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DEVELOPMENTS IN UNFCCC/IPCC DISCUSSIONS REGARDING REDUCING EMISSIONS FROM FOREST DEGRADATION AND DEFORESTATION AND IMPLICATIONS FOR TROPICAL FORESTS AND TROPICAL TIMBER PRODUCERS

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EXECUTIVE SUMMARY

Deforestation continues at an alarming net rate of around 11 million ha/yr (FAO, 2006), with regions in the tropics and subtropics experiencing the largest losses. Emissions from land use change are responsible for up to 20-25% of the total anthropogenic emissions, 90% as a result of deforestation mainly in the tropics. In the period 2000 to 2005 4.2 GtCO2e have been emitted solely as a result of land conversion. Moreover, deforestation and forest degradation constitute the main source of GHG emissions in most developing and ITTO producing member countries. Forest, still and in particular tropical forest, constitutes the largest terrestrial carbon reservoir.

The Stern report states that the opportunity cost of REDD (in the form of net present value of foregone returns from agriculture over 30 years), in the 8 tropical countries that are responsible for 70% of global emissions from land use change, could be estimated at around $5 billion per annum initially with the total protection of their cumulated 6.2 million hectares annually that are deforested at present, i.e. an average annual net cost of $ 800 per hectare. One can assume with reasonable confidence that the annual net opportunity cost of REDD under sustainable forest management which allows products to be harvested would globally be less than half the figure calculated for the Stern report (2006), and in some regions and areas likely to be very much less than half. These figures don't consider values for environmental services, which are currently extremely difficult to calculate in monetary terms, but which would further reduce the opportunity cost of REDD if forests were managed sustainably. Under a regime of total forest protection, the whole opportunity cost would need to be covered by a REDD mechanism.

Recognising the importance of GHG emissions from deforestation, the Conference of the Parties of the UN Framework Convention on Climate Change agreed, in December 2005, on a two year process to consider policy approaches and incentive options to reduce emissions from deforestation in developing countries (RED) for a post-2012 climate regime. This process was initiated by a number of tropical countries, including ITTO producing member countries. Since then, the process has focused on understanding drivers for deforestation and the implications of different existing definitions of deforestation and forest degradation, as well as on discussing technical and methodological requirements, financing options, policy instruments, approaches and positive impacts of protection.

With regard to technical and methodological requirements, the discussion has centred on how to define baselines or reference scenarios, how to avoid leakage, how to ensure permanence of the emission reductions and how to properly monitor and report these reductions.

Discussions on financing options have included market and non-market mechanisms. It is important to be aware that a mechanism that captures the carbon values of forests in tropical and subtropical countries, and hence helps to reduce emissions from deforestation and forest degradation, could serve to:

(i) address a large fraction of global anthropogenic GHG emissions;
(ii) minimize the economic costs of achieving country emission reduction targets; and
(iii) provide strong incentives for developing countries to set emission reduction targets.

Policy instruments that could be used within the UNFCCC include the inclusion of activities for reducing emissions from deforestation as an eligible option in the Clean Development Mechanism, the addendum of a new flexible mechanism to the Kyoto Protocol or the design of a new protocol for REDD.

A decision on how to deal with emission reductions from deforestation and forest degradation is expected to be taken during the next Conference of the Parties of the UNFCCC in Bali, Indonesia in December 2007. Another ongoing process that is linked to the consideration of REDD is the negotiation on further commitments within the Kyoto Protocol. Decisions with regard to further commitment periods can have a great impact on REDD, especially if REDD is to be included in the Kyoto Protocol.

Concluding from the current international debate and deliberations of two technical meetings of the UNFCCC and a considerable number of reports published over the past year or so, ITTO member countries should be aware of the following facts:

- Curbing deforestation and reducing forest degradation in tropical forests is a significant and highly cost effective climate change mitigation strategy. Thus, there are strong arguments in favour of including the reduction of emissions from deforestation and forest degradation in developing countries (REDD) as an eligible mitigation activity in the climate change convention.
- Deforestation and forest degradation has multiple economic, political, social, demographic and environmental origins and any future arrangement would need to be flexible enough to cover a wide range of situations.
- National policies would need to be strengthened to address the root causes of undue deforestation and of forest degradation.

- Incentive systems would need to be established allowing international transfer payments and/or additional funding for sustainable forest management which includes forest conservation and the maintenance of a steady flow of forest products and services.
- Hence forest management should be shaped to integrate the notion of keeping and restoring carbon reservoirs as an additional element of SFM.
- Committing forests as carbon reservoirs should be led by the nations where the forests stand.
- There is a need to get experience through pilot activities that explore alternative approaches to REDD
- ITTO is well placed to help countries to shape their REDD policies and to conduct pilot projects which can contribute to shape an international REDD mitigation strategy

The present preliminary report recommends to the Council to consider promoting activities aimed at

- clarifying the current pace/rate of deforestation and forest degradation in producer countries;
- estimating the future pace/rate of deforestation and forest degradation;
- estimating the potential for emission reductions;
- estimating the costs and benefits of REDD;
- defining a national negotiation strategy for prompt action (until Dec. 2007) and future commitment periods (after 2012); and
- undertaking pilot projects and promote exchange of experiences, knowledge and technology.

The role of ITTO as an organisation is to support its member countries in the implementation of the six recommendations for actions, through:

- Sharing know how with the UNFCCC process and helping to shape the further development of REDD within the UNFCCC.
- Promoting capacity building in ITTO producing member countries to fully understand the issues and opportunities of a future REDD scheme in the UNFCCC and the consequences in respect to SFM.
- Supporting producer countries to identify their priorities for negotiation and to create a knowledge base in practical REDD.
- Helping to formulate and finance pilot actions and projects in ITTO member countries to help develop a sustainable and feasible REDD scheme.
- It is further recommended to include REDD as a thematic area in the new ITTA, 2006.

Complementarily we propose some activities which fit with the time line of the negotiations within the UNFCCC.

In the short-term, until the end of 2007, we recommend to allow the ITTO Secretariat to actively monitor and engage in the ongoing process within the UNFCCC until the next meeting of the Parties in December 2007, prepare and conduct an ITTO side event during COP 13 to demonstrate experiences on SFM, including C&I and ongoing and already evaluated projects on conservation, SFM and forest restoration, and to promote exchange. ITTO should also further develop the concept of SFM as a valuable REDD alternative and a viable option to maintain carbon reservoirs.

In the mid-term, we recommend that ways and means be considered in the new ITTO Action Plan 2008-2012 to implement pilot projects to integrate a REDD approaches and practices into the SFM of the permanent forest estate, including protected forests and production forests.

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DEVELOPMENTS IN UNFCCC/IPCC DISCUSSIONS REGARDING REDUCING EMISSIONS FROM FOREST DEGRADATION AND DEFORESTATION AND IMPLICATIONS FOR TROPICAL FORESTS AND TROPICAL TIMBER PRODUCERS

1 Introduction

The importance of climate change for tropical forests and trade in tropical timber is widely recognized by the International Tropical Timber Organization (ITTO). The 1994 International Tropical Timber Agreement (ITTA) refers to the United Nations Framework Convention on Climate Change (UNFCCC) in its preamble. Further, three objectives set out in Article 1 of the ITTA include elements related to the role of forestry in mitigation of, and adaptation to, climate change. These are: forest values other than timber; new and additional financial resources; and reforestation, forest management and rehabilitation of degraded land (see box 1).

Box 1: ITTA objectives related to climate change and the UNFCCC

Objective f. To promote and support research and development with a view to improving forest management and efficiency of wood utilisation as well as increasing the capacity to conserve and enhance other forest values in timber producing tropical countries;
Objective g. To develop and contribute towards mechanisms for the provision of new and additional financial resources and expertise needed to enhance the capacity of producing members to attain the objectives of this Agreement;
Objective j. To encourage members to support and develop tropical timber reforestation and forest management activities as well as rehabilitation of degraded forest land, with due regard for the interests of local communities dependent on forest resources.

The 1994 ITTA explicitly allowed the implementation of activities impacting on/related to/relevant to climate change, particularly those concerned with SFM, forest land restoration and rehabilitation of degraded forests. The preamble includes a reminder of the Rio Declaration on Environment and Development, the Non-Legally Binding Authoritative Statement of Principles for a Global Consensus on the Management, Conservation and Sustainable Development of all Types of Forests, and the relevant Chapters of Agenda 21 as adopted by the United Nations Conference on Environment and Development in June 1992, in Rio de Janeiro; the United Nations Framework Convention on Climate Change; and the Convention on Biological Diversity. It recognises Principle 10 of the Non-Legally Binding Authoritative Statement of Principles for a Global Consensus on the Management, Conservation and Sustainable Development of all Types of Forests, which states that new and additional financial resources should be provided to developing countries to enable them to sustainably manage, conserve and develop their forests, including through afforestation, reforestation and combating deforestation and forest and land degradation.

Under Article 1 of the Agreement, there are many stated objectives which are relevant to climate change and avoiding deforestation:

- To contribute to the process of sustainable development (c);
- To encourage members to support and develop industrial tropical timber reforestation and forest management activities as well as rehabilitation of degraded forest land, with due regard for the interests of local communities dependent on forest resources (j);
- To encourage members to develop national policies aimed at sustainable utilization and conservation of timber producing forests and their genetic resources and at maintaining the ecological balance in the regions concerned, in the context of tropical timber trade (l).

In the description of the work of the Committees under Article 27, the 1994 ITTA states the following for RFM:
"*The Committee on Reforestation and Forest Management shall:*

(a) Promote cooperation between members as partners in development of forest activities in member countries, inter alia, in the following areas:
(i) Reforestation;
(ii) Rehabilitation;
(iii) Forest management".

The ITTO Yokohama Action Plan 2002-2006 also provides several ideas that allow the implementation of activities related /relevant to climate change and avoiding deforestation. In the description of the post Libreville action Plan developments, it is stated that "*Over coming years, ITTO will monitor further developments in the UNFCCC and emission trading and will report regularly to Council on these developments and their potential implications for*

tropical forests and the world tropical timber economy. ITTO is contributing to further methodological development through project work that relates to forests and climate change". In its key strategies for implementation of Objective 2000, it is stated that one of the major focuses of ITTO is "*Diversifying incentives for maintaining and expanding the forest base to help ensure continued timber supplies. This would include factoring in the value of, and developing innovative markets for, ecosystem services derived from production forests*". Its outline of actions for implementation includes:

- Examine ways to broaden ITTO's funding base;
- Closer cooperation with other relevant organizations and fora, consistent with the Organization's evolving priorities.

Under cross-cutting actions, the following is mentioned:

Undertake special studies on emerging issues of relevance to the world tropical timber economy.

Similarly, the ITTO Mangrove Workplan 2002–2006 provides some relevant ideas as follows:

- Encourage members and assist them where appropriate to: (…) rehabilitate degraded mangroves.
- Encourage members and assist them where appropriate to: (…) undertake systematic research and monitoring activities to be used to assess the health of mangrove species and their habitat including, *inter alia*, the effects of climate change/sea-level rise.

Under « *GOAL 1: Support activities to secure the tropical timber resource base*", of Reforestation and Forest Management, the following actions were also included:

- (3) In cooperation with relevant organizations, monitor the potential implications for the resource base of climate change and related policy developments, and the contribution of the resource base to the mitigation of the effects of climate change.
- (4) Promote the conservation, rehabilitation and sustainable management of threatened forest ecosystems, *inter alia* mangroves, in collaboration with relevant organizations.
- (5) Assess opportunities for, and promote development of, non-timber forest products and forest services which can improve the economic attractiveness of maintaining the forest resource base; and
- (7) Encourage members and assist them, where appropriate, to: (...) develop innovative mechanisms and relevant legislative frameworks, including incentives and market-based instruments, to secure and expand, where appropriate, the forest resource base.

Under "*GOAL 2: Promote sustainable management of tropical forest resources*" of Reforestation and Forest Management, the following actions were also included:

- (3) Develop and promote the implementation of guidelines for the management of secondary tropical forests, the restoration of degraded tropical forests and the rehabilitation of degraded forest land.
- (5) Monitor and assess the environmental, social and economic costs and benefits of forest plantation development and utilize that information to promote, where appropriate, new plantations within the ITTO Guidelines for the Establishment and Sustainable Management of Planted Tropical Forests.
- (6) Contribute appropriately to national and international efforts in the area of prevention and management of fire in relation to tropical timber-producing forests; and
- (10) Encourage members and assist them, where appropriate, to: (…) implement research and development activities in the management of secondary tropical forests, restoration of degraded tropical forests and rehabilitation of degraded forest land, taking into consideration ITTO guidelines;

It is also worth mentioning that several decisions taken by the Council under the 1994 ITTA allow the implementation of activities under consideration. These Decisions include:

- Decision 4(XXXIV) Criteria and indicators for sustainable forest management.
- Decision 6(XXXIII) Prevention and management of forest fire.
- Decision 3(XXXII) ITTO Guidelines for the restoration, management and rehabilitation of degraded and secondary tropical forests.
- Decision 7(XXXII) Sustainable management and conservation of mangrove forest ecosystems: ITTO Mangrove work plan.
- Decision 7(XXXI) Mangrove forest ecosystem work plan.
- Decision 9(XXIX) Mangrove conservation programme.
- Decision 3(XXIV) Criteria and indicators for sustainable management of natural tropical forests.

The 2006 ITTA builds on the foundations of the previous agreements, focusing on the world tropical timber economy and the sustainable management of the resource base, simultaneously encouraging the timber trade and the improved management of the forests. In addition, it contains provisions for information sharing, including non-tropical timber trade data, and allows for the consideration of non-tropical timber issues as they relate to tropical timber. In this regard, the new Agreement has taken up emerging issues, reflecting the experiences and work of the Organization in the past, especially its most recent years. At the same time it is forward-looking enough to cope with future challenges. In its preamble, the Agreement recalls, among other things, the United Nations Framework Convention on Climate Change, the United Nations Convention on Biological Diversity and the United Nations Convention to Combat Desertification (para c). It recognizes the importance of the multiple economic, environmental and social benefits provided by forests, including timber and non-timber forest products and environmental services, in the context of sustainable forest management, at local, national and global levels and the contribution of sustainable forest management to sustainable development and poverty alleviation and the achievement of internationally agreed development goals, including those contained in the Millennium Declaration (para f).

The effort to reflect the experiences and work of ITTO in the past enabled the Agreement to widen the Organization's scope towards new fields such as trade in non-wood forest products and considerations in respect to the valuation and trade of tropical forest service functions, but also with regard to illegal logging and related trade. Thus it can now play an even more important role as a platform for the exchange of experiences, and feed into other ongoing processes. The examples of fields in this wider scope, as found in Article 1 of the Agreement are:

Para (f): Promoting and supporting research and development with a view to improving forest management and efficiency of wood utilization and the competitiveness of wood products relative to other materials, as well as increasing the capacity to conserve and enhance other forest values in timber producing tropical forests;

Para (g): Developing and contributing towards mechanisms for the provision of new and additional financial resources with a view to promoting the adequacy and predictability of funding and expertise needed to enhance the capacity of producer members to attain the objectives of this Agreement;

Para (j): Encouraging members to support and develop tropical timber reforestation, as well as rehabilitation and restoration of degraded forest land, with due regard for the interests of local communities dependent on forest resources;

Para (m) Encouraging members to develop national policies aimed at sustainable utilization and conservation of timber producing forests, and maintaining ecological balance, in the context of the tropical timber trade;

Para (q) Promoting better understanding of the contribution of non-timber forest products and environmental services to the sustainable management of tropical forests with the aim of enhancing the capacity of members to develop strategies to strengthen such contributions in the context of sustainable forest management, and cooperating with relevant institutions and processes to this end.

2 Tropical Forest and Climate Change: an Overview

Climate change is considered to be one of the major threats to sustainable development as a result of its impacts on health, infrastructure, settlements, agriculture and food security, and forest ecosystems.

According to the IPCC, unprecedented changes in the climate system have taken place during the 20th century. These changes can be observed through three variables: increments in average temperatures; changes in rainfall patterns; and an increase in the intensity and frequency of extreme events. It is now widely accepted that these changes in the climate system are closely related to increased human-induced emissions of greenhouse gases (GHG), especially during the last 150 years.

