countries would lead to a carbon credit: Full carbon accounting on all lands (i.e., globally) would consist of a complete accounting of all changes in carbon stocks in all carbon pools on all lands. This would lead to an annual global accounting of between 0.2 and 0.7 GtC per year. Full carbon accounting restricted to Annex I countries would be a significant share of the carbon uptake of 1.9 to 2.3 GtC per

year. However, lands under Article 3.3 are likely to be only a small fraction of the total area of the global terrestrial biosphere, i.e., between 0.3 and 1.4% by 2010, depending on whether the harvest/regeneration cycle is included. This represents about 2 –9% of the area of temperate and boreal forests.

Forests, Afforestation, Reforestation and Deforestation

The choice of definitions for forests, afforestation, reforestation and deforestation, in combination with the accounting system, is critical: There are a range of individual, and combinations of, definitions for forests, afforestation, reforestation and deforestation. The choice of these definitions will determine how much and which land will be accounted for under Article 3.3 activities in Annex I countries.

Seven definitional scenarios were developed that combine different definitions of forests and ARD, reflecting a range of approaches that can be taken and an assessment of the implications of each of them. They can be split into two representative groups, i.e., scenarios in which only land-use changes trigger accounting under Article 3.3, and scenarios in which land-cover change or activities trigger accounting under Article 3.3. In all cases the scenarios only address lands that could be accounted for under Article 3.3, which are a small fraction of the total terrestrial biosphere as stated previously.

Single value thresholds of forest canopy cover or carbon density for defining forests could lead to changes in carbon being unaccounted due to aggradation or degradation: For national and international reasons forests have been defined in terms of legal, land-use, canopy cover and carbon density, but because they were not designed for the Kyoto Protocol, they may not suffice for the needs of the Protocol. Definitions of a forest, which are often based on a single threshold of canopy cover or carbon density may allow increases or decreases in carbon to remain unaccounted due to aggradation or degradation. To minimize this possibility multiple or sequential thresholds, or national, regional or biome-specific thresholds could be used, or the issues of aggradation and degradation could be covered under Article 3.4.

Some definitions of reforestation and deforestation allow harvesting-regeneration activities to be included under Article 3.3: Definitions of reforestation and deforestation based on actual canopy cover, which do not consider the concept of potential canopy cover, could lead to harvesting being referred to as deforestation and regeneration being referred to as reforestation. Some definitions of reforestation include the activity of regeneration after disturbance or harvesting, while disturbance or harvesting are not defined as deforestation. In these circumstances credits could be accounted for the regeneration, without debits for disturbance or harvesting, this would lead to an accounting system where the changes in terrestrial carbon do not reflect the real changes in the atmosphere.

Accounted changes in carbon stocks from harvesting-regeneration activities under Article 3.3 are unlikely to reflect the actual net exchange of carbon between the forest estate and the atmosphere because of the "since 1990" clause: If definitions are used such that the harvesting-regeneration cycle does lead to the creation of lands under Article 3.3 then the "accounted credits or debits" are highly dependent upon the accounting scheme because only those stands harvested or regenerated since 1990 would be considered lands under Article 3.3. Consequently, large credits or debits could be accounted even though the whole forest estate is in carbon balance, i.e., none of the accounting systems would reflect the actual net exchange of carbon between the forest estate and the atmosphere until the whole forest estate was within the accounting system. The harvesting/regeneration cycle could be addressed under Article 3.4, which does not explicitly contain the "since 1990" clause after the first commitment period, hence the whole forest estate could be considered within the accounting system.

Carbon stock credits from reforesting lands deforested between 1990 and 2008 would not match actual changes in carbon stocks: If lands are deforested, and subsequently reforested, between 1990 and 2008, then only a fraction of the carbon stock changes due to the deforestation are accounted during the commitment period, while net carbon credits will likely accrue due to the carbon stock increases due to reforestation during the commitment period. Thus, the credits would not match the carbon stock changes since 1990.

