

# The Forestry Sector in the Kyoto Protocol

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## 1. Introduction: some historical background

The text of the United Nations Framework Convention on Climate Change - UNFCCC (henceforth referred to as the Convention) was adopted and open for signatures in 1992, and entered into force in March 1994. It sets an overall framework for intergovernmental efforts to address the challenge posed by climate change ([www.unfccc.int](http://www.unfccc.int)). Under the Convention, forestry is explicitly mentioned in Article 4 item (c), as follows: *“All Parties, taking into account their common but differentiated responsibilities and their specific national and regional development priorities, objectives and circumstances, shall: promote and cooperate in the development, application and diffusion, including transfer, of technologies, practices and processes that control, reduce or prevent anthropogenic emissions of greenhouse gases not controlled by the Montreal Protocol in all relevant sectors, including the energy, transport, industry, agriculture, forestry and waste management sectors.”* Along the text of the Convention, reference is often made to “emissions by sources and removals by sinks of all greenhouse gases not controlled by the Montreal Protocol”. Sink, for the purposes of the Convention, is defined as *“any process, activity or mechanism, which removes a greenhouse gas, an aerosol or a precursor of a greenhouse gas from the atmosphere.”* Regardless of this reference, there is no mention in the text on how sinks should be accounted for under the Convention.

In 1997, during the third Conference of the

Parties to the Convention (COP3), a protocol to the Convention was adopted and became known as the Kyoto Protocol. It set up limits to greenhouse gas emissions for the period 2008-2012 for 38 industrialized countries (Annex I Parties), whereas developing countries (non-Annex I Parties) had no emission limits commitments. The text of the Kyoto Protocol makes reference to specific activities related to the forestry sector. The inclusion of sources as well as sinks in the protocol became an important issue, as discussions moved towards the possible introduction of quantitative reduction targets in the agreement. A questionnaire was distributed to Parties to clarify the main issues regarding sinks in relation to establishing reduction commitments (FCCC/AGBM/1997/8 at [www.unfccc.int](http://www.unfccc.int)). Despite an overall agreement that sinks were important and should be included in the commitments of industrialized countries (with concerns expressed with regard to definitions, timing and scope), Parties could not agree, however, on what categories and activities should or should not be included. At COP3, time pressure forced Parties to agree only on reforestation, afforestation and deforestation, which are explicitly included under Article 3 item 3 (Article 3.3) of the protocol, leaving space for future negotiations on additional activities, covered under Article 3 item 4 (Article 3.4). These additional activities, in principle, should only be allowed after the first commitment period. However, pressure in the negotiations led to the possibility of countries including these additional

activities during the first commitment period, if they so wished. The article reads as follows: "... *The Conference of the Parties serving as the meeting of the Parties to this Protocol shall, at its first session or as soon as practicable thereafter, 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 in the agricultural soils and the land-use change and forestry categories shall be added to, or subtracted from, the assigned amounts for Parties included in Annex I, taking into account uncertainties, transparency in reporting, verifiability, the methodological work of the Intergovernmental Panel on Climate Change, the advice provided by the Subsidiary Body for Scientific and Technological Advice in accordance with Article 5 and the decisions of the Conference of the Parties. Such a decision shall apply in the second and subsequent commitment periods. A Party may choose to apply such a decision on these additional human-induced activities for its first commitment period, provided that these activities have taken place since 1990.*"

The open text of Article 3.4 regarding which additional activities could be included (if any) in the accounting system of Annex I Parties to demonstrate compliance (i.e., achievement of their agreed emission reductions targets), caused several problems in the negotiations. Views ranged from complete exclusion of additional land use, land-use change and forest (LULUCF) activities from accounting, to the inclusion of a wide range of activities. Most of those against the inclusion of additional activities under Article 3.4, including Brazil and the European Union, were not convinced that the scientific knowledge regarding emissions and removals from LULUCF activities was developed enough to allow their inclusion to demonstrate compliance. Annex I Parties all seemed to agree that there were large uncertainties associated with the accounting of the net emissions (emissions – removals) from LULUCF activities. However, they were also convinced that the inclusion of these activities would largely alleviate their burden to achieve compliance. This issue was not particularly important to non-Annex I countries, since they do not have emission reduction limits under the Kyoto Protocol, in other words, they do not have to demonstrate compliance. However, they anticipated a direct link with Article 12 of the protocol, which defines the Clean Development Mechanism. Under this mechanism, non-Annex I Parties would be able to help Annex I countries to meet their emission reduction obligations in a cost-effective

way, thereby promoting sustainable development in their own countries. Another mechanism that was created to help countries to achieve compliance was the Joint Implementation, in which an Annex I country can invest in a project in another Annex I country and claim the resulting emission reductions in their demonstration of compliance. This mechanism is created under Article 6 of the protocol, and contemplates emissions reduction projects as well as LULUCF projects. All these discussions led one of the Convention bodies, the Subsidiary Body for Scientific and Technological Advice (SBSTA), to invite the Intergovernmental Panel on Climate Change (IPCC) to develop a Special Report on Land-use Change and Forestry, which was published in mid-2000. Until then, all the discussions regarding which activities would be included under Article 3.4 were halted, as well as those relative to the inclusion of LULUCF activities under Articles 6 and 12.