The burning of fossil fuels is the most important source of GHG. The second source of GHG emissions is from activities related to land use, primarily tropical deforestation, forest degradation and forest fires (see figure 1). GHG resulting from deforestation are mostly carbon dioxide with lesser amounts of methane and carbon monoxide. Besides its impacts on the climate system, deforestation is one of the most critical environmental problems facing developing countries today in terms of its long-term negative impact on biodiversity, loss of economic opportunities and increased social disparity.

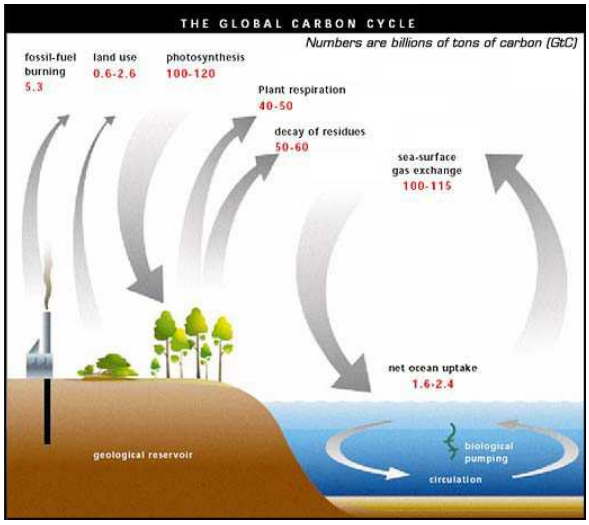

Figure 1: The global carbon cycle. Source: http://www.esd.ornl.gov/iab/iab2-2.htm

Forests can contribute to solving climate change related problems. The role of forests in carbon sequestration as a result of photosynthesis is well known. Because trees have a much longer lifespan than agricultural crops, they act as long-term reservoirs, which lock up the carbon for decades, even centuries, in the form of cellulose and lignin. Therefore, enhancing carbon sinks and reducing deforestation can contribute substantially to mitigating climate change and its impacts on ecological and social systems.

Impacts on forests

The impacts of climate change are likely to affect all forest landscapes. Indeed, the predicted change in climate variables will place severe pressure on forests' ability to adapt to these and to survive. With rising temperatures, changes in water availability and the expected double level of carbon dioxide, it is anticipated that forests will change at two levels: physiology and metabolism; and ecosystem functioning (see Table 1). These changes will impact on the availability and quality of both forest goods and services.

The IPCC Fourth Assessment report (IPCC 2007b) indicates that, while there is still uncertainty on predictions, negative climate change impacts may be stronger than previously projected and positive impacts are being over-estimated. Also, the projected potential positive effect of climate change, as well as the estimated carbon sink in mature forests, may be substantially threatened by enhancing or changing the regime of disturbances in forests such as fire, pests, drought, and heat waves, affecting forestry production including timber. Global climate change can affect the mitigation potential of the forestry sector by either increasing or decreasing potential for carbon sequestration.

Table 1: Summary of climate change impacts on forest ecosystems

Climate Factor	Cell level	Organism level	Species level	Ecosystem level
CO_2 increase	Photosynthetic rate increase	Growth rate increase	Decreased seed mortality	Biomass production increase
	Stomatal conductance reduction	Water use efficiency increase	Increased recruitment	Alterations in species competitiveness
		Seed production increase	Period for individuals to reach maturity	Changes in species composition
			Changes in individual population density	
Temperature increase	Photosynthesis increase or decrease	Primary production positive or negative changes	Regeneration rate changes	Alterations in species competitiveness
	Photosynthetic period can increase	Seed production changes	Possible increase in tree mortality	Species' composition changes
	Transpiration increase		Negative consequences for species sensitive to temperature changes	Soil mineralization increase
Rainfall regime changes	Growth rate reduction due to lower rainfall	Increase in seed mortality rate due to lower rainfall		Alterations in species competitiveness
			Increase of mature individuals' mortality rate	Species composition changes

Source: Meer, Kramek and Wjik, 2001.

The socioeconomic impacts of these changes in tropical forests have not been quantified yet. However, the following potential impacts on trade of forest goods and services can be listed[1]:

- Decrease in timber production as a result of increased extreme events such as forest fires, hurricanes, flooding and droughts;
- Decrease in timber production due to changes in ecosystems and increased pests;
- Changes in the quality of timber;
- Changes in the regional distribution of timber species;
- Impacts on the ability of some species designed for productive plantations to maintain growth rate and wood quality over the next 30 - 50 years;
- Indirect impacts on the timber chain due to changes in quantity and quality of offered timber;
- Impacts on the availability and quality of forest ecosystem services;
- Impacts on forest-dependant livelihoods; and
- Changes in land use due to an increasing demand for agricultural land.

[1] IPCC working group II has released its report on April 6, 2007. Therefore results of this report could not be fully integrated in the present document.

3 International Institutional Setting

Evidence of human interference with the climate first emerged in 1979 at the First World Climate Conference. Increased scientific evidence, coupled with growing public concern over global environmental issues began to push climate change onto the political agenda in the mid-1980s. Recognizing the needs of policymakers for authoritative and up-to-date scientific information, the World Meteorological Organization (WMO) and the UN Environmental Programme (UNEP) established the Intergovernmental Panel on Climate Change (IPCC) in 1988[2].

In 1990, the IPCC issued its First Assessment Report, confirming that climate change is a threat and calling for a global policy to tackle the problem. This call was echoed by the Ministerial Declaration of the Second World Climate Conference, held in Geneva at the end of 1990. Based on this Declaration, the UN General Assembly formally launched the negotiations on a framework convention on climate change. After 15 months of intergovernmental negotiation, governments adopted the United Nations Framework Convention on Climate Change (UNFCCC) in May 1992. The Convention was opened to signature in June 1992 during the UN Conference on Environment and Development (UNCED) held in Rio de Janeiro and came into force in March 1994. Today, 186 countries have signed and ratified the Convention.

The Convention's goal is "*to stabilise atmospheric concentrations of GHG at a level that would prevent human-induced actions from leading to "dangerous interference" with the global climate system* "(Art. 2 of the UN Framework Convention on Climate Change) The UNFCCC acknowledges that countries have "common but differentiated responsibilities" and different capabilities to address climate change. Under such premises, developed countries have engaged themselves to take a leading role in achieving the Convention's goal. In assisting developing countries in mitigation and adaptation activities, developed countries compromised themselves to provide new and additional funds. Mitigation and adaptation activities must be consistent with and supportive of sustainable development objectives. Scientific uncertainties that might still remain cannot be used as an argument to postpone action ("precautionary principle").

Members meet once a year in the Conference of the Parties (COP) to monitor implementation of the UNFCCC and to continue negotiations on how best to tackle climate change.

There are two main ways to address climate change: adaptation and mitigation. These strategies are complementary and non-exclusive.

Adaptation to climate change refers to adjustments in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderate, harm or exploit beneficial opportunities. Various types of adaptation can be distinguished, including anticipatory and reactive adaptation, private or public adaptation and autonomous or planned adaptation. Besides the stages for adaptation shown in the figure 2 the UNFCCC agreed in the last COP the Nairobi Adaptation Workplan, which includes a wider spectrum of possibilities for promoting adaptation to climate change.

Mitigation refers to an anthropogenic intervention to reduce the emission of GHG at the source or to enhance sinks (IPCC, 2001). At the third COP, held in Kyoto in 1997, the Parties to the Convention adopted a protocol aimed at paving the way for emission reduction in Annex I countries until 2012[3] (see figure 2)). This instrument is known as the Kyoto Protocol (see figure 2). The Kioto Protocol is a legal binding agreement in which many industrialised countries committed to reduce a total 5.2% of their emissions compared to the base year 1990. Countries with commitments are known as Annex I countries (see Annex 1 of this report for the list of the countries with commitments). Additionally, the reductions committed are to be achieved during the period between 2008 and 2012. For this reason this period is known as the "first commitment period". Commitments beyond 2012 are currently under negotiation. A first decision on this matter is expected to be taken by 2011 during the COP 15.

Countries with reduction commitments have two options: to reduce emissions within the country (internal measures) or to use the Flexible Mechanisms. These mechanism allow Annex I countries to "buy" part of their reductions commitments in other countries. There are three such Flexible Mechanisms: Joint Implementation, Clean Development Mechanism and International Emission Trading[4] (see fig. 2)

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[2] Until now the IPCC has produced three assessment reports, a special report on Land Use, Land Use Change and Forestry and several specific guidelines concerned with climate change and natural resources.

[3] Annex I countries are Parties that have emission reduction commitments (mainly industrialized countries). A list of Annex I countries is provided in the annex to this publication.

[4] **Joint Implementation** (Art. 6): "*Any Party included in Annex I may transfer to, or acquire from, any other such Party emission reduction units resulting from projects aimed at reducing anthropogenic emissions by sources or enhancing anthropogenic removals by sinks of greenhouse gases in any sector of the economy…*"

Clean Development Mechanism (Art. 12): The purpose of the clean development mechanism shall be to assist Parties not included in Annex I in achieving sustainable development and in contributing to the ultimate objective of the Convention, and to assist Parties included in Annex I in achieving compliance with their quantified emission limitation and reduction commitments under Article 3.

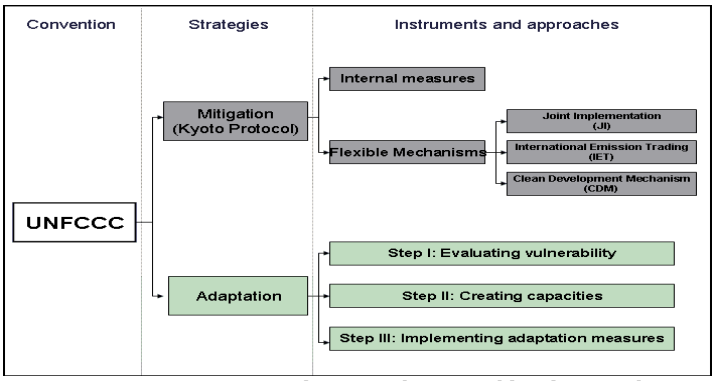

Figure 2: Strategies, Instruments and Approaches to tackle Climate Change

3.1 Forestry activities in the Kyoto Protocol

Forestry activities belong to "Land Use, Land Use Change and Forestry" (LULUCF). The use of LULUCF activities in the Kyoto Protocol is ruled by articles 3.3.and 3.4[5]. Further, eligibility of LULUCF activities for internal measures and in the Flexible Mechanisms were ruled by decisions of the COP, including specific modalities and procedures for the CDM. LULUCF includes the definition of forest and seven activities for the Kyoto Protocol activities (see box 2). There are important differences in the treatment of these seven forestry activities which are to be considered for the internal measures, for the Joint Implementation (JI) or for the Clean Development Mechanism (CDM).

Box 2: Key definitions in LULUCF

(a) **"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 metres at maturity *in situ*. A forest may consist either of closed forest formations where trees of various storeys and undergrowth cover a high proportion of the ground or open forest. Young natural stands and all plantations which have yet to reach a crown density of 10-30 per cent or tree height of 2-5 metres 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;

(b) **"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;

(c**) "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;

International Emission Trading (Art. 17): The Parties included in Annex B (~Annex I of the UNFCCC) may participate in emissions trading for the purposes of fulfilling their commitments under Article 3. Any such trading shall be supplemental to domestic actions for the purpose of meeting quantified emission limitation and reduction commitments under that Article.

5 **Art. 3.3:** "*The net changes in greenhouse gas emissions by sources and removals by sinks resulting from direct human-induced land-use change and forestry activities, limited to afforestation, reforestation and deforestation since 1990, measured as verifiable changes in carbon stocks in each commitment period, shall be used to meet the commitments 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* ».

Art. 3.4: "*Prior to the first session of the Conference of the Parties serving as the meeting of the Parties to this Protocol, each Party included in Annex I shall provide, for consideration by the Subsidiary Body for Scientific and Technological Advice, data to establish its level of carbon stocks in 1990 and to enable an estimate to be made of its changes in carbon stocks in subsequent years. 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.* »

(d) **"Deforestation"** is the direct human-induced conversion of forested land to non-forested land;

(e) **"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 contained here;

(f) **"Forest management"** is a system of practices for stewardship and use of forest land aimed at fulfilling relevant ecological (including biological diversity), economic and social functions of the forest in a sustainable manner;

(g) **"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;

(h) **"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.

Source: Dec. 11/CP.7 in FCCC/CP/2001/13/Add.1

The main difference between internal measures and flexible mechanisms in the treatment of forest is that for the internal measures, emission reductions are accounted on the basis of net changes in carbon stocks at the national level. These changes are recorded in the GHG national inventories submitted to the UNFCCC Secretariat. In the case of the flexible mechanisms, especially Joint Implementation and the Clean Development Mechanism, emission reduction or carbon sequestration is based on project activities.

There are also important differences in the treatment of LULUCF in the Joint Implementation (JI) and the Clean Development Mechanism (CDM), especially with regard to host countries, eligible activities, permanence and leakages (see table 2).

Table 2: Comparison of the treatment of LULUCF activities in JI and CDM

	Joint Implementation	Clean Development Mechanism
Host Countries	Annex I countries	Non- Annex I countries
Eligible Activities for the First Commitment Period	-Afforestation Reforestation - Revegetation - Forest Management -Cropland Management -Grazingland Management	Afforestation and Reforestation
Additionality	Not considered	Project activities have to sequester additional carbon against the baseline.
Treatment of leakage	Not considered	Has to be considered and if existent, leakage has to be reduced from the carbon potential and monitored during the lifespan of the CDM project activity.
Treatment of Permanence	Not considered	Carbon offset for A/R project activities in the CDM is considered as non-permanent. As a consequence, credits form these projects have a temporary character and are therefore cheaper than credits from other sectors.
Socio-economic and environmental impacts	Only environmental issues considered	Need to be considered. If any socio-economic or environmental potential impact is considered significant by the host countries or project participants, an impact assessment has to be conducted. Measures aimed to reduce these potential negative impacts are subject of periodical monitoring.
Responsible Body	Joint Implementation Supervisory Committee (JISC)	Executive Board of the CDM (EB)
Key decisions		"Marrakech Accords", COP-7, 2001 (FCCC/CP/2001/13): Dec. 11/CP7: "*Land Use, Land-Use Change and Forestry*" Dec. 17/CP7: "*Modalities and procedures for a clean development mechanism as defined in Art. 12 of the Kyoto Protocol*" COP-9, 2003 (FCCC/CP/2003/6): Dec. 19/CP9: "*Modalities and procedures for afforestation and reforestation project activities under the clean development mechanism in the first commitment period of the Kyoto Protocol*" COP-10, 2004 (FCCC/CP/2004/10) 13/CP.10 "*Incorporation of the modalities and procedures for afforestation and reforestation project activities under the clean development mechanism into the guidelines under Articles 7 and 8 of the Kyoto Protocol*" 14/CP.10 "*Simplified modalities and procedures for small-scale afforestation and reforestation project activities under the clean development mechanism*

		in the first commitment period of the Kyoto Protocol and measures to facilitate their implementation" 15/CP.10 "*Good practice guidance for land use, land-use change and forestry activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol*". COP-11, 2005 (FCCC/CP/2005/10) Decision -/CMP.1 "*Simplified modalities and procedures for small-scale afforestation and reforestation project activities under the clean development mechanism in the first commitment period of the Kyoto Protocol and measures to facilitate their implementation*"
Number of Methodologies and Projects approved by March 2007	None	7 methodologies as well as different tools and clarifications 1 project

Until now, 44 projects have been presented for the JI. However, not a single project is on forestry activities. With regard to the CDM, there are seven approved methodologies for forestry projects, including a simplified methodology for small scale projects. To date 1 project has been validated.

4 Deforestation, Forest Degradation and Carbon Pools: What is the Problem?

4.1 Tropical Forests and the Deforestation Plethora

Tropical forests and their soils are a vital resource for the countries in which they occur – for the production of wood and other forest products; for the conservation of soil, water, flora and fauna; or as a reserve of land that may be converted to agricultural production or other use. Although deforestation and forest degradation are not new – in some places, forest conversion has being going on for millennia – deforestation and forest degradation over the past 100 years are a problem that occurs particularly in developing countries in the tropics (see figure 3).