Additional Activities

Additional activities under Article 3.4 can be defined broadly or narrowly and can involve improved management practices or land-use change: Additional activities under Article 3.4 can be defined broadly (e.g., forest, cropland or range-land management) or narrowly (e.g., changes in tillage method, irrigation water management, fertilization or crop selection). Both are consistent with a land-based, activity-based or combined accounting system. However, because broad-based activities are land- or area-based, they are most suited to a land-based accounting system, where-as narrowly-based activities are most suited to activity-based accounting. It should be noted that when broad-based activities are associated with land-use changes it may be difficult to separate the human-induced changes in carbon stock from those occurring naturally or in response to indirect human activities.

Carbon Accounting

Accounting systems can be either land-based, activity-based or a combination of both and should be transparent, consistent, comparable, complete, accurate, verifiable and efficient. The sequence of steps for a land-based system is: (i) definition of applicable activities referring to specific land areas; (ii) estimate of land units per activity, (iii) estimate of changes in carbon stocks per unit land area/time period, and (iv) sum over land units and the commitment period. If the land-based approach is used it may be difficult to factor out natural and indirect human-induced effects when there are changes in land-use. The sequence of steps for an activity-based system is: (i) definition of applicable activities; (ii) estimate of changes in carbon stocks per activity/unit of area/time period, (iii) estimate of land area per activity, and (iv) sum over activities and commitment period. If the activity-based approach is used, and if there are multiple activities taking place at some locations, the effects may not be additive and accounting errors could occur.

Selective accounting of carbon pools can reduce monitoring costs: Criteria for such as system could be to monitor all carbon pools anticipated to have reduced carbon, but only some of the pools expected to have increased carbon, but credit would only be given to those carbon stocks that are monitored/estimated.

Options exist to deal with uncertainties by using good practice guidelines or by adjusting the carbon stock changes: There are several sources of uncertainty, including measurement uncertainty, and uncertainties in identifying lands under Articles 3.3 and 3.4 and in defining and applying baselines (if included). These uncertainties could be addressed by using good-practice guidelines or by adjusting the carbon stock changes to understate the increases and overstate the decreases.

Permanence is a critical issue that can be addressed, inter-alia, by debiting all subsequent releases : Carbon sinks are potentially reversible through human activities, disturbances or environmental changes. Permanence is a greater problem with LULUCF activities, and in particular for project-based activities, than with other sectors. One possible solution is to ensure that any credit for enhanced carbon stocks is balanced by accounting for any subsequent reductions in carbon stocks.

Contiguous commitments periods reduce the incentives to concentrate activities that reduce carbon stocks in time periods not covered: Contiguous commitments periods under the Kyoto Protocol would avoid incentives to concentrate activities that reduce carbon stocks in time periods not covered.

Policies can stimulate LULUCF activities but quantifying their impact on carbon stocks may be difficult: Policies may provide a framework for incentives for implementing LULUCF activities, but it may be very difficult for

countries to quantitatively assess the relative impact of policies for governments or other institutions compared to other human and natural factors that result in changes in carbon stocks.

Differentiation of changes in carbon stocks due to direct human-induced activities from changes in carbon stocks due to indirect human-induced activities and natural factors is difficult, if not impossible, if changes in land-use are involved: For Article 3.3 activities that involve land-use changes, e.g., conversion of grasslands or pastures to forests, it may be difficult, if not impossible, to distinguish with present scientific tools that portion of the observed carbon stock changes that are directly human-induced from that portion caused by indirect human activities and natural factors. In contrast, when activities are narrowly defined under Article 3.4 and where land-use remains the same, e.g., conservation tillage, it may be possible to partly factor out the changes in carbon stocks from applicable management practices from other indirect human activities and natural factors by using control plots, ecological models or a combination of both. It is worth noting that emissions and removals from natural causes such as El Nino may be quite significant.