The report from IPCC addressed Articles 3.3 and 3.4 of the Kyoto Protocol in two chapters (Chapter 3 and 4); it also included potential implications of different definitions of forest, deforestation, reforestation, and afforestation (see section II below) in Chapter 2, and considerations of project-based activities (Articles 6 and 12) in Chapter 5. The report introduced different aspects related to LULUCF, in a non-policy prescriptive way, and Parties could find elements to either support or reject the consideration of LULUCF activities under Article 3.4. In particular, since the Convention and the Kyoto Protocol focus on human-induced changes in greenhouse gas emissions by sources and removal by sinks, one issue of concern regarded the separation (or what became later known as factoring out) of natural and indirect effects on these changes from those that resulted from a direct human-induced effect. In the Summary for Policymakers of the IPCC report, the following considerations are made: "*Natural variability, such as El Niño cycles, and the indirect effects of human activity, such as CO<sub>2</sub> fertilization, nutrient deposition, and the effects of climate change, could significantly affect carbon stocks during a commitment period on lands under Article 3.3 or 3.4. The spatial distribution of the emissions and removals of greenhouse gases due to these factors is uncertain, as is the portion of them that may enter the accounting system. These emissions and removals could be potentially large compared to the commitments in the first commitment period. This could be a significant issue in the design of an accounting framework*". And further: "*The Kyoto Protocol specifies*

that accounting under Article 3.3 be restricted to “direct human-induced land-use change and forestry activities, limited to afforestation, reforestation, and deforestation occurring since 1990. For activities that involve land-use changes (e.g., from grassland/pasture to forest) it may be very difficult, if not impossible, to distinguish with present scientific tools that portion of the observed stock change that is directly human-induced from that portion that is caused by indirect and natural factors.”

Another consideration that was highly explored by those against the inclusion of LULUCF activities under Articles 3.4 and 6 was the following: “Enhancement of carbon stocks resulting from land use, land-use change, and forestry activities is potentially reversible through human activities, disturbances, or environmental change, including climate change. This potential reversibility is a characteristic feature of LULUCF activities in contrast to activities in other sectors. This potential reversibility and non-permanence of stocks may require attention with respect to accounting, for example, by ensuring that any credit for enhanced carbon stocks is balanced by accounting for any subsequent reductions in those carbon stocks, regardless of the cause.”

Despite these considerations, the report, in its entirety, could still be perceived as being supportive of LULUCF activities in the CDM and in Articles 3.4 and 6. The negotiations, however, were far from simple. At COP6 (December 2000), Parties could not reach consensus on this issue, leading to the Conference of the Parties meeting again six months later (COP6 bis). At this COP, Parties had no option but to be flexible enough to allow the process to move on. The failure of COP6 was still vivid and Parties had to start being more flexible in their positions. This flexibility, however, should only go as far as the environmental integrity of the Kyoto Protocol could be ensured, i.e., if it would not compromise the anticipated mean reduction of 5.2% of the global CO<sub>2</sub> emissions by Annex I Parties in 1990, during the first commitment period (2008 -2012). It was in this mood that Brazil, supported by G77 and China, developed some principles that govern the treatment of land use, land-use change and forestry activities, contained in the draft decision -/CMP.1 (Land use, land-use change and forestry) of the Marrakesh Accords (2001). These principles are as follows:

- (a) *That the treatment of these activities be based on sound science;*
- (b) *That consistent methodologies be used over time for the estimation and reporting of these activities;*
- (c) *That the aim stated in Article 3.1<sup>1</sup> of the Kyoto*

*Protocol not be changed by accounting for land use, land-use change and forestry activities;*

(d) *That the mere presence of carbon stocks be excluded from accounting;*

(e) *That the implementation of land use, land-use change and forestry activities contributes to the conservation of biodiversity and sustainable use of natural resources;*

(f) *That accounting for land use, land-use change and forestry does not imply a transfer of commitments to a future commitment period;*

(g) *That reversal of any removal due to land use, land-use change and forestry activities be accounted for at the appropriate point in time;*

(h) *That accounting excludes removals resulting from: (i) elevated carbon dioxide concentrations above their pre-industrial level; (ii) indirect nitrogen deposition; and (iii) the dynamic effects of age structure resulting from activities and practices before the reference year.*

The original text on these principles was much more developed than the final text agreed at COP7 (2001). Of particular relevance were principles (d), (g) and (h).

The sections that follow will focus on specific issues related to Articles 3.3, 3.4, 6 and 12, with more emphasis on the latter, due to its relevance to non-developing countries.

## 2. Articles 3.3, 3.4 and 6 of the Kyoto Protocol

### 2.1 Article 3: Afforestation, Reforestation and Deforestation

Article 3.3 defines the activities that Annex I Parties shall consider to demonstrate compliance with their quantified emission limitation and reduction commitments. The article reads as follows: “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

<sup>1</sup> The Parties included in Annex I shall, individually or jointly, ensure that their aggregate anthropogenic carbon dioxide equivalent emissions of the greenhouse gases listed in Annex A do not exceed their assigned amounts, calculated pursuant to their quantified emission limitation and reduction commitments inscribed in Annex B and in accordance with the provisions of this Article, with a view to reducing their overall emissions of such gases by at least 5 per cent below 1990 levels in the commitment period 2008 to 2012.