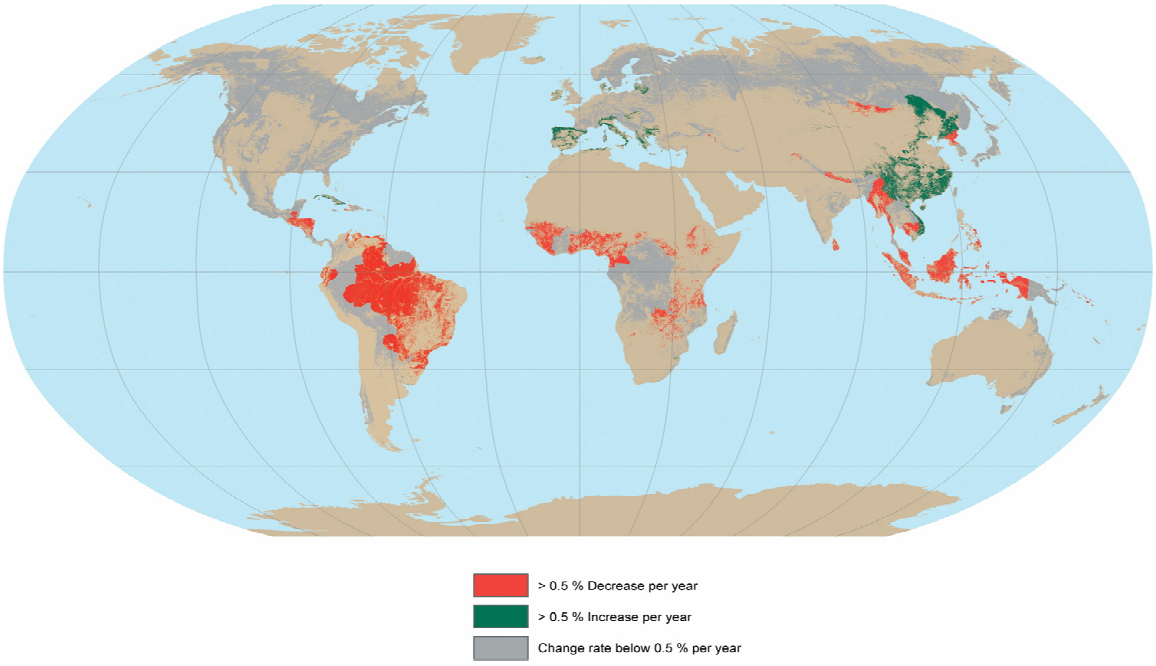

Figure 3: Dynamics of global forest cover (FAO 2006)

According to FAO's Forest Resources Assessment of 2005 (FAO 2006), about half of the 4 billion hectares of the global forests are situated in developing countries in the tropics and subtropics. Deforestation, mainly as conversion of forests to agricultural land, continues with an average rate of 11.3 million hectares forest loss per annum between 1990 and 2005 (based on 78 tropical countries), which corresponds to a pan tropical annual deforestation rate of 0.65%. Countries with the highest absolute deforestation per annum over the same time span were Brazil, Indonesia, Sudan, Myanmar and the Democratic Republic of Congo, see table 3. The four countries combined account for 40% of the total tropical forest area and 52% of the total deforestation rate between 1990 and 2005. The countries with the highest relative deforestation rate per annum (1990 – 2005) are Burundi (6%), Togo (5.2%), Honduras (3.9%) and Nigeria (3.7%).

Total deforestation rates according to the main tropical regions. A total of 78 developing countries situated in the tropical belt have been considered in the analysis. The average deforestation per annum over 15 years (1990 – 2005) is highest in tropical South America (24 countries) with 4.44 million hectares, followed by Africa (4.1 million hectares, 36 countries) and Tropical Asia and Pacific (2.8 million hectares, 18 countries). Figure 2 summarizes the relative deforestation rates over the same period. In relative terms, the highest deforestation is observed in Tropical Asia (0.88%), followed by Africa (0.69%) and Tropical America (0.53%). The sub-regions with the highest relative loss of forests between 1990 and 2005 are West Africa and Central America with 1.65% and 1.05% forest cover loss respectively per annum. A special case is observed for the Caribbean islands that report a gain in forest cover of 0.82% compared to 1990. This is due to a particularly high forest cover reported in the 2005 report by Cuba. It has to be observed, nevertheless, that not all data collected in the FRA 2005 are based on independent assessments, such as satellite imagery survey, and for a number of countries the available data might not accurately reflect a country's real forest area. The general trend in forest area development, however, remains valid.

Table 3: The ten countries with the highest absolute and relative deforestation rates in the world (based on data of the Forest Resource Assessment 2005 – FAO, 2006)

Country	Deforestation (ha) (average per annum 1990-2005)	Country	Deforestation (% of 1990 forest cover)
Brazil	2,821,900	Burundi*	6.0
Indonesia	1,871,500	Togo*	5.2
Sudan*	589,000	Honduras*	3.9
Myanmar*	466,500	Nigeria	3.7
DR Congo*	461,400	Niger*	3.6
Zambia*	444,800	Philippines	3.2
Tanzania*	412,300	Benin*	2.8
Nigeria	409,700	Uganda*	2.4
Zimbabwe	312,900	Ghana	2.3
Venezuela	287,500	Indonesia	2.1
Other 68 countries	3,257,400		
Total	11,334,900	Average 78 tropical countries	0.65

*LDC countries in the UNFCCC Source: Forner et al., 2006

Generally spoken, the conversion of forested land to other uses such as agriculture represents a radical change in the environment and the ecology of an area. Knowledge of the longer term implications of these large scale changes in the forest landscape - at national and global levels - is limited; however, there is evidence that deforestation contributes to impoverishment of poor people and causes deterioration in local site conditions or exacerbates natural disasters.

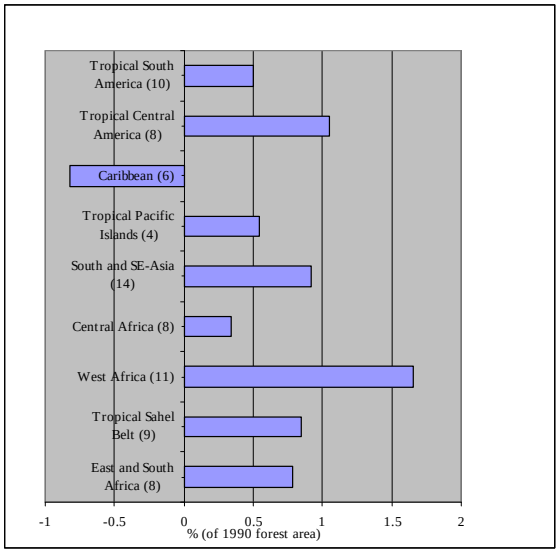

Figure 4: Relative changes in forest areas per year (average years 1990-2005, database: FAO 2006)

According to the specific localities and the particular socio-economic conditions, there is a wide array of drivers contribute to deforestation. There is plentiful literature available about the causes and effects of deforestation, some are succinct and analytical (e.g. Kaimowitz and Angelsen, 1999; Wunder, 2003) and others descriptive and proposing deforestation models (e.g. Jepma, 1995).

Table 4 presents a rough attempt to describe the range of drivers in the different parts of the tropics. While deforestation occurs for different reasons, most of the conversion is for agricultural purposes, including planting crops and grazing cattle. Infrastructural development, oil extraction, mining and commercial logging are other direct drivers of deforestation.

Due to social, environmental and political complexities, to the indirect nature of many of the causal relations and to the wide diversity of situations, any attempt to generalize the causes of deforestation and forest degradation is difficult and "invites criticism" (Kaimowitz and Angelsen, 1999). Current policies and market failures often lead to inappropriate deforestation and forest degradation. Despite substantial controversy surrounding forest use, particularly concerning resource depletion through timber harvesting, hunting and non-timber forest product gathering, the greatest influence upon forest destruction has resulted from activities outside the sector, that is, agriculture, transmigration, energy, mining and infrastructure development. In fact, non-forest sector projects and policies affect forest destruction and poverty in forested areas more than any forestry activity or forest policy *per se* (Blaser and Douglas 2000).

Table 4: Drivers of deforestation and their importance in the main tropical regions

Drivers	Tropical Sahel Belt	West Africa	Congo Basin	East and South Africa	South and SE Asia	Pacific Islands	Central America	Tropical South America
Institutional drivers:								
Development Strategies(1)	-	++	++	++	+++	+	+	+++
Migration (2)	+	+	+	-	++	-	+	++
Economic Drivers:								
Small-scale agriculture	+	+++	+	+++	++	+++	+++	+++
Agrobusiness: soya, oil palm, rubber, cattle, …	++	+++	+	++	+++	++	++	+++
Timber extraction	+	++	+++	+	++	++	+	+
Pulp, plantations	-	++	+	+	+++	+++	+	++
Fuelwood extraction	+++	++	+	++	+	++	++	+
Mining and Oil	+	++	+	++	+	-	-	++
Social Drivers:								
Opportunities (3)	-	++	+	+	++	-	+++	+++
Poverty	+++	++	++	++	+	+	+++	+
Armed conflicts	++	++	++	+	-	-	+	-

+++: strong influence; ++ medium influence; + low influence; - no influence at all

(1) Development strategies include government policies to create incentives for land-use other than forests, infrastructural development and macroeconomic policies detrimental to forests;

(2) Migration includes planned transmigration programmes, incentive programmes to displace families and unplanned colonization of forest land;

(3) Opportunities include land speculation, taking advantages of short term economic shortfalls, etc.

Despite of the controversy over transformation from forest to other land use, it has also to be said that not all deforestation is undesirable. Social and economic pressures make it inevitable that substantial areas of what is still natural forest today will be converted to agriculture and other uses (Blaser and Douglas 2000). Deforestation, thus, can be an integrated element of economic and social development and as such not undesirable in many circumstances. For many actors, forest land is perceived as a reserve of land for other uses than forestry. Particularly in forest-rich countries or in forest rich regions within a country, forests might still be perceived as a hampering factor for development or just as the "development reserve". In forest-poor countries or forest-poor regions within a particular country, the perception of forests might be completely different. Here, the remaining forest often receives more attention as a component of proper land-use; in such situations the specific role of the forests and trees as an economic resource or an important economic element at the landscape level has often been fully recognized. There are often short-term considerations and

financial gains that drive deforestation and in particular forest degradation. Hence it is important to distinguish between what could be denomited as "good" and "bad" deforestation. It would be of utmost importance that deforestation be discouraged when:

- it is not efficient from an economic viewpoint;
- it is non-sustainable – in other words, it is a threat to environmental stability; and
- it leads to social inequities and conflicts.

Deforestation and forest degradation have received a great deal of attention in international politics and have even become an emotive and divisive issue in the wider public. Despite the prominence given to tackling deforestation and the numerous efforts to reduce deforestation in natural forests, it continues unabated. Paradoxically, this has occurred despite international negotiations on the fate of the world's forests and the input of substantial resources through national budgets and donor grants, World Bank lending, Global Environmental Facility grants, grants through the International Tropical Timber Organization, global alliances and campaigns on forests, debt-for-nature-swaps, and other initiatives.

Over the past 15 years or so, the international community has failed to reach consensus over a legally binding instrument on forests that includes the curbing of tropical deforestation as a major goal. The debate on how to shape an international regime on forests is still ongoing within the UN Forum on Forests under the Economic and Social Council of the UN, but, in early 2007, its mandate and scope still remain unclear. Since the early 1990s, the international negotiation process included deliberations under the Intergovernmental Panel on Forests, followed by the Intergovernmental Forum on Forests and finally, since 2000, within the United Nations Forum on Forests (UNFF).. In 1993 the CGIAR network launched the Centre for International Forestry Research, and various huge initiatives have been undertaken by international environmental organizations, such as WWF and IUCN, to protect and restore forests and to curb deforestation. To date, none of these processes and initiatives have reached their goals..

4.2 Emissions from Deforestation and Forest Degradation

4.2.1 General Estimates of Forest Carbon Emissions

Forests account for almost half of the global terrestrial carbon pool (reservoir), and if vegetation alone is considered (excluding soils), they hold about 75% of the living carbon. The total carbon content of forest ecosystems in 2005 was estimated at 1,036 $GtCO_2$ (FAO Forest Resources Assessment 2005). Changes in forest area and forest carbon content per area are intrinsically linked to carbon emissions and removals. Forests play an important role in the global carbon budget because they can be either sources or sinks of atmospheric carbon.

Table 5: Global CO_2 budgets in GtC/yr (GtCO2/yr) for 1980-1989, 1990-1999, and for 2000-2005.

	SAR*	**TAR***		**AR4º**		**SR-LULUCF+**	
	1980-1989	**1980-1989**	**1990-1999**	**1990-1999**	**2000-2005**	**1980-1989**	**1989-1998**
Emissions from fossil fuel and cement	5.5 ± 0.3 (20.2)	5.4 ±0.3 (19.8)	6.3 ±0.4 (23.1)	6.4 ±0.4 (23.5 ±1.5)	7.2 ±0.3 (26.4 ±0.9)	5.5 ±0.5 (20.2)	6.3 ±0.6 (23.1)
Emissions from land use change	1.7 ±0.6 (6.2)	1.7 ±0.8 (6.2)	ND	1.6 ±0.9 (5.9 ±4.0)	ND	1.7 ±0.8 (6.2)	1.6 ±0.8 (5.9)
Land-atmosphere flux[6]	-0.2 ±0.6 (-0.7)	-0.2 ±0.7 (-0.7)	-1.4 ±0.7 (-5.13)	-1 (-3.66)		-0.2 ±1.0 (-0.7)	-0.7 ±1.0 (-2.5)

*(Based upon chapter 3, table 2 of Summary for Policymakers, IPCC WGI TAR)
º (Based upon Summary for Policymakers, IPCC WGI Fourth Assessment Report)
+(Based upon IPCC, Special report on Land use, land-use change and forestry)

[6] *Land-atmosphere flux is* the balance of a positive term due to land-use change and a residual terrestrial sink. The two terms cannot be separated on the basis of current atmospheric measurements. Using independent analyses to estimate the land-use change component for 1980 to 1989, the residual terrestrial sink can be inferred as follows: Land use change 1.7 PgC/yr (0.6 to 2.5); Residual Terrestrial sink -1.9 PgC/yr (-3.8 to 0.3)-

Currently, there is no agreement on the magnitude of the net flux from forests to the atmosphere. This net flux is a balance between a large global sink caused mainly by increased carbon uptake in mid to high latitudes lands -mostly from forest regrowth- and a large source caused mainly by deforestation and degradation of tropical forests (Table 5).

The 20% decrease in forest area since 1850 has contributed 90% of the carbon emissions from land-use change since then (Houghton et al 2001). Emissions depend on both the rate of deforestation and changes in carbon stock per hectare after deforestation, with changes in carbon stocks varying with land use, region, ecosystem, and use of the removed forest biomass. In addition, forest fires contribute to the release of GHG.

Annual emissions from land-use change (mainly through deforestation and degradation in tropical developing countries) account for approximately 20-25% of the total anthropogenic emissions of greenhouse gases, but estimates of the magnitude of these emissions are uncertain for several reasons such as a lack of resources, lack of standard methods, lack of capacity at national levels, and lack of data (Houghton 2005).