Baselines can be used to distinguish the effects of LULUCF activities from business-as–usual and pre-1990 activities: Baselines can be used, if desired and in some cases, to distinguish between the effects of LULUCF activities and BAU and activities initiated pre-1990 on carbon stock changes. Baselines that could be used include: (i) continuation of BAU, (ii) continuation of 1990 activities, (iii) absence of active management, (iv) performance benchmarks and standard management, and (v) rate of stock changes in 1990. One difficulty is verification of baselines that are counterfactual.

Methods exist to minimize leakage, including increasing the spatial scale of the accounting system: Leakage, which is a particular problem for project-based accounting, represents changes in carbon stocks outside the accounting system that result from activities that cause changes in carbon stocks within the boundary system. In some cases, leakage may be addressed by increasing the spatial and temporal scale of the accounting system

Methods for Measuring and Monitoring

Methods for measuring and estimating changes in carbon stocks exist to meet the needs of the Kyoto Protocol: Technical methods that may be deemed to be sensitive enough to serve the requirements of the Protocol exist for above ground carbon stocks and probably for below ground carbon stocks. However, while Annex 1 Parties generally have the technologies available, few currently apply them routinely for monitoring, hence operational systems will have to be developed. In contrast, Non Annex 1 Parties may require assistance to develop the necessary capacities. Improved methods and research results are likely to be highly transferable from Annex I to non-Annex I Parties.

Potential of Article 3.3 Activities

Article 3.3 activities have the potential to reduce greenhouse gases emissions into the atmosphere by avoiding deforestation and by increasing the uptake of carbon from the atmosphere into the terrestrial biosphere through afforestation and reforestation. However, ARD activities are likely to result in accounted net emissions from Annex I Parties during the first commitment period because the debits due to deforestation are likely to outweigh the credits due to afforestation and reforestation, even though the total forested lands in Annex I countries are likely to be a net sink: Using IPCC definitions of AR and D, continuation of the current rates of A/R and D activities in Annex I countries would result in annual accounted changes in carbon stocks of 7 to 46 Mt C (A/R) and –90 Mt C (D) during the first commitment period, hence an overall accounted debit of –44 to –83 Mt C annually. If hypothetically, the rates of A/R are increased by 20%, and the rates of D are decreased by 20%, this would result in an increased uptake of 0 to 3 Mt C (A/R) and a decreased emission of 18 Mt C (D), hence an overall accounted debit of –23 to –62 Mt C annually. These accounted changes in carbon reflect the net exchange of carbon between the atmosphere and terrestrial biosphere on lands accounted under Article 3.3, which are only a small fraction of the

total forested lands within Annex I countries. Using FAO definitions of AR and D, coupled with three different accounting systems (land-based I and II and activity-based), results in either large credits or debits being accounted. Only in the case of land-based I does the accounted carbon approximately reflect the net exchange of carbon between the atmosphere and terrestrial biosphere on lands accounted under Article 3.3. However, the large debits (-333 to –849 Mt C per year) reflect the fact that much of the managed forest estates, which are in carbon equilibrium, are not accounted for. Significant opportunities exist for reducing emissions through avoided deforestation and enhancing uptake through reforestation and afforestation in non-Annex I countries.

Potential of Article 3.4 Activities

Article 3.4 activities have the potential to uptake carbon by up to 250Mt C annually within Annex I countries during the first commitment period: Activities which could potentially fall under Article 3.4 include forest management other than that covered by Art 3.3 (ARD), changes in management practices which do not lead to a change in cover type, e.g., conservation tillage, and changes in land management which lead to a change in land cover type, e.g., conversion of cropland to grassland. There are three broad categories of management activities in Annex I countries that have the potential to uptake carbon dioxide by up to 250 Mt C annually during the first commitment period, i.e., forest, cropland and range-land management. In addition, there is the potential to increase the uptake of carbon in non- Annex I countries through the same three management activities and by converting degraded agricultural lands into agroforestry.