*as verifiable changes in carbon stocks in each commitment period, shall be used to meet the commitments under this Article of each Party included in Annex I. The greenhouse gas emissions by sources and removals by sinks associated with those activities shall be reported in a transparent and verifiable manner and reviewed in accordance with Articles 7 and 8."*

The net changes are to be reported according to guidelines adopted by the Conference of the Parties. Annex I Parties already report their greenhouse gas emissions as part of their commitments under Article 4.1 of the Convention ("to develop, periodically update, publish and make available to the Conference of the Parties, in accordance with Article 12, national inventories of anthropogenic emissions by sources and removals by sinks of all greenhouse gases not controlled by the Montreal Protocol, using comparable methodologies to be agreed upon by the Conference of the Parties"). To ensure that countries use comparable methodologies, Parties follow, in their inventories, the guidelines developed by the Intergovernmental Panel on Climate Change (IPCC). Industrialized countries have to apply the two IPCC reports on Good Practice Guidance (Good Practice Guidance and Uncertainties Management (2000) and Good Practice Guidance for Land Use, Land-Use Change and Forestry (2003)) to report on their annual emissions by sector, as well as net emissions from Land-Use Change and Forestry. Developing countries and countries with economies in transition use the 1996 IPCC Guidelines for Greenhouse Gas Emissions, but are encouraged to use the Good Practice reports. Presently, the IPCC is undergoing a revision of these Guidelines, as per a request of the COP7, to produce sector reports for Energy, Industrial Processes and Product Use (IPPU), Agriculture, Forestry and Other Land Uses (AFO-LU), and Waste. In addition, a volume containing General Guidelines and Reporting will also be part of the 2006 IPCC Guidelines. The IPCC panel approved the Terms of Reference, Work Plan and Table of Contents at the end of year 2003, and the work initiated in early 2004, with the goal of being completed by April 2006.

The reporting guidelines, for the purposes of the Kyoto Protocol, were introduced in the Good Practice Guidance for Land Use, Land-use Change and Forestry (IPCC, 2003; [www.ipcc-nggip.iges.or.jp](http://www.ipcc-nggip.iges.or.jp)) in Chapter 4 (Supplementary Methods and Good Practice Guidance Arising from the Kyoto Protocol). The chapter considers the requirements and methodologies for measuring, estimating

and reporting activities under Article 3.3 and 3.4 (if elected by a Party). The chapter also provides good practice guidance for LULUCF projects under Articles 6 (Joint Implementation) and 12 (Clean Development Mechanism) of the Kyoto Protocol.

Although Article 3.3 explicitly included the activities afforestation, reforestation and deforestation, these were not defined at COP3. At COP4 (1998), a clarification was introduced in Decision 9/CP.4 in the following text: "*The adjustment to a Party's assigned amount shall be equal to verifiable changes in carbon stocks during the period 2008 to 2012 resulting from direct human-induced activities of afforestation, reforestation, and deforestation since 1 January 1990*". The IPCC Special Report on Land Use, Land-use Change and Forestry (2000) outlined, in Chapter 2, some generic issues associated with specific definitions and methodologies, for consideration of the Parties before an agreement was reached. While there was widespread understanding amongst Parties that afforestation, reforestation and deforestation implied land-use change (from non-forest to forest, as a result from the two first activities; and from forest into non-forest in the latter), such an agreement could not be reached with regard to the definition of forest itself. This was not unexpected: the IPCC Special Report had indicated that more than 240 such definitions existed (see Lund, 1999), "*reflecting wide differences in biogeophysical conditions, social structures, and economies*". Hours of discussion at COP6 could not lead to an agreement on the definition of forest, until finally, at COP6 bis, Parties decided to move forward and accept the definition proposed by the co-chairs of the contact group convened by the Subsidiary Body for Scientific and Technological Advice to the Convention, with a request that SBSTA investigated the possible implications of "biome-specific forest definitions" for the second and subsequent commitment periods. The definition of forest was agreed as follows: "*Forest is a minimum area of land of 0.05-1.0 hectares with tree crown cover (or equivalent stocking level) of more than 10-30 per cent with trees with the potential to reach a minimum height of 2-5 meters at maturity in situ. A forest may consist either of closed forest formations where trees of various stories and undergrowth cover a high proportion of the ground or open forest. Young natural stands and all plantations which have yet to reach crown density of 10-30 per cent or tree height of 2-5 meters are included under forest, as are areas normally forming part of the forest area which are temporarily unstocked as a result of*

*human intervention such as harvesting or natural causes but which are expected to revert to forest”.*

Countries have to select a single minimum tree crown cover value between 10-30 per cent, a single minimum land area value between 0.05 and 1 hectare and a single minimum tree height value between 2 and 5 meters, for the purposes of applying the definition of forest during the first commitment period. The choice of the Parties shall be consistent with the information that is historically reported to the Food and Agriculture Organization of the United Nations or other international bodies, and shall remain fixed for the duration of the first commitment period.