Table 6. Estimates of carbon loss from tropical forests to the atmosphere and attributed to deforestation (from different authors) . (In GtC/yr (GtCO2/yr)

Region	Fearnside (2000) 1981-1990	Malhi and Grace (2000) 1980-1995	Houghton (2003) 1990s	DeFries et al. (2002) 1990s	Achard et al. (2004) 1990s
America	0.94 (3.45)	0.94 (3.45)	0.75 (2.75)	0.43 (1.58)	0.44 (1.61)
Africa	0.42 (1.54)	0.36 (1.32)	0.35 (1.28)	0.12 (0.44)	0.16 (0.59)
Asia	0.66 (2.42)	1.08 (3.96)	1.09 (4.00)	0.35 (1.28)	0.39 (1.43)
Total	**2 (7.33)**	**2.4 (8.8)**	**2.2 (8.06)**	**0.91 (3.33)**	**0.99 (3.63)**

Source: Adapted from UNFCCC, 2006b

Independent estimates of emissions from global or tropical ?deforestation range from 2.0 to 2.4 GtC/yr for the 1980s to 0.91-2.2 GtC/yr for the 90s (Table 6). The amount of carbon emitted by region also shows important variations according to different authors. On the other hand, the IPCC has consistently provided global estimates of emissions from land use change in the range of 1.7 GtC/yr (6,230 GtCO2/yr) for the 80s to 1.6 GtC/yr (5800 MtCO2/yr) for the 90s with uncertainties ranging from plus-minus 0.6 to 0.9 GtC/yr (Table 6) (IPCC 2007, UNFCCC 2006b).

Table7: Estimates of forest area, net changes in forest area (negative numbers indicating decrease), carbon stock in living biomass and growing stock in 1990, 2000 and 2005

Region	Forest area, million ha	Annual change, million ha/yr		Carbon stock in living biomass, $GTCO_2$			Annual emissions/uptake GTCO2		Growing stock in 2005
	2005	1990-2000	2000-2005	1990	2000	2005	2000/90	2005/2000	million m^3
Africa	635'412	-4.4	-4	241.27	228.07	222.93	-1.3	-1.03	64'957
Asia	571'577	-0.8	1	150.70	130.53	119.53	-2.0	-2.20	47'111
Europe[1)]	1'001'394	0.9	0.7	154.00	158.03	160.97	0.4	0.59	107'264
North and Central America	705'849	-0.3	-0.3	150.33	153.63	155.47	0.3	0.37	78'582
Oceania	206'254	-0.4	-0.4	42.53	41.80	41.80	-0.1		7'361
South America	831.540	-3.8	-4.3	358.23	345.40	335.50	-1.3	-1.98	128'944
Total	3'952'026	-8.9	-7.3	1'097	1'057	1'036	-4.00	-4.25	434'219

Note 1) including whole Russian federation
Source: FAO (2006) NOTE: South America forest area is wrong- and then check total

Finally, in its latest Forest Assessment Report, FAO also estimates the evolution of carbon stocks by region and at the global level between 1990 and the year 2005. According to these estimates, which combine remote sensing with information provided by countries, the global carbon stocks have decreased from 1,097 GtCO2 in 1990, to 1,057 GtCO2 in the year 2000 and to 1,036 GtCO2 by the year 2005 (Table 7). From these figures, we may infer global annual emissions of 3,960 MtCO2/yr in the period 1990-2000 to 4,253 MtCO2/yr in the period 2000-2005. If we

subtract the carbon sinks from North America and Europe, the net emissions amount to 4,690 MtCO2/yr and 5,207 MtCO2/yr respectively for the above mentioned periods.

When estimating carbon emissions from land use change, both the area and extent of land cover change from forest to non-forest and the carbon emissions associated with each land cover type must be estimated. Remote sensing technology has improved over the past two decades, and the process of discriminating between forest and non-forest using high resolution imagery can achieve accuracies of up to 95%. However, the high spatial variability in carbon stocks within different forest types causes uncertainty when extrapolating from one or several point surveys to global estimates.

Estimates of the future rate of deforestation vary widely among different authors. Sathaye *et al.* (2007) estimate that deforestation will continue in all the regions, particularly at high rates in Africa and South America, for a total of just under 600 million ha lost cumulatively by 2050. Using a spatial-explicit model coupled with demographic and economic databases, Soares-Filo *et al*, (2006) predict that under a business-as-usual scenario, by 2050, projected deforestation trends will eliminate 40% of the current 540 million ha of Amazon forests, releasing approximately $117{,}000 \pm 30{,}000$ $MtCO_2$ of carbon to the atmosphere[7].

Attributing carbon emissions shares to different drivers of deforestation outlined in the previous section is very difficult, since often only the amount of forest areas cleared are known but not the proximal causes of deforestation. Also, the carbon dynamics differ according to the new forms of land-use. For example, a change from forest to the establishment of pasture may lead in some cases to an increase in soil carbon, while a change to agriculture will decrease the soil carbon pool. In general, the replacement of native forests with annual agriculture crops and/or pasture will have the most dramatic effect on carbon emissions, leading to a loss of up to 90% of the carbon previously found in living biomass and 30% of the carbon stored in soils.

4.2.2 Estimating Emissions from Land Use Change: National Level and Project Level Approaches

In recent years, there has been much progress in the acquisition of data and the development of methods and tools for estimating and monitoring carbon emissions from tropical deforestation and degradation. The quantification of emissions must be based on the area of forest change and the associated biomass and carbon soil loss.

A challenge at the national level is to estimate the extent of land cover change from forest to non-forest land-uses and the carbon stocks as well as the carbon emissions associated with each land cover type (Brown, 2002; DeFries et al., 2006). For monitoring deforestation at the national level, the interpretation of remotely sensed data must be backed up by ground-based observation (DeFries et al., 2006). But monitoring degradation, which may also occur over large areas and may give rise to significant emissions, is more difficult. It requires more cognition in image analysis and very high resolution data. The challenges consist in developing standard protocols for using the remote sensing data, and analytical methods that suit the variety of national conditions but yet meet acceptable levels of accuracy; one approach is to use a "hierarchical nested approach" as suggested by DeFries et al. (2006) (Figure 5).

The second large task is to estimate changes in carbon stocks, because the high variability in carbon stocks within different forest types makes the extrapolation of data difficult. In addition, it is necessary account for the loss of biomass as a result of degradation[8]. In the past, degradation has not been given much consideration and has not been quantified in most countries. It is much more difficult to detect from remote sensing imagery than deforestation and may take place far away of roads, so remains often also invisible from the ground (Trines et al., 2006).

For detecting carbon stock changes, it is first recommended to use the IPCC methods and good practice guidance (IPCC, 2003, IPCC 2006). Governments need a well-established operational forest monitoring system, but for most countries, a minimum forest inventory program based on the IPCC Inventory Guidelines and FAO Forest Assessment[9] would be needed in order to obtain C stock estimates. Ground based methods are also currently essential; in these cases tree biomass is estimated via forest stock volumes using the tree algometry (using biomass expansion factors). Remote sensing for measuring aboveground biomass will be available in the near future. For example, Radar and Lidar sensors can be used for these purposes (UNFCC, 2006b).

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[7] IPCC Fourth assessment report. Chapter 9. Forestry

[8] In the case of forest degradation, the biomass is progressively thinned out, although the area would still be considered "forest" (e.g. when canopy cover drops below 10%, which it may never do).

[9] The 2005 FAO FRA, provides country-level data on forest area, rates of conversion, and carbon stocks to facilitate the estimation of changes in carbon stocks in the absence of more detailed national data.

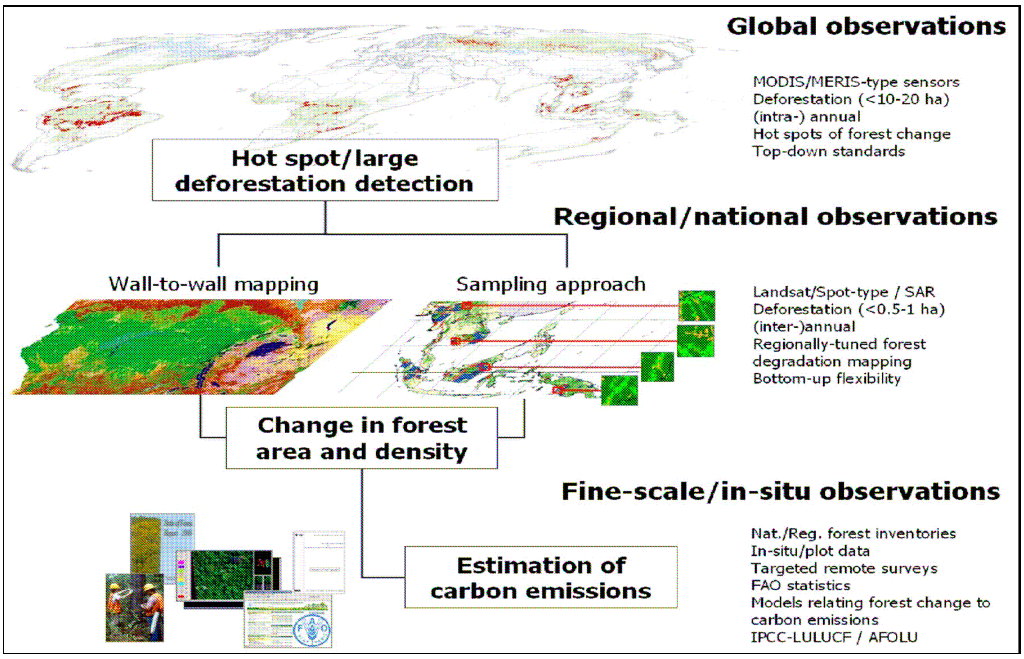


Figure 5: Conceptual framework for hierarchical method for tracking carbon emissions from land used change (from DeFries et al. 2006).

At the project level, problems to be resolved are broadly the same as those at the national level: it is necessary to obtain the most accurate information on land use change processes within the project. This task usually requires high resolution imagery but often this is not possible due to lack of economic resources or lack of data for the study region. Local expert knowledge and the use of sampling methodologies are necessary to obtain estimates of changes in forest cover; these methodologies must be useful for individual projects but also generic enough to be applied for large scale estimation

4.2.3 Links between Deforestation, Forest Degradation and Bio-fuels

Recently, the commercial use of biomass for bioenergy has received a boost from high oil prices and the policies that governments have initiated to promote renewable energy sources. Over the past few years, the areas under biofuel plantations have increased dramatically around the world, particularly of soybeans and oil palm. This latter produces more oil per hectare than any other oilseed, and can be blended directly with petroleum-based diesel, producing a cleaner fuel. Malaysia and Indonesia account for 85% of the palm oil produced worldwide (Carrere 2006).

In Brazil, in 1940 there were only 704 hectares of soya fields, by 2003 there were 18 million hectares. Globally, the areas under oil palm and under soybean increased by 43% (10.7 million hectares) and 26% (77.1 million hectares) respectively during 1990-2002.

In 2002 three million hectares were covered with oil palm plantations in Indonesia. Currently, six million hectares of land have oil palm plantations; these plantations traditionally supply the domestic and international market for household products such as soap, margarine and cooking oil. However, the use of oil palm for bio-diesel to reduce greenhouse gas emissions from petroleum diesel is pushing further the demand for this crop One study calculates that 0.3 ha of oil palm plantation would be needed to generate 1 m3 of bio-diesel. In 2009, bio-diesel from oil palm is projected to reach 2% of diesel consumption or 0.7 million m3, requiring over 200,000 ha of plantations. In 2025 the demand for biodiesel is projected to reach 5% of petroleum diesel consumption, equivalent to 4.7 million m3. This will need 1.41 million ha of oil plantations[10].

Because plantations are often established after natural forests have been logged and then burned to clear the land for planting, the increasing area under plantations of oil palm may seriously threaten the remaining tropical forests in Indonesia, outside national parks and other protected areas. Furthermore, large parts of South East Asia consist of peatlands, initially covered by rainforests. These peat swamp forests store significant CO_2 amounts that have been accumulated over thousands of years. Rainforest peatlands are rapidly being destroyed as through deforestation and

[10].DTE 69, 2006. Down to Earth. International campaign for ecological justice in Indonesia.

drainage for plantations (mainly oil palm an pulp wood). A recent study elaborated by Wetlands International[11] has found that one tonne of biodiesel made from palm oil grown on Southeast Asia's peatlands is linked to the emission of 10-30 tons of carbon dioxide. Shockingly, this is 2-8 times as much carbon released as in production of a tonne of petrodiesel. [12]

In Brazil and Argentina, forests are being cleared to extend the area under soybean cultivation. While the market for soybeans has been traditionally for food and animal fodder, there is an increasing interest in using this crop to produce bio-diesel. The fast expansion of soybeans is also displacing other crops and pushing poor farmers to clear more land for agriculture deep into the forests. Brazil is the second biggest soybean producer (50 million tonnes or 26% of world production in (2003). Argentina, Paraguay and Bolivia have market shares of 18%, 2% and 1% respectively. Other big producers are China and India (8% and 2% respectively). Soybean is traditionally grown in temperate and subtropical regions, but is now expanding into tropical regions. The Amazonian region is directly affected as new high-yielding tropical soy varieties have been specifically developed for expansion in this region. According to data from Brazil's National Institute for Space Research, the annual rate of forest loss in the Amazon increased by 40% in the year 2002, resulting mainly from pressure to replace forest with soy agriculture and cattle ranching (Carrere 2006).

Argentina shifted to the production of genetically modified soybeans, and it is assumed that until 2003 the expansion of the soy area has been at the expense of other agricultural crops; however currently, 75% of the soy area growth is assumed to be in the humid parts of the Chaco region, and the remaining 25% in the Atlantic forest in Misiones Province (Carrere 2006).

Actions at several levels are urgently needed to resolve the situation. For example, a new definition of forests, which forbids the clearing and further establishment of plantations – as a sort of "short-term unstocking", is needed. For example, in Indonesia, by law, plantations can be established only on forest land that has been designated as Conversion Forests, and not on Permanent Forest lands. It is necessary to create wider governance reforms as well as reinforcing markets that discriminate in favour of products from legal and well managed sources. Some NGOs are calling for strict criteria to be applied to the use of biofuel raw materials, including: no conversion of primary forest for plantations, no burning to clear forest for plantations, no human rights violations or police or military operations.[13] For example, WWF[14], helped increased the general awareness of the oil palm issue and as a result have generated more responsible trade and investment practices, both in the retail and the financial sector. At the government level, much work remains to be done[15] (WWF 2002).

To address the growing problems of sustainability in the oil palm industry, the Roundtable on Sustainable Palm Oil (RSPO) [16] was established in Kuala Lumpur in 2003. A non-legally binding 'statement of intent' signed by over 40 companies and organisations was established to promote sustainable palm oil production through better management practices. The RSPO has agreed a set of principles and guidelines for conditions in oil palm plantations which will become an international standard in 2007, and encouraged funding for small-scale farmers, who contribute 30 per cent of palm oil production in Indonesia (RSPO 2006). However, environmental and social concerns prevail, and although initiatives such as the RSPO encourage sustainable production, the role of government in applying RSPO standards remains unclear, as do the responsibilities of industries in the supply chain.[17] The RSPO principles have been criticized

[11] Wetland International and Delft hydraulics 2006. *Peatland degradation fuels climate change*. The report estimates that production of one metric ton of palm oil will result in an average emission of 20 tonnes of carbon dioxide from peat decomposition alone, not including emissions resulting from production or combustion.

[12] These issues change the global picture concerning carbon emissions. In the ranking of countries based on their total CO_2 emissions, Indonesia comes 21st. However, if peatland emissions are included, Indonesia is ranked third. The country emits more than India, more than Russia, and several times more than the UK or Germany. It emits more than all the efforts of western countries to reduce greenhouse gases under the Kyoto Protocol. However, emissions from peatlands are currently not calculated in official statistics. Therefore, preventing these emissions does not count as a reduction of a country's emission; unlike investments in industry, as the Kyoto Protocol does not provide any incentives for action yet.

[13] Joint Statement of NGO-alliance: No to deforestation diesel! (issued 18/Apr/06), http://home.snafu.de/watchin/Biodiesel_eng.htm

[14] WWF in 2002 developed a series of position papers on key forest issues, including one on oil palm. Key elements of sustainability within the oil palm industry are, among others.: plantations don't replace forests that have high conservation value; any incentives that promote conversion of such forest should be eliminated;

[15] WWF's has made a series of recommendations to governments, private sector, consumer and NGOs.