Project-based Activities

The key issues of concern for project-based activities, i.e., baselines, additionality, leakage, monitoring, verification, and permanence are, with the exception of permanence, not unique to LULUCF activities: Experience is being gained to address these issues through about thirty Activities Implemented Jointly (AIJ) and other LULUCF projects that are under initial stages of implementation in nineteen countries. To date this experience is constrained by a number of factors including the small number, the limited range of project types, the short period of field operations and the lack of internationally agreed guidelines and methods to establish baselines and quantify emissions and uptake. Key issues include, *inter-alia*:

- *baselines:* project or regional/national sectoral baselines, and fixed or adjustable
- *additionality:* environmental, financial, technological and institutional
- *leakage:* national and transboundary – quantification could be addressed through monitoring key indicators and using standard risk coefficients, and reduction through project design by offering alternative livelihoods and access to land, food, fuel and timber resources
- *monitoring and verification*: techniques and tools exist to measure carbon stocks in project areas relatively precisely depending on the carbon pool. Qualified independent third-party verification could play an essential role in ensuring unbiased monitoring.
- *permanence:* could be addressed by projects that run in perpetuity, debits for all releases, project replacement, or delayed/partial credit initially (tonne year accounting). It could also be addressed through various internal and external risk reduction approaches including good practice management systems, project diversification, self-insurance reserves, standard insurance services, involvement of local stakeholders and regional carbon pools

Reporting Guidelines

The Revised 1996 Guidelines for National Greenhouse Gas Inventories, which were developed for estimating and reporting national greenhouse gas inventories under the UNFCCC, provide a framework for addressing the accounting and reporting needs of the Kyoto Protocol, but elaboration may be needed depending upon decisions taken by the Parties: The guidelines contain: (i) a *reference manual,* which covers the main LUCF activities and all carbon pools, encourages comprehensive accounting of all pools, but does not differentiate between direct and indirect human induced activities; (ii) a *workbook,* which provides accounting methods and default data for above ground biomass and the top 0.3m of soil, but not for below-ground biomass, deeper soils or wood products, and changes in soil carbon and the other pools are not linked; and (iii) *reporting instructions,* which contains definitions for activities and tables to report emissions and removals of greenhouse gases. In particular, issues such as

permanence, baselines, since 1990, the meaning of direct-human induced and human-induced, wood products and some additional activities may need to be addressed.

The guidelines were not intended to address projects: Many of the data and reporting requirements for projects and national inventories are similar for a given activity and carbon pool, but additional features may include: (i) project location and boundaries, (ii) leakage, (iii) baselines, (iv) additionality and (v) environmental and socio-economic impacts.

Sustainable Development

LULUCF activities and projects can have a broad range of positive environmental, social and economic impacts if the projects are appropriately designed and implemented: A system of criteria and indicators could be valuable to compare sustainable development impacts across LULUCF activities and projects. If sustainable development criteria vary significantly across countries or regions there may be an incentive to locate projects in areas with less stringent criteria. Sustainable development impacts can be strengthened if there is: (i) sufficient institutional and technical capacity to implement guidelines and safeguards, (ii) effective community participation, and (iii) transfer and local adaptation of technology. Environmental and social impact assessments, which are applied widely at the project, sectoral and regional level could be adapted to LULUCF projects.

FOR PROJECTS, SEVERAL ADDITIONAL FACTORS IDENTIFIED AS CRITICAL TO STRENGTHEN SUSTAINABLE DEVELOPMENT IMPACTS

LULUCF ACTIVITES AND PROJECTS CAN HAVE A BROAD RANGE OF ENVIRONMENTAL, SOCIAL AND ECONOMIC IMPACTS, e.g.

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- **Forests, soils, water resources**
- **Food, fiber, fuel**
- **Employment, health, poverty, equity**

- **REALIZING THE POTENTIAL FOR S.D. WILL DEPEND UPON THE MEANS BY WHICH ACTIVITIES AND PROJECTS ARE DESIGNED AND IMPLEMENTEDLULHAVE A BROAD RANGE OF ENVIRONMENTAL, SOCIAL AND ECONOMIC IMPACTS, e.g.**

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