The other definitions followed in a reasonably straightforward manner, and were agreed as follows:

*“Afforestation is the direct human-induced conversion of land that has not been forested for a period of at least 50 years to forested land through planting, seeding and/or the human-induced promotion of natural seed sources.”*

*“Reforestation is the direct human-induced conversion of non-forested land to forested land through planting, seeding and/or the human-induced promotion of natural seed sources, on land that was forested but that has been converted to non-forested land. For the first commitment period, reforestation activities will be limited to reforestation occurring on those lands that did not contain forest on 31 December 1989.”*

*“Deforestation is the direct human-induced conversion of forested land to non-forested land.”*

All these definitions apply to the first commitment period. A technical paper (Rakoncsay, 2002) was produced to investigate the potential implications of a change in the definition of “forest” in the next commitment periods. The conclusions are not very encouraging, in particular due to the following considerations:

● *“Changing the applicable forest definition from one commitment period to the next is likely to create considerable difficulties for Parties in their reporting. It can introduce a new source of error into the conversion, making it even more difficult to calculate changes in carbon stocks over time reliably. This factor alone can raise questions about the wisdom of changing definitions.”*

● *“Different definitions will result in areas changing status (from forest to non-forest or vice-versa) solely or partly due to the definition change. Modalities will have to be developed to allocate the change in forest area to various causes.”*

Despite the agreement on the LULUCF definitions under Article 3.3, some issues of concern still remained:

● *With regard to deforestation:* since the thresholds of tree crown cover and tree height in the forest definition are very low (regardless of the choice of Parties), there was concern that some activities could lead to significant changes in carbon stock in the forest, without characterizing deforestation. For instance, suppose there was a forest with 80% tree crown cover and tree height of 7 meters in a specific country. Suppose also that the choice of forest parameters (crown cover and height) of that country was 20% and 5 meters, respectively. Activities such as thinning or harvesting are normally carried out in that forest, resulting in a loss of tree crown cover from 80% to 30%. Even though there is a considerable change in carbon stock in the area, this would not be captured in the inventory of that country, since the area would still maintain its “forest” label. Hence, the loss of carbon that resulted from the thinning or harvesting (from 80% to 30%) would not be accounted for. This concern was addressed at COP7, which agreed on the following: *“Each Party included in Annex I shall report ... on how harvesting or forest disturbance that is followed by the re-establishment of a forest is distinguished from deforestation.”*

This concern motivated COP7 (2000) to invite the Intergovernmental Panel on Climate Change - IPCC *“to develop definitions for direct human-induced degradation of forests and devegetation of other vegetation types and methodological options to inventory and report on emissions resulting from these activities, to be submitted for consideration and possible adoption to the Conference of the Parties at its ninth session”.* In response to the invitation, IPCC developed a Special Report, which was delivered and accepted by the IPCC Plenary in November 2003. The request for IPCC to address the issue of devegetation will be clarified in the next section (Additional Activities), and was triggered by concerns with unbalanced or incomplete accounting by Parties. The report (Definitions and Methodological Options to Inventory Emissions from Land Use, Land-Use Change, and Forestry) was adopted by the IPCC Plenary in November 2003.

sions from Direct Human-induced Degradation of Forests and Devegetation of Other Vegetation Types), can be downloaded from [www.ipcc-nggip.iges.or.jp](http://www.ipcc-nggip.iges.or.jp) and provides the principles and the framework for the development of final definitions of forest degradation and devegetation of other vegetation types. It acknowledges the existence of nearly 50 published definitions of degradation, and only three published definitions of devegetation. The report states that *“none of the existing definitions was found to be directly suitable for operational use in the context of the Kyoto Protocol, because either lacked quantifiable threshold or were not applicable to describing changes in carbon stocks”*, indicating that guidance on methodological options could not be provided in advance of determination of finalized definitions, which needed to be agreed upon by the COP.

- *With regard to the reference in Articles 3.3 and 3.4 that the verifiable changes in carbon stocks during the period 2008–2012 should result from human-induced activities: the IPCC Special Report on Land Use, Land-use Change and Forestry (IPCC, 2000) had pointed out that “although carbon stock changes can be measured directly with a variety of techniques, attributing a given change in carbon stocks to a particular cause can be more challenging.” And further: “at a global level, significant carbon stock changes that are unrelated to human activities and unlikely to reflect long-term changes in carbon sequestration can be expected over a 5-year commitment period.”*

- *With regard to the reference in Article 3.3 that the verifiable changes in carbon stocks during the period 2008–2012 should result from direct human-induced activities: the IPCC Special Report on Land Use, Land-use Change and Forestry (IPCC, 2000) acknowledges that “one of the most significant distinctions between direct activities and indirect influences relates to the effects of CO<sub>2</sub> fertilization and nitrogen deposition. At the global scale, carbon cycle studies suggest that terrestrial ecosystems that are not subject to tropical deforestation are sequestering an average of approximately 2.2 Gt C/year through biomass re-growth resulting from natural regeneration and uptake of carbon dioxide, as well as nutrient fertilization and changing climate. The geographical distribution of this sink is uncertain, but if credit became available for the effects of carbon and/or nitrogen fertilization over a large fraction of the landscape, the implications would be profound. If Parties could obtain credit for 50 percent of the estimated sink from these fac-*

tors, achieving the emission limitations of the first commitment period would not require any actions beyond business-as-usual projections (Lashof and Hare, 1999).