[16] http://www.rspo.org/

[17] More Information on these issues can be found at:

- Promised Land: Palm Oil and Land Acquisition in Indonesia - Implications for Local Communities and Indigenous Peoples by Marcus Colchester, Norman Jiwan, Andiko, Martua Sirait, Asep Yunan Firdaus, A. Surambo and Herbert Pane (2006) Forest Peoples Programme, Sawit Watch, HuMA and ICRAF, Bogor (also available in Bahasa Indonesia).
- Ghosts on our own land: oil palm smallholders in Indonesia and the Roundtable on Sustainable Palm Oil by Forest Peoples Programme and Sawit Watch, Bogor (2006) (also available in Bahasa Indonesia).

because its statements allow for multiple interpretations, e.g. smallholder farms, are more socially responsive and environmentally responsible, palm oil from smallholdings therefore has the better likelihood of being sustainable; however, the RSPO certification scheme and its procedures hamper the certification of smallholder produced oil as."sustainable" [18]

Currently, in the USA and in other countries, there are different reasons for objecting to corn-based ethanol. However we don't included corn based ethanol in this report as this issue is more related to existing agricultural land and deforestation rates are not directly affected yet. , A future increase in the demand for corn for ethanol will necessarily means less space for livestock, or for food production. A its a consequence is probable that, in the near future, such corn-based ethanol plantations could compete for forest land.

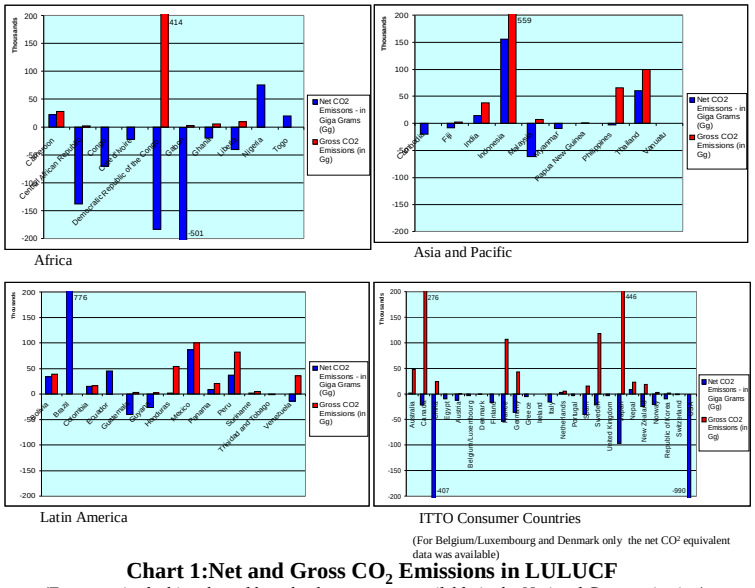
4.2.4 The National Communications from ITTO Member Countries

This section presents an analysis of the current and potential future emissions from deforestation in ITTO member countries. Some clarifications are required to facilitate understanding of this section .
With regard to chart 1:

- The data on CO_2 emissions[19] and removals were mostly provided from the countries' latest National Communications[20] found on the UNFCCC website. Data were taken from the National Communication to the UNFCCC of each ITTO member country[21].
- Gross emissions refer to the emissions from deforestation without any discount of carbon sequestration (e.g. through afforestation or reforestation)
- Net emissions refer to the gross emissions minus the sequestration reported (e.g. through afforestation and reforestation activities).
- Gross emissions from deforestation in developing countries take place mostly by clearing natural forest for another land use (deforestation).
- Carbon sequestration takes place mainly in plantations.
- Soils and biodiversity losses, or displacement of forest dependent people, resulting from deforesting natural forest are not accounted for here. The analysis is solely on the impacts on GHG emissions and sinks as primarily relevant for climate change. However these issues need to be considered when promoting REDD.
- Data on forest degradation are not available and cannot be included in an analysis.

- Carbon Trading: A Critical Conversation on Climate Change, Privatisation and Power, by Larry Lohmann (editor), Dag Hammarskjold Foundation, Durban Group for Climate Justice and The Corner House, October 2006. Available in PDF format from www.thecornerhouse.org.uk/

[18] Colin, N. 2005. Certifying the oil palm plantation business. Public forum on sustainable Palm Oil. Kuala Lumpur.
[19] Except the CO2 data of Belgium/Luxembourg and Denmark, which show Gg of CO2 Equivalents, all other data are in Gg of CO2.
[20] Excluding Liberia and Myanmar, which have both ratified the UNFCCC and are in accession for the Ratification of the Kyoto Protocol. The data from Liberia was extrapolated out of the given National Communication data from Ghana and the Liberian country profile of the ITTO publication "Status of Tropical Forest Management 2005". The data for Myanmar was taken from its governmental website (http://www.energy.gov.mm/Env_CDM.htm).
[21] All data used in the following sections are compiled in Annex 3.



(For Belgium/Luxembourg and Denmark only the net CO^2 equivalent data was available)

Chart 1:Net and Gross CO_2 Emissions in LULUCF
(For countries lacking the red bar, the data were not available in the National Communication)

With regard to Chart 2:

- It shows the time required for the forests of the ITTO's producer countries to be depleted to 20% of the 2001forest cover. [22] The illustrated results are obtained using the forest cover data from 2001 available in ITTO 2005 and the annual forest cover change between 1990 and 2000 obtained in FAO 2001. For obvious reasons, countries with a positive annual forest cover change as well as countries with no data available were not considered [23].

- The data of the annual forest cover change in the years 1990-2000 were taken from the FAO publication Global Forest Resource Assessment 2000[24], and the data of the total closed natural forest area of each country were provided by the ITTO publication Status of Tropical Forest Management 2005.

- Estimations do not consider the interlinkages between deforestation and further forest degradation or other environmental impacts that could accelerate reduction of forest cover as a secondary effect (e.g. unsustainable management, reduction of habitat, etc.)

[22] Based on Houghton's (2005) arbitrary assumption that countries will halt deforestation when only 15% of their 2000 forest area remain. For the calculation in this report, an arbitrary 20% relative to the forest cover of 2001 was taken as a critical benchmark for subsequent need for action.
[23] The only country with no available data in forest cover change was Suriname.
[24] FAO – Food and Agriculture Organization. 2001. Global Forest Resource Assessment 2000. Table 4. Change in Forest Cover 1990-2000. (http://www.fao.org/docrep/004/y1997e/y1997e1r.htm).

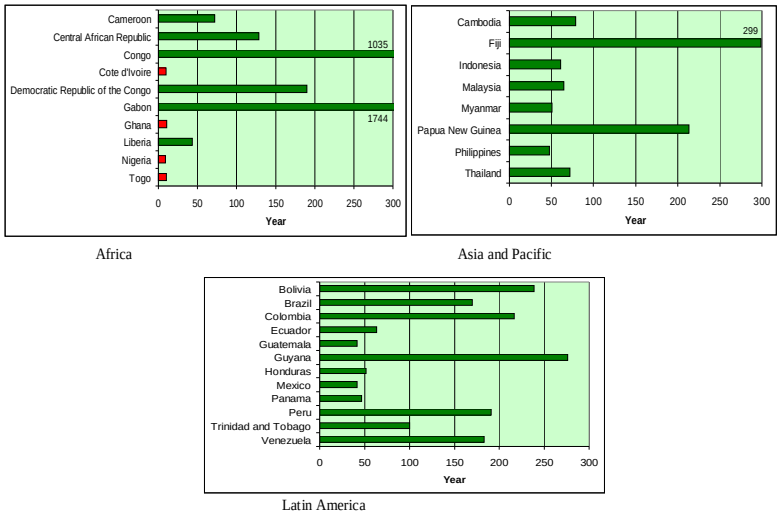


Chart 2: Remaining years for forest cover depletion to 20% relative to 2001
Calculated with the annual forest cover change rate of 1990-2000)

ITTO Producer Countries

Africa

As shown in chart 1 above, the Democratic Republic of the Congo (DRC) denotes a high amount of gross CO_2 emissions, which illustrate the country's high deforestation rate. In comparison to this, the DRC must also be strongly involved in carbon-sequestration activities (afforestation and/or reforestation), since, in spite of the high deforestation rate, the net CO_2 emissions show a negative sign (net removals),.

There are only three African ITTO member countries in which the reported emissions are higher than the reported sequestration. In Cameroon, Nigeria and Togo the amount of sequestered carbon might not be equivalent to the gross emitted CO_2 from deforestation. As can be observed in chart 2, it appears that these three countries are at risk of loosing their forest cover in the near future.

Assuming that current deforestation rates continue, the forests of Cote d'Ivoire, Nigeria and Togo will almost have disappeared within the next 10 years. Ghana also belongs to those countries at risk of rapidly achieving the 20% forest cover limit.

Even if the Democratic Republic of the Congo has the largest area of Africa's remaining closed natural forest (over 126 million hectares), the current deforestation rate will deplete the forests to 20% within less than 200 years.

Asia and Pacific

Eye-catching in chart 1 are the high gross CO_2 emissions from Indonesia, which indicate a high deforestation rate. Furthermore, the chart illustrates that Indonesia shows the highest amount of net emissions of all ITTO producing countries in Asia and the Pacific. Hence, the country's sinks do not compensate for the emitted CO_2 from current deforestation activities.

Thailand, India and Papua New Guinea (in decreasing order) also show positive net CO_2 emissions. There is an interesting additional fact about India. The country is not found in chart 4, because of its positive annual forest cover change between 1990 and 2000.

Vanuatu, the Philippines, Fiji, Myanmar, Cambodia and Malaysia (in decreasing order) all denote net CO_2 sequestration, showing that in these countries the sink capacity can compensate for the emissions from deforestation activities. The data on gross emissions are available only for the Philippines, Fiji and Myanmar . The high gross CO_2 emissions in the Philippines suggests a high deforestation rate but simultaneously the net removals show the country's dedication to carbon-sequestration activities.

The gross CO_2 emissions of Malaysia and Fiji are much lower compared to the remaining countries with available gross emission data. Remarkably, Malaysia shows the highest net sequestration of all ITTO Asia and Pacific producer countries.. These data suggest the country's strong involvement in reforestation and/or afforestation activities.

Indonesia, with over 100 million hectares of forest, will reduce its forest cover by 80% within the next 60 years if the current deforestation rates continue. This is slightly above the remaining years for Myanmar and the Philippines with currently much less closed forest cover.

India and Vanuatu are not showed in the chart below, because of their positive annual forest cover change between 1990 and 2000. It is noteworthy that, according to the data provided in the National Communications for the 1990s, the world's second highest deforestation rate occurred in India (just after Brazil). [25]
NOTE: you only mention deforestation here and do not take into account degradation:- If India may have an increase in forest cover, at the same time forest degradation rates are high perhaps explaining in part the discrepancy noted in the last para.

Latin America
Brazil is by far the leader of all Latin American ITTO member countries in its net CO_2 emissions. Also, even if the data for gross emissions are lacking, the assumption is that the country might have high gross emissions levels due to deforestation activities, as an annual forest cover loss of over 2 million hectares was measured for the period of 1990-2000. Note: if no gross how net ?

Mexico, Peru and Honduras (in decreasing order) all show a relatively high level of gross CO_2 emissions, which indicates their relatively high deforestation rates. As Mexico's net emissions almost achieve the same value as its gross emissions, one may conclude that the country may possibly have a low sink capacity. Peru and Honduras might be more engaged in carbon-storing activities than Mexico because of the larger difference between the net and the gross CO_2 emission data.

Similarly to the situation analyzed for Mexico, Bolivia, Colombia and Suriname (in decreasing order) also show almost the same amount of net and gross CO_2 emissions within their GHG inventories. As mentioned above, this might be an indicator of the countries' low involvement in re- and afforestation activities.

Venezuela, Guyana and Guatemala (in decreasing order) all show net CO_2 removals. In these countries, the gross removals from carbon-storing activities might compensate for the entire emissions from deforestation. It is noteworthy that Guatemala has the highest annual forest cover change rate of all ITTO Latin American member countries and the smallest amount of remaining closed natural forest (beside Trinidad and Tobago).

Brazil, Peru, Colombia, Venezuela and Bolivia (in decreasing order), with between 50 and 490 (!) million hectares of remaining closed forest, will all deplete their forests within around 200 years.

In contrast to this, Honduras, Panama and Guatemala (in decreasing order), with around 3 million hectares of remaining closed forest, will all deplete their forests within the next 50 years.

ITTO Consumer Member Countries
As the issue of avoiding deforestation is primarily relevant for ITTO producer member countries, these are not included in chart 2. Instead, we focus on the comparison of net and gross CO_2 emissions of the ITTO consumer member countries.

In chart 7 it is striking to note the high gross CO_2 emissions of Japan and Canada because both show also net CO_2 removals; this would be explained by both counties compensating for these emissions with a large sinks,.

Alos noteworthy are the high net CO_2 removals of China and the USA. With gross emission data only available for China, these high net removals might indicate for both countries their high involvement in carbon-sequestration activities such as reforestation and/or afforestation.

It should be noted that Nepal, the Netherlands and Australia (in decreasing order) are the only ITTO consumer member countries which show net positive CO_2 emissions in the LULUCF sector.

[25] FAO – Food and Agriculture Organization. 2001. Global Forest Resource Assessment 2000. Main Report. FAO Forestry Paper No. 140.

4.3 Costs and Benefits

An understanding of REDD's potential contribution to climate change mitigation requires an economic assessment of the costs and benefits of avoiding tropical deforestation and forest degradation in the context of reducing CO_2e emissions. Such an assessment necessitates that costs and benefits are estimated for both the business-as-usual scenario (BAU- i.e. current trends continuing into the future) and for scenarios based on changes which can be influenced by policy and market forces. Over the last few years, a number of studies have started to provide data which can contribute to such assessments. Due to the highly varied conditions found in different parts of the tropics in terms of a range of factors, both environmental (e.g. trends in forest conditions, actual and potential environmental services under different physico-climatic conditions) and socio-economic (e.g. returns to different actors from harvesting a range of forest products or of transforming forest to agricultural land), a number of assumptions have been made in these studies and these need to be critically looked at. Based on some of these studies, an attempt is made here to compare the potential costs and benefits of a BAU scenario with those under a REDD scenario to illustrate the potential for REDD. It further serves to illustrate some of the key aspects which need to be considered by different actors and the need for obtaining better baseline information so that the various costs and benefits can be attributed to the range of local, national and international actors involved in climate change and its mitigation.

4.3.1 BAU Scenario: Costs and Further Costs

CO_2e emissions from deforestation and forest degradation, mostly occurring in the tropics, are estimated to represent currently more than 18% of global emissions (Stern 2006). If unabated, the rapid advance of tropical forest degradation and deforestation would not only continue to lead to further CO_2e emissions as carbon stocks are released, but also to a reduced CO_2 sink capacity. It is now estimated that climate change under a BAU scenario of CO_2 e emissions, with the same share attributed to deforestation and degradation, will reduce welfare by an amount equivalent to a reduction of consumption per head of between 5 and 20% now and into the future. Tropical countries would suffer disproportionately more from climatic changes (droughts, floods, erosion, diseases, agricultural production more vulnerable, some high forest areas naturally converting to savannahs etc.). These costs are so high, even excluding other environmental costs associated with deforestation, that BAU with associated lower and only short term gross benefits would just not be a viable option anymore for a substantial part of humanity. Stern's (2006) study calculates that, under a BAU trajectory, the social cost of carbon today is of the order of $85 per tonne of CO_2 (estimate calculation including risk assessment). The study estimates that the social costs of carbon on a BAU trajectory compared to that on a path towards stabilisation at 550ppm, and the net benefits over costs (in NPV terms) from implementing strong mitigation policies this year would be of the order of $2.5 trillion.

4.3.2 Mitigation Potential, Costs and Benefits

With a trajectory of emission levels aimed at stabilizing CO_2e concentrations at 450 – 550 ppm, the social cost of carbon would start in the region of $ 25-30 /t CO_2, i.e. one third of the level expected if the world stays with BAU (Stern 2006). This cost would however increase over time since marginal damages increase with a rise in GHG stocks. The current assessment of the potential mitigation options from carbon sequestered globally in forest and agricultural soils is in the order of 100GtC (cumulative) by 2050 (2/3 in forests and 1/3 in agricultural soils), equivalent to about 10% to 20% of projected fossil fuel emissions during the same period[26].