Meira Filho further developed this issue and considered the possible implications that could result from the appropriation, by Annex I and non-Annex I Parties, of their natural “sinks”. He indicated that if this occurred, the implication could be an increase of 44.4% in the emissions of the Annex I countries relative to 1990, as opposed to a reduction of 5.2%, as contemplated by the Kyoto Protocol.

Later on, COP7 requested that the IPCC *“develop practicable methodologies to factor out direct human-induced changes in carbon stocks and greenhouse gas emissions by sources and removals by sinks from changes in carbon stocks and greenhouse gas emissions by sources and removals by sinks due to indirect human-induced and natural effects (such as those from carbon dioxide fertilization and nitrogen deposition), and effects due to past practices in forests (pre-reference year), to be submitted to COP10.”*

At COP9, IPCC informed the COP that it could not accept the invitation, in view of limited scientific knowledge available to address the issue at present.

## 2.2 Article 3.4 of the Kyoto Protocol: Additional Activities

The loose text of Article 3.4, allowing for additional human-induced activities related to changes in greenhouse gas emissions by sources and removals by sinks in the agricultural soils and the land-use change and forestry categories, was largely responsible for the difficulties in reaching agreement on the possible set of activities (if any) that could be included in the accounting of Annex I Parties to demonstrate compliance. Views ranged from complete identification of the activities that would be allowed under Article 3.4, to the broad definition of the activities, which prevailed in the end. There were concerns that the inclusion of a wide range of activities could allow countries to meet compliance without tackling the core issue of emission reduction associated with fuel combustion and transport.

In Marrakesh, Parties agreed that emissions by sources and removals by sinks resulting from forest management, cropland management, grazing

land management, and revegetation could enter the accounting system of Annex I countries. Definitions were developed for each one of these broad activities, as follows:

- *Forest management is a system of practices for stewardship and use of forestland aimed at fulfilling relevant ecological (including biological diversity), economic and social functions of the forest in a sustainable manner.*
- *Cropland management is the system of practices on land on which agricultural crops are grown and on land that is set aside or temporarily not being used for crop production.*
- *Grazing land management is the system of practices on land used for livestock production aimed at manipulating the amount and type of vegetation and livestock produced.*
- *Revegetation is a direct human-induced activity to increase carbon stocks on sites through the establishment of vegetation that covers a minimum area of 0.05 hectares and does not meet the definitions of afforestation and reforestation.*
- *Different approaches were agreed upon to account for these activities. Whereas for cropland and grazing land management, and revegetation, a net-net approach was adopted, for forest management, a gross-net approach was adopted. For the first three activities, the calculations are as follows:*

$$\text{Accountable (GHG}\downarrow\uparrow) = (\text{GHG}\downarrow\uparrow)_{2008-2012} - 5 \bullet (\text{GHG}\downarrow\uparrow)_{1990}$$

where

$(\text{GHG}\downarrow\uparrow)_t$  = anthropogenic greenhouse gas emissions by sources and removals by sinks at year or period  $t$

For forest management, Parties have agreed upon some flexibility in the first commitment period by allowing Parties to indicate the maximum amount that could be added or subtracted from their assigned amount from forest management under Article 3.4. This value is identified for all Annex I Parties in an Appendix to decision 17/CP.7 (Land Use, Land-use Change and Forestry).

## 2.3 Article 12 of the Kyoto Protocol: Clean Development Mechanism

As mentioned in the introduction, the Clean Development Mechanism (CDM) is the only mechanism in the Kyoto Protocol that allows the transfer of financial resources from industrialized countries to developing countries to promote mitigation of climate change in the latter. Mitigation, in the context of the Convention and its Protocol, means the reduction of greenhouse gas emissions relative to what would otherwise occur. The mitigation can be achieved through projects that generate certified emission reductions (CERs), which can be used by Annex I Parties to meet their emission limitations commitment.

Initially, the negotiations about which activities could be considered under the CDM centered on emission reduction projects. Many Parties had trouble accepting the inclusion of “sinks”<sup>2</sup> in the CDM. One of the difficulties was associated with the understanding that the carbon stored in forests is inherently less permanent than the reductions obtained through other CDM projects. The knowledge that the carbon stored in the vegetation can be emitted to the atmosphere in case of total or partial loss, fire and/or degradation of the forest stand, amongst others, created doubts about the effective contribution of these projects in the mitigation of climate change. This issue became known as non-permanence, and is typical of project activities in the forest sector.

The uncertainties associated with the quantification/estimation of the carbon stocks in the different forest carbon pools (live biomass – above and below-ground; dead organic matter – litter and dead wood; and soil organic carbon), and poor forest databases, particularly in developing countries, contributed to increased skepticism that forests should be included in the negotiations of LULUCF project activities under the CDM.

Finally, another fundamental question referred to the very territorial sovereignty of the countries. It is natural, if not obvious, that no country agrees to turn over to others, through an international

<sup>2</sup> Sink, for the purposes of the Convention and Kyoto Protocol, means any process, activity or mechanism that removes a greenhouse gas, an aerosol or a precursor of a greenhouse gas from the atmosphere.

treaty (and indefinitely), the control of part of its territory. This question, amongst others of a more scientific nature, was responsible for the creation of the principle that secures the reversibility of the greenhouse gas emissions to the emitting country, at the appropriate point in time (see Introduction). Hence, the temporary character of the certified emission reductions associated with afforestation/reforestation project activities was guided not only by the scientific uncertainties, but also by this reversibility principle. It allows the industrialized countries to gain time to implement, in their own territories, the necessary measures to meet their emission reduction target.

These reasons, amongst others, led the negotiators to agree to a limited set of LULUCF activities under the CDM in the first commitment period, which was restricted to afforestation and reforestation. In addition, the use of certificates by an Annex I Party, resulting from these types of project activities, was capped to 1% of that Party's CO<sub>2</sub> emissions in 1990, times five, during the period from 2008-2012. Considering that the total CO<sub>2</sub> emissions by Annex I Parties, in 1990, totaled 13.728.306 Gg CO<sub>2</sub> (or kt CO<sub>2</sub>), the limit of 1% corresponds to 137.283 Gg CO<sub>2</sub>. This total, however, refers to the maximum allowed quantity that could be used in the first commitment period, which would only be attained if all Annex I Parties had ratified the Kyoto Protocol and would make use of their allowable limit. With the USA's withdrawal from the Kyoto regime, responsible for 36.1% of the total carbon dioxide emissions of Annex I Parties in 1990, the total maximum allowable quantity was reduced to 87.712 Gg CO<sub>2</sub> per year. This value could become even smaller, depending on the way the European Union decides on the use of tCERs or ICER for compliance.

Colombia was the first country to propose a way to address non-permanence, suggesting a temporary character to the certificates from LULUCF project activities. This implied that the certificates from afforestation/reforestation would have to be replaced by permanent CERs after a pre-defined number of years. It was only in 2003 during COP9 when the negotiations of the modalities and procedures for the inclusion of afforestation and reforestation project activities in the CDM were being finalized that Parties agreed to two types of CER categories: tCERs (temporary CERs) and ICERs (long-term CERs). These categories will

be discussed later in this article.

It was also during COP9 that definitions were developed to estimate the amount of tCERs or ICERs that could result from an afforestation or reforestation project's activities in the CDM. In practice, three elements are necessary in the calculation of the net anthropogenic greenhouse gas removals by sinks, which will result in the issuance of tCERs or ICERs: (1) baseline net greenhouse gas removal by sinks; (2) actual net greenhouse gas removal by sinks; and (3) leakage.

### 2.3.1 Baseline net greenhouse gas removal by sinks (BL)

The baseline net greenhouse gas removal by sinks (BL) is the sum of the changes in carbon stocks in carbon pools within the project boundary that would have occurred in the absence of the afforestation or reforestation project activity under the CDM. In other words, in estimation of BL, only the expected changes in the carbon pools are considered. The possible greenhouse gas emissions that could be expected to occur in the absence of the project activity, within the project boundary, are not included in the calculation. To put it simply, the calculation of BL could be represented using a mathematical notation:

$$BL = \Sigma \Delta C(x, \text{expected})$$

where  $\Sigma$  is the operator sum applied to all carbon pools considered;  $\Delta C(x, \text{expected})$  indicates the expected change in carbon stock in pool  $x$ , where  $x$  can be aboveground ground biomass; belowground biomass; dead wood; litter; and soil organic carbon. Parties can exclude a given carbon pool from consideration if they can provide transparent and verifiable information that the exclusion will not increase the expected net anthropogenic greenhouse gas removal by sinks. In the case of the BL calculation, it means that a carbon pool can be excluded if this exclusion does not lead to a smaller value of BL than would otherwise occur.

The text of Decision 19/CP.9 indicates that the BL shall be established in a transparent and conservative manner regarding the choice of approaches, assumptions, methodologies, parameters, data sources, key factors and additions, and taking uncertainty into account. It also indicates that es-



timation of BL shall be done on a project-specific basis, and taking into account relevant national and/or sector policies and circumstances, such as historical land uses, practices and economic trends.

### 2.3.2 Actual net greenhouse gas removal by sinks (AR)

The actual net greenhouse gas removal by sinks (AR) is defined as the sum of the verifiable changes in carbon stocks in carbon pools within the boundaries of the project, minus the increase in emissions of greenhouse gases measured in CO<sub>2</sub> equivalents<sup>3</sup> by the sources that are increased as a result of the implementation of the afforestation or reforestation project activity, while avoiding double counting within the project activity, attributable to the deforestation or reforestation project activity under the CDM. Similar to the calculation of BL, the use of a mathematical notation to represent the calculation of AR is:

$$AR = \Sigma \Delta C(x, \text{verifiable}) - \Sigma GHG(\text{emissions})$$

where  $\Sigma$  is the operator sum applied to all carbon pools considered;  $\Delta C(x, \text{verifiable})$  indicates the verified changes in the carbon stock in pool  $x$ , where  $x$  can be aboveground biomass; belowground biomass; dead wood; litter; and soil organic carbon. Parties can exclude a given carbon pool from consideration if they can provide transparent and verifiable information that the exclusion will not increase the expected net anthropogenic greenhouse gas removals by sinks. In the case of AR calculation, this means that a carbon pool can be excluded if this exclusion does not lead to a greater value of RR than would otherwise occur. By  $\Sigma GHG(\text{emissions})$  it is understood the sum of the emissions that are increased as a result of the implementation of the project, such as burning of residues within the project boundary, application of fertilizers etc.