More recent studies have been conducted at the national, regional and global scales to estimate the mitigation potential (areas, carbon benefits and costs) of reducing tropical deforestation. In a short-term context (2008-2012), Jung (2005) estimates that 93% of the total mitigation potential in the tropics corresponds to avoided deforestation. For the Amazon basin, Soares- Filo et al. (2006) estimate that by 2050 the cumulative avoided deforestation potential for this region reaches 62,000 Mt CO_2 under a "governance" scenario.

Calculations on the economics of climate change suggest that the action to prevent further deforestation would be relatively cheap compared with other types of mitigation (Stern 2006). The mitigation costs of reduced deforestation depend on the cause of deforestation (timber or fuelwood extraction, conversion to agriculture, settlement or infrastructure), the associated returns from the non-forest land use, the returns from potential alternative forest uses or services, and on any compensation paid to the individual or institutional landowner to change land-use practices. These costs vary by country and region (Sathaye *et al.*,2007) [27].

[26] IPCC.Climate change 2001. Mitigation. TAR
[27] IPCC Fourth assesment report. Chapter 9. Forestry

Cooperation on reducing emissions would provide for a cost-effective solution that could "green" economic growth, facilitate technology transfer and generate funding for adaptation in developing countries. If half the emission reductions required by 2050 to effectively combat climate change were met through investment abroad, it could generate up to USD 100 billion per year in green investment flow to developing countries. That would amount to less than half of one per cent of the economic output of industrialized countries. Getting that to work would be a move towards a self-financing climate component[28].

On the basis of research it mandated, the Stern report states that the opportunity cost of forest protection (in the form of net present value of foregone returns from agriculture over 30 years), in the 8 tropical countries[29] which are responsible for 70% of emissions from land use change, could be estimated at around $5 billion per annum initially with the total protection of their cumulated 6.2 million hectares annually deforested at present, i.e. an average annual net cost of $ 800 per hectare. The detailed study (Grieg-Gran 2006), on which the Stern report is based, also estimates the administrative costs for such a scheme to control deforestation. Recognising that these would be highly dependent on the nature of the measures taken, and on the base costs in existing schemes, a lower bound figure for annual administration costs of US$4 per ha and an upper bound of US$15 per ha can be derived. These represent the likely range of operational costs of a compensation scheme employing a system of payments.

A realistic revision of some of the assumptions made in the study could however result in a significantly reduced net value foregone from forest protection.

The calculation assumed total forest protection with no product harvesting, however sustainable. This substantially underestimates the potential for forests to act both as Carbon reserves and as sinks while still providing forest products on a sustainable basis. The extraction of timber or other forest products does not necessarily result in CO_2 emissions, since a significant proportion of marketed forest products remains as carbon stock. Secondly, the sequestration capacity of a forest is directly related to its MAI, which drops off as the forest attains maturity- implying that CO_2 capture rates are lower in mature forest than in fast growing younger stands. Assuming a conservative scenario of a 20 m3 per hectare sustainable harvest of valuable timber with a gross market value of $300/m3 on a 25 year rotation, $240 can be obtained annually without CO_2 emissions and perhaps even allowing still a contribution to increased CO2 capture. With other forest products harvested sustainably, the economic benefits from forest products can conservatively be estimated at more than $300/ha annually. Even fuelwood use may not lead to net CO2 emission if the volume of fuelwood removed is compensated by CO2 capture from sustainably growing forest.

The calculation does not include an annual value for the environmental services which forests provide, such as watershed protection and regulation of water flow, generation and renewal of soil and soil fertility, contributions to fertility of agricultural land. Some of these services already command substantial market values (Jenkins et al 2007). This value would increase substantially per ha of forest as the forest area is further reduced since the marginal value would increase.

On the side of the returns from agricultural land obtained from deforestation, the study assumes that the net annual returns from the different types of agricultural production (livestock, annual or tree crops) will be sustainable over the 30 discounted years. This is highly unlikely given that the remaining forest areas are generally on more fragile lands and agricultural production from such cleared sites would necessitate higher inputs to maintain production levels than on relatively richer sites, where problems for maintaining sustainability already exist. The CO2e emissions from agricultural production are also not taken into account, and these are likely to increase at the margin as poorer forest sites are converted to agricultural use.

Hence one can assume with reasonable confidence that the annual net opportunity cost of REDD under sustainable forest management which allows products to be harvested would be considerably lower than half the $800/ha calculated in the Stern report, since the returns from SFM estimated above are on an annual basis and Sterns figure is a NPV over 30 years of agricultural production.

Looking at the long-term, (Sohngen and Sedjo, 2006) estimate that for 27.2 US$/tCO2, deforestation could potentially be virtually eliminated. Over 50 years, this could mean a net cumulative gain of 278,000 $MtCO_2$ relative to the baseline and 422 million additional hectares in forests. For lower prices of 1.36 US$/$tCO_2$, only about 18,000 $MtCO_2$ additional could be sequestered over 50 years. The largest gains in carbon would occur in Southeast Asia, which gains nearly 109,000 $MtCO_2$ for 27.2 US$/$tCO_2$, followed by South America, Africa, and Central America, which would gain 80,000 , 70,000, and 22,000 $MtCO_2$ for 27.2 US$/$tCO_2$, respectively (Figure 6)

[28] FCCC/CP/2006/5 cop12 paragraph 108

[29] Stern 2006: *The Economics of Climate Change* – the eight countries are: Brazil, Indonesia, PNG, Cameroon, Congo, Ghana, Bolivia and Malaysia.

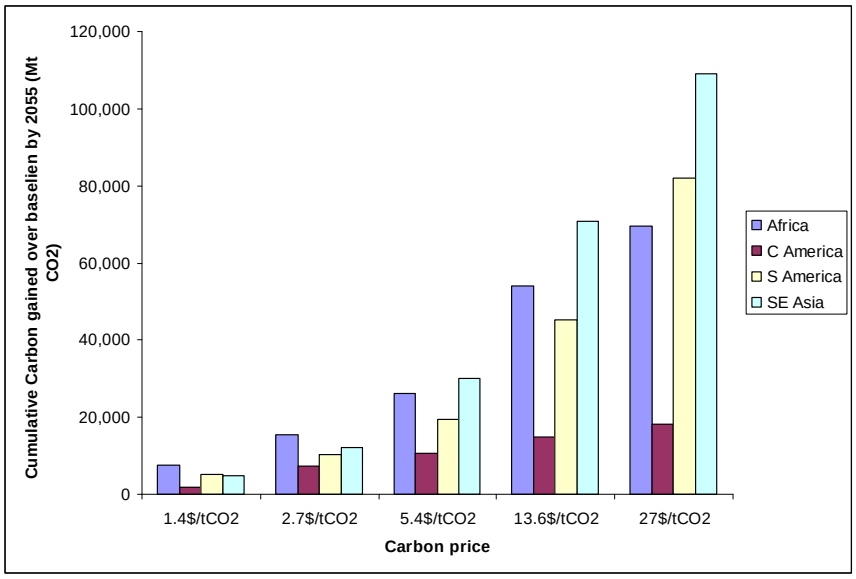


Figure 6: Cumulative carbon gained through avoided deforestation by 2055 over the reference case, by tropical regions under various carbon price scenarios (Sohngen and Sedjo, 2006).

Reducing deforestation is thus a high-priority mitigation option within tropical regions. In addition to the significant carbon gains, substantive environmental and other benefits could be obtained from this option.

Summing the measures, the cumulative carbon mitigation benefits by 2050 for a scenario of 2.7 US$/tCO2 + 5% annual carbon price increment from one model are estimated to be 91,400 MtCO2; 59% of it coming from avoided deforestation. These estimates increase for a higher price scenario of 5.4 US$/tCO2 + 3%/yr annual carbon price to 104,800 MtCO2, where 69% of total mitigation comes from avoiding deforestation (Sathaye et al. 2007). The mitigation potential of the continents of Asia, Africa and Latin America dominates the global total mitigation potential for the period up to 2050 and 2100 respectively (Figure 7).

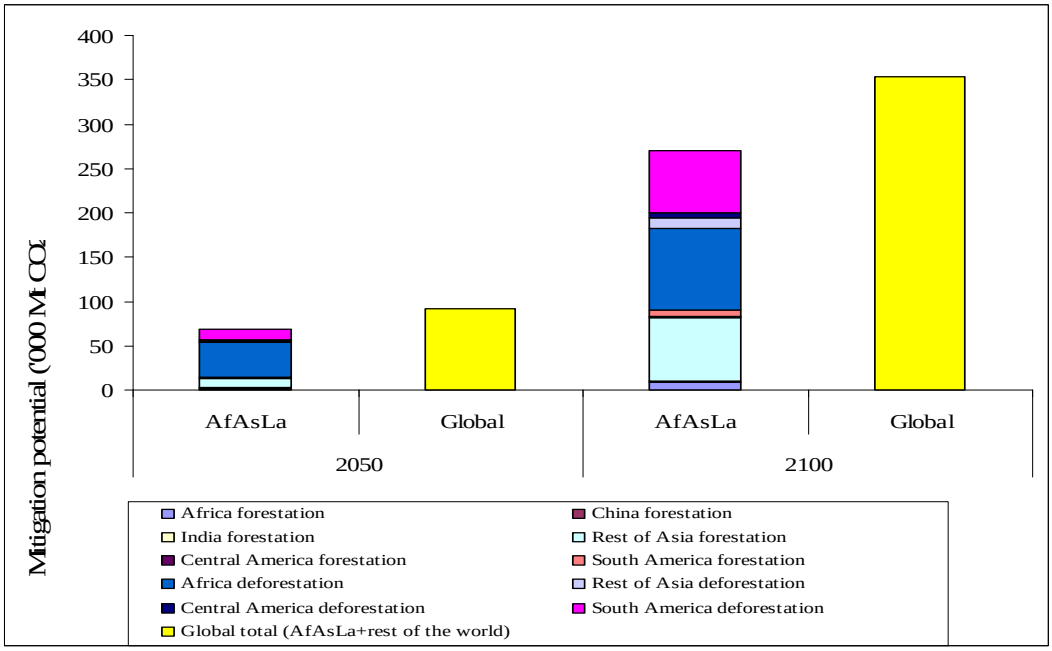


Figure 7: Cumulative mitigation potential (2000-2050 and 2000-2100) in different regions according to mitigation options under the 2.7 US$/tCO2 +5%/yr annual carbon price increment
Note: AfAsLa = Africa, Asia and Latin America.
Source: Sathaye et al. 2007.

Summarizing, the literature is confident, despite variations in estimates, of the large potential for mitigation potential in the Tropics. It is clear that this is the part of the world where the largest mitigation potential is foreseen in the forestry sector. For the tropics, the mitigation estimates for lower price ranges (<20 US$/tCO2) are around 1100 MtCO2/yr in 2040, about half of this potential being located in Central and South America (Sathaye et al. 2007, Soares Filho et al. 2006, Sohngen and Sedjo 2006). For each of the African and SE Asian regions, this mitigation potential is estimated at 300 MtCO2/yr in 2040. In the high range of price scenarios (< 100 US$/tCO2), the global mitigation estimates are in the range of 3000 – 4000 MtCO2/yr in 2040. From this total, the estimates range for the tropics from 1,100 to 3,500 MtCO2/yr in 2040[30] (Nabuurs et al, 2007).

Given that most studies have calculated costs of mitigation by setting aside forest under full protection, it is reasonable to assume that these costs could be reduced globally by significantly more than half under sustainable forest management regimes with the similar CO2e stocking and capture rates. Depending on the specific conditions in different regions and areas, the opportunity costs of mitigation under SFM would be even lower. It seems to be of the utmost importance that more precise cost benefit assessments are made in different regions and areas for mitigation under SFM REDD scenarios instead of solely with forests being fully protected.

Different types of policy levers are available to enhance carbon mitigation in forestry biomass. The potential approaches can be categorized into three general types of programs: (1) project-based approaches that consider only individual carbon projects in individual areas, (2) comprehensive approaches that treat all forests as possible emission sources, and (3) indirect approaches aimed at creating systematic change in the forestry and land-using sector (Sohngen B, & R Beach 2006).

[30] IPCC Fourth assesment report. Chapter 9. Forestry

5 New Development in the UNFCCC: Reducing Emissions from Deforestation and Forest Degradation in Developing Countries

Afforestation and reforestation activities on areas that were not forested in 1990 are eligible as projects under the Clean Development Mechanism (CDM) for the first commitment period of the Kyoto Protocol from 2008 to 2012 (see Robledo, 2004). Avoided deforestation was excluded because of concerns about additionality (adequately defining baselines such that mitigation can be measured relative to those baselines), permanence, and leakage (Schlamadinger *et al*., 2005). Therefore, reducing emissions from deforestation and forest degradation in developing countries (REDD) cannot be credited in the first commitment period of the Kyoto Protocol (2008-2012).

However, several proposals have come forward to include emission reductions from deforestation and forest degradation (REDD) within the Kyoto Protocol.. During COP11, held in Montreal from November 28 to December 9, 2005, Papua New Guinea and Costa Rica, on behalf of the Coalition for Rainforest Nations, proposed that parties to the UNFCCC address emissions from deforestation and create incentives for developing nations to manage these emissions. This submission started the discussion on how to consider REDD from developing countries in the framework of the UNFCCC.

Consequently, the COP11 agreed to start a two year process on issues relating to reducing emissions from deforestation in developing countries, focusing on relevant scientific, technical and methodological issues, and on the exchange of relevant information and experiences including policy approaches and positive incentives[31]. The SBSTA[32] will report on this matter to the COP 13, to take place in Bali, Indonesia, in December 2007.

Since the begin of the discussions, the following have been the mile stones in the negotiation process: the COP11 decision proposed that parties to the UNFCCC be given an opportunity to provide their views on providing incentives for reducing deforestation before the 24th meeting of the United Nations Sessions of the Subsidiary Bodies, held in Bonn, Germany, in May 2006 (SBSTA 24) [33]. Twenty-one nations provided formal inputs by the time of the SBSTA 24 meeting, and an agreement was reached to continue considering the development of incentive mechanisms by which developing countries may reduce deforestation (FCCC/SBSTA/2006/MISC.5 and Add.1). The SBSTA 24 decided to organize a workshop held in Rome, Italy, in September 2006[34], to provide an opportunity for Parties to share experiences and consider relevant aspects relating to reducing emissions from deforestation in developing countries.

The workshop decided to continue consideration of relevant scientific, technical and methodological issues and the exchange of relevant information and experiences, including policy approaches and positive incentives, at its 25TH meeting SBSTA held in Nairobi, in November 2006[35]. The resolution of SBSTA was to continue discussing the range of topics considered at the first workshop, which will focus on: the discussions of ongoing and potential policy approaches and positive incentives, and technical and methodological requirements related to their implementation; assessment of results and their reliability; and improving the understanding of reducing emissions from deforestation in developing countries. Parties not included in Annex I to the Convention were also invited, if in a position to do so and on a voluntary basis, to submit to the secretariat, by 23 February 2007, any updated information and additional data on emissions and trends in deforestation, data needs, and policies and programmes in place or being considered to address deforestation and its root causes[36]. Furthermore, the SBSTA, requested the Secretariat to organize a second workshop on reducing emissions from deforestation in developing countries. The workshop took place in Cairns, Australia from March 7 to 9, 2007.

This section summarizes the key issues considered in the negotiation process. It is worth clarifying that the ongoing negotiation process on REDD takes place with the Convention and not as part of the discussions for the Kyoto Protocol. This fact gives more flexibility to the negotiation as a) more Parties are allowed to participate (e.g. USA or Australia, which are not part of the Kyoto Protocol) and b) more political options can be considered (e.g. a new protocol covering only REDD issues).