In other words, AR represents the net contribution of afforestation or reforestation project activity in the increase in CO<sub>2</sub> removal from the atmosphere within the boundaries of the project, taking into account not only the verifiable changes in carbon stocks in the carbon pools considered, but also emissions of greenhouse gases that result from the implementation of the project activity.

<sup>3</sup> The concentration of carbon dioxide that would cause the same quantity of radiative forcing as a given mixture of carbon dioxide and other greenhouse gases (IPCC, 2001; Synthesis Report).

### 2.3.3 Leakage (L)

*Leakage (L)* refers to the increase in greenhouse gas emissions by sources, which occurs outside the boundary of an afforestation or reforestation project activity under the CDM, which is measurable and attributable to the afforestation, and reforestation project activity. The project activity shall be designed in such a manner as to minimize leakage.

### 2.3.4 Net anthropogenic greenhouse gas removal by sinks (NR)

The net anthropogenic greenhouse gas removal by sinks (NR) is the actual net greenhouse gas removal by sinks minus the baseline net greenhouse gas removal by sinks minus leakage, i.e.,  $NR = AR - BL - L$ .

## 2.4 Crediting Period

Crediting period is the period that an afforestation or reforestation project activity is entitled to the issuance of tCERs or ICERs. Project participants shall choose one of two possible options:

- (1) maximum of 20 years, renewed at most twice (40, 60 years), with a revision of the baseline at each renewal; or
- (2) maximum of 30 years, with no revision of the baseline.

## 2.5 Expiring CERs: tCERs and ICERs

As already mentioned, registered afforestation and reforestation project activities under the CDM may be entitled to the issuance of temporary CERs (either tCERs or ICERs), created to address the issue of non-permanence. Parties have agreed at COP9 that the project participants in an afforestation or reforestation project activity under the CDM shall select one of the two approaches (tCERs or ICERs), which shall remain fixed for the entire crediting period, including any renewals.

These expiring CERs differ from other CERs in the following aspects:

- they expire if there is a verifiable decrease in the net anthropogenic greenhouse gas removals by sinks, after certification (unplanned release of carbon);
- they have to be replaced by permanent CERs at the end of the crediting period; and
- they cannot be carried over into future commitment periods (i.e., no banking or stocking of temporary CERs allowed).

- *These differences will certainly impact the price of certificates from afforestation and reforestation project activities in relation to other CERs.*
- *The expiring CERs also have features, which distinguish them from one another, which are presented in Table I. These differences are also expected to be reflected in the price of these certificates on the market.*

**Table I** - Main differences between tCERs and ICERs

	<b>tCERs</b>	<b>ICERs</b>
Quantity of CERs that can be issued at each verification	Value of NR since the beginning of the project	Value of NR since the last verification
Expiration	End of the commitment period subsequent to the period in which they were issued	End of the crediting period for which they were issued
Reversibility of the CER		Needs to be replaced when the certification report of the DOE indicates a reversal of the NR since the previous certification
Carry over to subsequent commitment period (banking)	Not possible	Not possible

### 2.5.1 Some potential implications of the choice of tCERs or ICERs

There are potentially two paths for an afforestation or reforestation project activity: (1) one, which is expected to have an increasing net removal during the crediting period; and (2) one which is expected to have fluctuating carbon stocks during the crediting period.

In path (1), there are no apparent advantages of one type of expiring CER over the other. Obviously, the amount of CERs issued at each verification will be different, and the time for which they are usable will be different (tCERs only for the commitment period for which they were issued; ICERs

for the entire crediting period). In path (2), since the verification occurs every 5 years after the first verification, there is a large chance for reversal, which would require an immediate replacement of the reversed ICERs. In theory, the liability for the replacement of the reversed ICERs lies with the buyer. However, the contract may transfer this liability to the seller.

Since the ICERs, when issued, do not expire until the end of the crediting period (which can be 20, 40, 60, or 30 years), it can be thought of as a guarantee that during this entire period the buyer will not need to replace them (unless there is a flagged decrease in the NR from the previous verification). This may lead to greater income earlier on in the project. Note, however, that at the next verification, only the increase in NR from the previous verification will generate new ICERs.

In the case of tCERs, since they expire earlier than the ICERs, there is no risk that they will need to be replaced due to a decrease in the carbon stock. In addition, there is no “commitment” with the buyer that after the tCER expires, the project will generate other tCERs. In this case, the buyer will have to seek other temporary or permanent CERs in the market. The tCERs are flexible in the sense that, when they expire, then can be replaced by permanent CERs. This flexibility does not exist in the case of the ICERs during the crediting period, unless they are reversible.

## 3. Small-scale afforestation and reforestation (A&R) project activities

The inclusion of project activities under the CDM was triggered by the existence of this type of project in the modalities and procedures for emission reduction projects. It was also thought that it would ensure more equity in the distribution of projects amongst developing countries. Africa was one of the strongest supporters of the inclusion of A&R small-scale projects under the CDM, and has played a strong role in insuring their inclusion in the final text of negotiations, finalized at COP9 in Milan. This included simplified modalities and procedures for small-scale afforestation and reforestation project activities under the CDM for the first commitment period of the Kyoto Protocol and measures to facilitate their implementation

(see Decision 14/CP.10 at [www.unfccc.int](http://www.unfccc.int)). The rationale behind the small scale project activities is to reduce their transaction costs through the implementation of simplified modalities and procedures. Due to already complex negotiations to include LULUCF projects under the CDM and due to the uncertainties associated with the quantification of the net anthropogenic greenhouse gas removals by sinks, several Parties were concerned that the use of simplified modalities could risk the environmental integrity of the Kyoto Protocol. Amongst the countries, which resisted the inclusion, China was the strongest, but Brazil and the European Union also voiced their concerns.

At COP9, the definition of the small scale A&R project activities was agreed as follows: *"Small-scale afforestation and reforestation project activities under the CDM are those that are expected to result in net anthropogenic greenhouse gas removals by sinks of less than 8 kilotonnes of CO<sub>2</sub> per year and are developed or implemented by low-income communities and individuals as determined by the host Party. If a small-scale afforestation and reforestation project activity under the CDM results in net anthropogenic greenhouse gas removal by sinks of greater than 8 kilotonnes of CO<sub>2</sub> per year, the excess removal will not be eligible for the issuance of tCERs or ICERs."*

However, at that COP, only the inclusion and definition could be agreed upon as part of the negotiations to include afforestation and reforestation project activities under the CDM. The most difficult element to negotiate was the amount of net anthropogenic gas removal by sinks that would be permissible, with views ranging from 3 kilotons of CO<sub>2</sub> (China) to 45 kilotons of CO<sub>2</sub> (Africa). There was no limitation of the area which could be encompassed by the project boundaries, since it was understood that specific conditions in different countries could lead to different removal capabilities of the A&R project activity, regardless of the area size. Hence, the limitation was set only on the maximum amount of net anthropogenic greenhouse gas removal by sinks that would be eligible for certification.

COP10, in December 2003, also requested its Subsidiary Body for Scientific and Technological Advice (SBSTA) to present draft recommendations on simplified modalities and procedures for small-scale A&R project activities under the CDM at the next COP meeting (December 2004), as well as measures to facilitate the implementation of these projects.

At the onset of the discussions to meet the request by COP9, two issues related to the definition of small-scale A&R project activities were identified: (1) the difficulty to annually ensure net anthropogenic greenhouse gas removals by sinks (NA) of 8 kilotons of CO<sub>2</sub>; and (2) the fact that, to be consistent with the definition of NA, the maximum NA eligible should be expressed in terms of CO<sub>2</sub> equivalent, and not CO<sub>2</sub>. CO<sub>2</sub> equivalent (CO<sub>2eq</sub>) is meant to "convert" the emissions and removals of non-CO<sub>2</sub> greenhouse gases (such as methane and nitrous oxide) into CO<sub>2</sub> "equivalent" emission and removals. For the purposes of the Convention and the Kyoto Protocol, the Global Warming Potential (GWP) of these gases as established by the Intergovernmental Panel on Climate Change (IPCC) are used.

The consideration of these issues at COP10 led to the clarification *"that a small-scale afforestation or reforestation project activity under the clean development mechanism will result in net anthropogenic greenhouse gas removal by sinks of less than 8 kilotons of carbon dioxide per year if the average projected net anthropogenic greenhouse removal by sinks for each verification period do not exceed 8 kilotons of carbon dioxide equivalent per year"*.

At COP10, the possible simplifications for small-scale A&R project activities were intensely discussed, culminating in the agreement that the Executive Board of the CDM should develop, for COP11 evaluation: (1) default factors for assessing the existing carbon stocks and for simplified baseline methodologies; (2) simplified monitoring methodologies to estimate or measure the actual net greenhouse gas removal by sinks; (3) and guidelines to estimate leakage.

At COP10, however, some simplifications were already identified, as follows:

- no monitoring of the baseline is requested;
- if project participants can provide relevant information that indicates that in the absence of the small-scale afforestation or reforestation project activity under the CDM no significant changes in the carbon stocks within the project boundary would have occurred, they shall assess the existing carbon stocks prior to the implementation of the project activity. The existing carbon stocks shall be considered as the baseline and shall be assumed to be constant throughout the crediting period; and

- if project participants demonstrate that the small-scale afforestation or reforestation project activity under the CDM does not result in the displacement of activities or people or does not trigger activities outside the project boundary which would be attributable to the small-scale afforestation or reforestation project activity under the CDM, if an increase in greenhouse gas emissions by sources occurs, a leakage estimation is not required.
- If the conditions above cannot be met, the project participants may either follow the guidelines being developed by the Executive Board of the CDM or develop project-specific methods, provided they reflect good practice appropriate to the type of the project activity.

One of the concerns when accepting the inclusion of small-scale A&R project activities under the CDM regarded the possible fragmentation of a large project activity into smaller parts, which became known as debundling. In this case, the project activity is not eligible to use the simplified

modalities and procedures developed for small-scale A&R project activities under the CDM. COP10 established some criteria to determine the occurrence of debundling, based on the identity of the project participants, the timing of the request for registration, and the proximity of the proposed small-scale A&R project activity under the CDM to other already registered (or with an application for registration) small-scale A&R project activity. These criteria can be found in Decision 14/COP.10 in the site of the UNFCCC ([www.unfccc.int](http://www.unfccc.int)).

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