[31] The conclusions by the COP do not include forest degradation. However many Parties and observers have flagged the issue that an important amount of GHG emissions takes place while forest is being degraded. However as degradation does not lead in all cases to deforestation, these emissions could remain outside the GHG account system. For this reason, many Parties support the position that forest degradation has to be included in any case.
[32] Subsidiary Body for Scientific and Technological Advice
[33] FCCC/SBSTA/2006/5
[34] Working paper No.1 (a) (2006) see too Working paper No.1 (d)(2006)
[35] FCCC/SBSTA/2006/11
[36] FCCC/SBSTA/2007/MISC.2

5.1 Policy Instruments, Approaches and Positive Incentives

In the discussion on policy instruments and approaches, two elements need to be differentiated: first the kind of policy instrument that can be used for tackling emissions of GHG from deforestation and forest degradation; and second the level on which this instrument is to be applied, be it local, regional or national.

Let us focus the discussion on the kind of instrument that can be used for REDD, since the different levels were discussed in the sections above. The starting point of the discussion is the fact that the ongoing negotiation on REDD takes place under the Convention, and all possible instruments are therefore open for discussion. Forner et all (2006) discuss three main possible policy instruments that can be envisaged for REDD (see table 8);

a) The CDM: in this case activities aimed at reducing emissions from deforestation and forest degradation would be eligible for the Clean Development Mechanism. In principle, definitions already set in the Marrakech Accords should be used, unless a special provision is made. The negotiation will then need to concentrate on the modalities and procedures for such activities and define how to establish appropriate methodologies. As the CDM is a project based mechanism, if the parties agree to include REDD as an eligible activity (or set of activities) the level is to be local and a national approach won't be considered in the quantification of GHG emission reductions.

b) A new flexible mechanism: this alternative foresees the introduction of a new flexible mechanism in the Kyoto Protocol. This can be done through an amendment or an addition to the Protocol. In this case, Parties would have more flexibility to agree on specific definitions for REDD, since definitions can be set for this mechanism only. Additionally, Parties will be free to decide at which level REDD should be addressed. Further, agreement on modalities and on procedures would depend on the architecture of the mechanism. However, only Parties which have ratified the Kyoto Protocol would be eligible for participating in such a mechanism.

c) A new protocol: in this case possibilities for setting commitments (voluntary or not), definitions, modalities and procedures would be the most flexible . Besides, all Parties of the Convention could participate in a new protocol. However there is no institutional framework that could guide the Parties in setting such a protocol. As the negotiations on future commitments is also ongoing, a potential new protocol should be seen within this wider perspective

Table 8. Main positive and negative aspects of different policy instruments

Option	Advantages	Disadvantages
An eligible activity under the CDM	Proven ability of the CDM to provide incentives for action Institutional framework already in place	A political agreement is not likely Technical hurdles Limited to project-based action Uncertainties related to international price for carbon as a major driver for action
A new mechanism under the Kyoto Protocol	Ability of the GHG market to provide incentives for action Flexibility within Kyoto Protocol limits	Controversy could lead to less flexibility in the design Technical hurdles as for the CDM
A second protocol	Easier to negotiate Flexible to accommodate realities beyond climate change (i.e. biodiversity)	No institutional framework exists

Source; Forner et al. (2006), modified

Regarding positive incentives, the following options have been considered in the submissions: direct regulation (e.g. national policies), taxes and subsidies, transfer payments and permit trading. There is some literature analysing the pros and cons of each of these incentives (e.g. Kaimowitz und Angelsen 1998, von Amsber 1998, Lele et al. 2000, Espach 2006, Forner et al., 2006). One common conclusion is that a given incentive is not better or less good *per se*, but its success depends on the overall institutional framework as well as on the possibilities to enforce the institutional agreements at various levels and to monitor results.

In the context of the UNFCCC, there is limited experience with the positive incentives. Direct regulation, taxes and subsidies have been used mainly in Annex I countries (e.g. The CO_2 Law in Switzerland). Permit trading is the fundamental basis of the International Emission Trading flexible mechanism, which can be fully used during the first commitment period. However, due to the fact that the first commitment period has not yet started, it is difficult to foresee the efficiency of the permit trading incentive in reducing GHG emissions. Finally, experience in transfer payments are relatively new and these mainly depend on the existing national legislative framework. A previous

analysis on the possibilities of using these incentives for promoting REDD activities has been made by Forner et al., 2006 (see Table 9).

Table 9: Applicability of policy instruments at the international level, under different options under the UNFCCC

	Policy forms within the UNFCCC			
Incentives	**Kyoto-type**		**Non-Kyoto**	
	An activity under the CDM	**A separate mechanism**	**A second protocol**	**COP decisions**
Direct regulation	Not applicable. Credits are issued relative to a baseline. No targets or deadlines are specified.	In principle, a separate mechanism could establish targets for emission reductions and deadlines for compliance.	Applicable. It could establish, for example, targets for deforestation	Not applicable. Soft law is not binding and, hence, no direct regulation can be established
Taxes/subsidies	Not likely to be an international instrument for different reasons			
Permit trading	Not directly applicable. While the reduction of deforestation could generate tradable permits, trade only operates within Annex I Parties. Rather, in the absence of commitments, developing countries receive a payment.		Applicable. It could establish a permit trading mechanism.	Not applicable.
Transfer payments	Applicable. Transfer payments will result from the selling of credits	Applicable. A mechanism could establish a targeted fund.	Applicable. It could establish a targeted fund.	Not applicable in isolation. Decisions may revisit funding under the Convention

Source: Forner et all, 2006

5.2 Definitions

Deforestation and forest degradation are terms with various definitions. The differences may be the result of the specific goals for which the definition was set (see table 10). However, within the framework of the UNFCCC, it is important to keep in mind that definitions should serve the final objective of the Convention, which is *the stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system.* Further, the Article 2 of the Convention adds that *such a level should be achieved within a time-frame sufficient to allow ecosystems to adapt naturally to climate change, to ensure that food production is not threatened and to enable economic development in a sustainable manner.*

Table 10: Definitions of deforestation and forest degradation

Forest	
ITTO	ITTO defines various related termini: **Permanent forest estate (PFE):** Land, whether public or private, secured by law and kept under permanent forest cover. This includes land for the production of timber and other forest products, for the protection of soil and water, and for the conservation of biological diversity, as well as land intended to fulfil a combination of these functions. **Planted forest:** A forest stand that has been established by planting or seeding **Primary forest:** Forest which has never been subject to human disturbance, or has been so little affected by hunting, gathering and tree cutting that its natural structure, functions and dynamics have not undergone any changes that exceed the elastic capacity of the ecosystem **Production PFE:** That part of the PFE assigned to the production of timber and/ or other extractive uses **Protected area:** An area of land and/or sea especially dedicated to the protection and maintenance of biological diversity, and of natural and associated cultural resources, and managed through legal or other effective means **Protection PFE:** That part of the PFE in which the production of timber (or other extractive uses) is prohibited
UNFCCC/KP	Forests is defined in the Marrakech Accords as following: **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 metres

	at maturity *in situ*. A forest may consist either of closed forest formations where trees of various storeys and undergrowth cover a high proportion of the ground or open forest. Young natural stands and all plantations which have yet to reach a crown density of 10-30 per cent or tree height of 2-5 metres 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; Note: According to the Procedures and Modalities for afforestation and reforestation within the CDM each non Annex I country had to submit their definition on forest for the first commitment period within the ranges established in the Marrakech Accords. (Dec. 19/CP.9)
IPCC	**Forest land:** This category includes all land with woody vegetation, consistent with thresholds used to define forest land in the national GHG inventory, sub-divided at the national level into managed and unmanaged, and also by ecosystem type as specified in the *IPCC Guidelines* (since forest management has a particular meaning under the Marrakech Accords, a subdivision of managed forests as described in Chapter 4 of the GPG-LULUCF may be required). The category also includes systems with vegetation that currently fall below, but are expected to exceed, the threshold of the forest land category. Further, in the "Good Practice Guidelines for Land Use Land Use Change and Forestry" the IPCC also mentioned the definition of forest agreed in the Marrakech Accords (UNFCCC/KP)
FAO for FRA 2005	Land spanning more than 0.5 hectares with trees higher than 5 meters and a canopy cover of more than 10 percent, or trees able to reach these thresholds in situ. It does not include land that is predominantly under agricultural or urban land use. Explanatory notes 1. Forest is determined both by the presence of trees and the absence of other predominant land uses. The trees should be able to reach a minimum height of 5 meters in situ. Areas under reforestation that have not yet reached but are expected to reach a canopy cover of 10 percent and a tree height of 5 m are included, as are temporarily unstocked areas, resulting from human intervention or natural causes, which are expected to regenerate. 2. Includes areas with bamboo and palms provided that height and canopy cover criteria are met. 3. Includes forest roads, firebreaks and other small open areas; forest in national parks, nature reserves and other protected areas such as those of specific scientific, historical, cultural or spiritual interest. 4. Includes windbreaks, shelterbelts and corridors of trees with an area of more than 0.5 ha and width of more than 20 m. 5. Includes plantations primarily used for forestry or protection purposes, such as rubberwood plantations and cork oak stands. 6. Excludes tree stands in agricultural production systems, for example in fruit plantations and agroforestry systems. The term also excludes trees in urban parks and gardens.
Forest Degradation	
ITTO	The reduction of the capacity of a forest to produce goods and services. 'Capacity' includes the maintenance of ecosystem structure and functions
UNFCCC/KP	Non available yet
IPCC	a) A direct human-induced loss of forest values (particularly carbon). Likely to be characterised by a reduction of the tree crown cover. Routine management from which crown cover will recover within the normal cycle of forest management operation is not included b) Changes within the forest that negatively affect the structure or function of the stand and site, and thereby lower the capacity to supply products and/or services c) Direct human-induced activity that leady to a long-term reduction in forest carbon stocks
FAO	FAO 2000: A reduction of the canopy cover or stocking within the forest through logging, fire, windfelling or other events, provide that the canopy cover stays above 10%. In a more general sense, forest degradation is a long term reduction of the overall potential supply of benefits from the forest, which includes wood, biodiversity and any other product or service. FRA 2005. Changes within the forest, which negatively affect the structure or function of the stand or site, and thereby lower the capacity to supply products and/or services.
UNEP/CBD/SBSTTA 2001	A degraded forest is a secondary forests that has lost, through human activities, the structure, function, species composition of productivity normally associated with a natural forest type expected on that site
Deforestation	
ITTO	n.a.
UNFCCC/KP	Deforestation is the direct human-induced conversion of forested land to non-forested land
IPCC	Deforestation is the direct human-induced conversion of forested land to non-forested land (considered in IPCC 2003 as in the Marrakech Accords for the Kyoto Protocol)
FAO for FRA 2005	The conversion of forest to another land use or the long-term reduction of the tree canopy cover below the minimum 10 percent threshold. Explanatory notes 1. Deforestation implies the long-term or permanent loss of forest cover and implies transformation into another land use. Such a loss can only be caused and maintained by a continued human-induced or natural perturbation. 2. Deforestation includes areas of forest converted to agriculture, pasture, water reservoirs and urban areas.

	3. The term specifically excludes areas where the trees have been removed as a result of harvesting or logging, and where the forest is expected to regenerate naturally or with the aid of silvicultural measures. Unless logging is followed by the clearing of the remaining logged-over forest for the introduction of alternative land uses, or the maintenance of the clearings through continued disturbance, forests commonly regenerate, although often to a different, secondary condition. In areas of shifting agriculture, forest, forest fallow and agricultural lands appear in a dynamic pattern where deforestation and the return of forest occur frequently in small patches. To simplify reporting of such areas, the net change over a larger area is typically used. 4. Deforestation also includes areas where, for example, the impact of disturbance, overutilization or changing environmental conditions affects the forest to an extent that it cannot sustain a tree cover above the 10 percent threshold.

Sources: ITTO, 2005; IPCC, 2003; FAO, 2004; Dec. 11/CP.7; FCCC/CP/2001/13/Add.1

These differences in definitions imply that existing information, mainly from the national reports to the FAO and definitions introduced and used by ITTO, are not always consistent with the definitions agreed in the Kyoto Protocol. This fact has the following main consequences for any agreement on REDD within the UNFCCC:

- Difficulties to differentiate between deforestation and forest degradation, as in many countries existing information is mainly or solely on deforestation over time;
- Difficulties in quantifying emissions, as the indicator used to differentiate between forest and non-forest land is not the same (range between 10 to 30% of crown cover for example). That would mean that emissions from a landscape with a tree cover from 29% to 11% could be assumed as emissions originating from outside the forest and vice-versa;
- Based on the current definitions for the Kyoto Protocol, if a natural forest is cleared for establishing a plantation (including palm oil, rubber and other tree-based plantations currently included in the agricultural sector), there won't be deforestation since the land is maintained as a forest in the sense of the definitions given in the Marrakech Accords of the Kyoto Protocol. This fact can constitute a perverse incentive not only in terms of REDD but also in terms of conservation of biological diversity and other functions of the (natural) forest.

At this stage, it is necessary to clarify that **these differences are common to many Annex I countries** (mainly industrialized countries), where a wide range of forestry activities are eligible as emission reduction within the Kyoto Protocol. Therefore, what is needed is to facilitate a mechanism that, while recognizing these difficulties, promotes a sustainable reduction of the emissions from deforestation and forest degradation in developing countries.

For the time being, one of the main difficulties in the negotiation process on REDD is that it is yet not clear what would be included in a future forest-related mitigation scheme besides afforestation and reforestation. For some parties, forest degradation has to be included as it is though degradation that the major part of the GHG emissions from land use is most probably occurring. For this fraction, which indeed includes forestry stakeholders, the negotiation has to extend to deforestation AND forest degradation. This position is shared e.g. by the members of the Coalition of Rainforest Nations.

On the other side, there are also parties that claim that because forest degradation is not yet defined under the Kyoto Protocol, and considering that the main part of available data is on deforestation, current negotiations on the UNFCCC should focus on GHG emissions only from deforestation.

Both options bring great challenges since the process of changing the use of a given land area occurs in a continuum. The quantification of emissions is made particularly difficult when only part of this continuum is to be considered. However, there is an argument in favour of considering forest degradation that needs to be highlighted here. Under the definitions of the Kyoto Protocol, some land uses that are often considered as agriculture would remain under forest for the Protocol. This is the case for example for many agroforests, home gardens as well as for coffee, palm oil and rubber plantations. If forest degradation in developing countries is not considered in future agreements within the UNFCCC and/or the Kyoto Protocol, gross emissions due to forest clearance for other land uses with high biomass content (e.g. agroforestry or oil palm plantations) won't be quantified nor reported. That could result into a perverse incentive for deforestation to allow the establishment of palm oil plantations or any other agroforestry system.

Options in the negotiation:
At the present stage, the following alternatives can be envisaged for the UNFCCC negotiation:

a) The parties include a definition of forest degradation.
b) The parties don't consider forest degradation.
c) The parties agree on a complete set of definitions including forest, deforestation and forest degradation. The implications of this assumption differ greatly depending on the policy instrument that will be agreed (see section 5.1).

d) Finally, some parties propose that more flexibility should be given to definitions. The argument is that if a given country, using its own definitions, maintains them over an agreed period, the final objective of reducing GHG emissions can be achieved and monitored far more easily and accurately than if the process agrees on stable definitions that don't consider the particularities of the countries. According to this idea, global definitions will introduce more uncertainty to the system since countries would need to adjust their existing data before accounting any emission reduction. This cannot be done without increasing uncertainties on the overall national figures.

5.3 Principles

After the second workshop in Cairns, Australia, it was recognised that any action in reducing emissions from deforestation (eventually also from forest degradation) should be guided by commonly agreed principles. Such principles as suggested so far by Parties could include:

- Real benefits for the climate system
- Promoting sustainable development
- Common but differentiated responsibilities
- State sovereignty
- Polluter pays
- Voluntary participation
- Robustness of the system
- Completeness over space, time and forest type
- Simple and consistent treatment of deforestation with the rest of the "Agriculture, Forest and Other Land Uses" (AFOLU)[37]
- Intergenerational responsibility
- Equity and fairness
- Cost effectiveness
- Enhancing forest ecosystem services as a capital resource
- Need to act quickly while protecting the integrity of existing mechanisms

5.4 Technical and Methodological Issues/Requirements

Technical and methodological issues and requirements refer mainly to how to define a baseline or a reference scenario, how to treat leakages, permanence and additionality and how to monitor and report emission reductions (see glossary for definitions of these terms). All technical issues need to be sorted out during the negotiation. Detailed methodologies or tools can however bee agreed to be designed by technical bodies (e.g. the Afforestation Reforestation Working Group or the Executive Board) or based on proposals by projects (bottom up approach).

Baseline or reference scenario

Two issues should be considered when analysing the proposals with regard to the baseline or reference emission rate. scale and time scenario. ,

With regard to the scale of the baseline/reference scenario, there are three levels under discussion; local, regional or national. Local and regional baselines are linked to project activities while national baselines are based on the possibility to mainly use national policies to reduce GHG emissions. However, it is possible to foresee a combination between these approaches where national baselines could be used as a reference for emission reductions in project activities at the local level.

With regard to the time period to be considered, there are two approaches: to consider only past trends or to consider past and future trends. The first approach is more favourable for countries with high rates of deforestation in the past, as these countries would have the greatest potential for claiming emission reductions in the future (e.g. Africa). The second approach would be more favourable to countries that had a low rate of deforestation in the past but are threatened by a high future deforestation rate.

A final comment on the baseline/reference scenario should be made concerning the kind of emissions to be measured/estimated. The discussion in this case focuses on the whether REDD refers to net emissions or to gross emissions. As observed in the charts in chapter 4.2, the difference between gross and net emissions is very significant. A decision on net or gross emissions in the UNFCCC needs to consider the wide range of implications of both calculation options. The implications linked to these two different options are currently not well spelled out in the negotiations and should be considered with more care in future sessions previous to any agreement being made.

[37] New denomination of LULUCF in the Fourth Assessment Report of the IPCCC

Leakage

Again, the main discussion on leakage revolves around differences on how to deal with it depending on whether the approach for REDD is national or local In general terms the discussion on leakage tends to accept that if an accurate national baseline/reference scenario and monitoring system can be set at the national level, risks of unaccounted leakage would disappear. This affirmation is based on the idea that if any displacement of activities or communities due to a REDD activity takes place, national inventories will reflect it. Therefore emissions resulting from displacement will need to be considered in the calculation of the net emission amount of a country.

Those supporting the project activity approach argue that good experience has been gained through the treatment of leakage in the A/R CDM, which could be used as a basis for addressing potential leakage in a REDD project.

Parties are very aware that leakage needs to be tackled and that there is a certain level of clarity on how to do it both with a national or a local approach.

Permanence

The issue of permanence is related to the possibility that carbon in reservoirs can be emitted at any time, e.g. due to a fire or a pest, making emission reductions non-permanent. Proposals for dealing with non-permanence include (a) using temporary credits, (b) bank credits and debits from one commitment period to the next, (c) reducing future financial incentives to take account of deforestation emissions above the agreed level and (d) by mandatory banking of a share of the emission reductions. Further, some Parties see sustainable forest management as a means to promote permanence of the emission reductions.

The treatment of permanence is especially relevant if Parties agree on a market mechanism for REDD. As has observed for the CDM, temporary credits are far cheaper. This fact, added to the elevated transaction costs for A/R CDM project activities, has created additional barriers to forestry activities in mitigating climate change. A future solution to the question of permanence should therefore consider that emission reductions made by other sectors are not automatically permanent. For example, a reduction of emissions in transportation doesn't necessarily lead to a reduction in oil production or to a permanent maintenance of the carbon in the oil reserves *per se*. In fact, as long as carbon is in the biosphere, it can be released. Therefore, other sectors should also consider the question of permanence. That could increase the competitively of REDD in future. Parties interested in a wider consideration of permanence should include this item for the ongoing negotiations for future commitment periods of the Kyoto Protocol.

Additionality

Additionality means that a project has to be additional to any activity that would have taken place in the absence of the project. Additionality is the result of the carbon emissions reduced by the project (project scenario) minus those emissions that would occur in the absence of the project (baseline). It is a term used within the CDM. As the current negotiations on REDD are within the Convention, the question as to whether activities in REDD have to be additional or not is completely open.

Emission reductions for internal measures in Annex I countries, as well as project activities within the Joint Implementation, do not need to be additional. Some parties argue that the same treatment should be given to any reduction resulting from REDD. Others argue that any reduction from REDD should be additional, especially if a market mechanism is to be established.

Monitoring and reporting

Maintenance of the reservoirs (pools) needs to be regularly monitored and verified. These data have to be consistently reported so that a clear quantification of the global emission reductions can be calculated. To do so, reliable methods are needed to accurately assess emission reductions over time. While such methods exist, they tend to be very expensive. The experience in the ongoing A/R CDM shows that monitoring costs can be very high (in some cases 25% of the total project cost).

Monitoring and reporting requirements need to be agreed in such a way that accurate quantification of the emission reduction over time is possible, while at the same time making technologies and capacity building available for developing countries.

5.5 Financing Options

There is a general agreement that any mechanism for REDD should include provision of new and additional financial resources. However there are different positions on where these resources should come from and which kind of mechanism should be agreed.

The discussion focuses on following questions:
What should be paid for?
Who should pay?
Which kind of mechanism should be set in place (market, non-market)?
Who should be paid and how to ensure an appropriate income distribution?

Many submissions include proposals on financing mechanisms for REDD. Table 11 summarizes some of the proposals made by Parties since COP11. The table includes those proposals which, according to observations during the second expert meeting hosted in Cairns, are gaining momentum in the negotiation. All these proposals are on the negotiation table. There is no clarity yet as to which mechanism will be agreed.

Table 11: Some proposals for funding mechanisms on REDD

Presented by	Type of mechanism	Characteristics
Bolivia, Central African Republic, Costa Rica, DR of Congo; Dominican Republic, Fiji, Ghana, Guatemala, Honduras, Kenya, Madagascar, Nicaragua, Panama, PNG, Samoa, Solomon Islands, Vanuatu (Known as the Coalition for Rainforest Nations) Basket initiatives including deforestation and forest degradation	**REDD Mechanism**	Accounts for gross carbon emission reductions and non-CO2 emission reductions only in existing forest areas on a national basis Market Mechanism (higher accuracy and value) and/or non-market incentives (lower accuracy and value) Voluntary policy approaches Gross reductions of GHG emissions against a reference scenario (defined as a function of the emissions rate and a development adjustment factor) for a reference period Nationally-based. However it could be implemented synergistically with the project-based A/R CDM
	REDD Stabilization Fund	Accounts for carbon emissions and removals and non-CO_2 emissions in countries participating in the REDD Mechanism that seek to maintain and stabilise existing forest areas on a national basis. It is meant to be special useful for countries with low DD rates and to maintain their forests New and additional funding as: - a levy on Emission Reduction Units (similar as those imposed to the CERs) - a tax on carbon intensive commodities and services - new and additional ODA
	REDD enabling Fund	A special purpose group of funds designed to prepare and support developing countries who seek to participate in the mechanisms above, including piloting activities To create capacities in some developing countries so that these can participate in a REDD system New and additional financial sources It should develop 3 voluntary tracks: - REDD non-market (or fund-based) mechanisms - REDD market-based mechanisms - REDD stabilization instrument

Brazil It includes only deforestation. It is based on the concept of "compensated reductions" presented in Santilli et al (2005)		RED should be considered solely under the Convention. Therefore no mechanism aimed at fulfilling commitments by Annex I countries. Related to "avoided deforestation" or "conservation". Based on voluntary reductions by developing countries. Seeks positive incentives for the **net** reduction of emissions from deforestation in developing countries. Incentives should encompass the provision of new and additional financial resources, technology transfer capacity building and enhancement of endogenous capacities Financial incentives to be provided by Annex I countries voluntarily engaged Means: new and existing national public policies and measures Only ex-post results can be considered Reductions are to be calculated based on a comparison between the rate of emissions from deforestation for a certain past period with the reference emissions rate. Countries can create a credit or a debit. Credits will be converted to financial incentives coming from developed country partners according to their obligations under the UNFCCC Developing countries will then be either a) ready to a prompt start ; or b) require capacity building Scheme based on country's definitions (for deforestation)
RED Mechanism **Chile** **Costa Rica on behalf of Dominican Republic, Guatemala, Honduras , Mexico, Panama, Paraguay and Peru** (it is focused on deforestation without explicitly exclude degradation)	Credit for early action	Early action should be eligible for crediting
	Avoided Deforestation Carbon Fund (ADCF) Note: this fund has many similarities with the REDD Stabilization Fund	Aimed at providing resources for the implementation of specific activities that a) reduce emissions from deforestation and/or b) maintain low rates of deforestation. This fund could be financed through i) Voluntary contributions ii) An X% levy of Emission Reduction Units issued or Assigned Amounts (similar as of the CERs) iii) A tax on carbon intensive commodities and services in Annex I countries This fund replenishment instruments are based on the polluter pays principle
	Enabling Fund	Aimed at supporting capacity building and piloting activities Sources of replenishment should be identified and additional ODA is urgently required
	Market based mechanism	Including the CDM and other market mechanisms and coupled with an appropriate demand (e.g. by increasing reduction commitments of Annex I countries)
Germany on behalf of the European Community and its member countries and supported by Bosnia and Herzegovina, Serbia, Former Yugoslav Republic of Macedonia, Croatia and Turkey It mentions only deforestation	Preparatory scheme for post 2012	- Assessment of national implementation of policies to combat deforestation - Activities to improve monitoring and reporting capacity required for RED - Process to define baselines or reference scenarios including the anticipation of future trends - Positive incentives including o Voluntary funding o Activities Implemented Jointly o Other sources of funding and support

India Based on the concept of "compensated conservation" It mentions only deforestation	Financial mechanism for **Compensated Conservation**	The concept of Compensated Conservation is aimed at compensating countries for maintaining and increasing forests as carbon pools as a result of effective conservation and increase/improvement in forest cover backed by verifiable monitoring systems Additionality: Proposal of Compensated Conservation intended to be outside the CDM of Kyoto Protocol Baseline: Increment/decrease to be evaluated as gain/loss against a predetermined base year/cut off year say 1990 Leakage: The Carbon sequestered through CDM A/R projects of host country to be deducted as leakage Technical and Methodological Requirements for monitoring and reporting Verification: Through independent inspections Set up new financial mechanism linked to verifiable C increment, ODA, GEF, or Climate Change Adaptation Fund enhanced and made available for such incentives Capacity Building would be canalized through the UNFCCC •Fiscal incentives to flow against one single National Project •Recipient country to decide distribution of incentives amongst participating communities including investment in further conservation activities forests/other wooded lands
Tuvalu Considers deforestation and forest degradation	**Forest Retention Incentive Scheme (FRIS)** Established under the UNFCCC and would relate to reducing emissions from deforestation and forest degradation	***Community Forest Retention Trust Accounts*** Communities that wish to set aside forest areas or manage them on a sustainable basis would seek funding to establish a Community Forest Retention Trust Account (CFRT Account). Sources of funding for the CFRT Account could include: The Special Climate Change Fund Bilateral ODA Corporate sponsorship NGO contributions Government contributions (including through debt for nature swaps and other similar measures)
		Forest Retention Certificates Once the CFRT Account was established communities could apply for Forest Retention Certificates. These Certificates would be based on an estimate of the amount of greenhouse gas emissions reduced by the project for a period of time. This estimate would be based on current emission trends compared with potential actions to reduce these emission trends.
		International Forest Retention Fund Funding for the redemption of these Certificates would come from an IFRT established under the Convention Redemption of the Certificates would be granted *ex poste*. Communities could deposit these redeemed Certificates into their CFRT Account or use the money as the community sees fit. Procedures for assessment and auditing would be kept as simple as possible to minimise transaction costs. The Certificates could only be redeemed to the International Forest Retention Fund. They cannot be sold, transferred or traded.

Source: Submissions by Parties

5.6 The negotiation ahead

As agreed in Montreal in 2005, the ongoing process on REDD will report to the next COP meeting in Bali in December 2007. Before this meeting, a draft decision will need to be discussed. The first opportunity Parties will have to prepare such draft, will be the next SBSTA meeting in Bonn in May. Some Parties have asked the Secretariat of the UNFCCC to organise a third expert meeting after the SBSTA aimed at finalising the draft decision.

A key issue that needs to be carefully considered by Parties interested in REDD is the implications of the ongoing negotiation on further commitments within the Kyoto Protocol as the existing binding agreement for mitigation to climate change Until now, all decisions within the Kyoto Protocol refer to the first commitment period (2008- 2012). Article 3, paragraph 9 of the Kyoto Protocol provides that The Conference of the Parties acting as the Meeting of the Parties (COP/MOP) shall initiate consideration of future commitments for Annex I Parties at least seven years before the end of the first commitment period. Pursuant to that provision, the COP/MOP at its first session held at Montreal from 28 November to 10 December 2005, established the Ad Hoc Working Group on Further Commitments for Annex I Parties under the Kyoto Protocol (AWG). The AWG is mandated to report to each COP/MOP on the status of its work. It aims to complete its work and have its results adopted by the Conference of the Parties at the earliest possible time to ensure that there is no gap between the first and second commitment period of the Kyoto Protocol.

Decisions with regard to further commitment periods can have a great impact on REDD, especially if REDD is to be included in the Kyoto Protocol.

6 Relevance for the ITTO

The modest participation of the forest sector in developing countries would change if REDD is adopted as a climate change mitigation strategy by the UNFCCC. According to the Stern Review[38] (Stern, 2006) there is increasing momentum for this. Deforestation and forest degradation is an issue in tropical timber producing countries. Nevertheless, reducing emissions from deforestation and forest degradation, partly achievable through possible international transfer payments, also brings opportunities to these countries to maintain their permanent forest estate through an additional incentive through REDD. If REDD participating countries are to significantly reduce their deforestation and forest degradation rates, they will need to tackle the policy, governance and market failures driving land use change and unsustainable forestry. Hence, some of the core objectives of ITTO are at stake. Estimates of the global value of REDD payments are subject to major variation depending on the underlying assumptions. Even assuming a carbon value of US $10 per ton of carbon dioxide (CO_2e), estimates include a net present value of US $150 billion (cited in Chomitz et al., 2006) and an annual revenue of $2 to 5 billion. This conservative figure, compared with the 2.2 billion US$ needed to achieve the Year 2000 Objective of ITTO (Costs of Achieving the Year 2000 Objective, Expert Panel Report 1995), would be a significant amount to consider in an overall framework of SFM.

ITTO should be involved in shaping the forest carbon mitigation strategy in the Climate Change negotiations. Forest- and particular tropical forest - related discussions in the UNFCCC are in full swing and it is most probable that until end of 2009 (COP in Copenhagen), the forest-related agenda will be shaped. It is of vital interest for ITTO and its member countries that a number of key challenges of ITTO's work are fully addressed in that forum. This includes:

- The inclusion of the notions of permanent forest estates and SFM as key elements for maintaining carbon pools within a wider concept of landscape management. Committing forests as carbon pools has to be integrated into a wider concept of SFM to guarantee additionality, permanence and avoidance of leakages. The current discussion is weak on such issues and ITTO's expertise is desperately needed in this regard.
- An UNFCCC negotiation without considering the wider notion of SFM, that includes conservation and production approaches, can become a threat for forest management *per se*. There is a tendency in the negotiation to only consider strict forest conservation against deforestation, and not to tackle the core issue of maintaining carbon stocks through SFM.
- In order to be a successful approach, REDD should fully recognize the sovereignty principle of a country to conserve and manage its forests. Hence, countries need to develop a REDD scheme, where they can decide on their own which forests should be committed as carbon reservoirs. Methodologies should allow articulating local activities with national accounting systems. ITTO is the international organization with most experience in this regard through its project work. ITTO can therefore offer its producing member countries to test feasible and sustainable approaches for a future REDD scheme.
- There will most probably be some kind of market or non-market mechanism for transfer payments for REDD. However, it is not clear yet who will receive this money and which mechanism would be needed to ensure equitable income distribution. Here, ITTO, through its involvement in SFM at national, regional and local level, including all sorts of stakeholders, can help to develop appropriate and feasible compensation schemes that are lasting and low in transaction costs.
- The UNFCCC process should make illegal practices less attractive.

Recognize the opportunities: utilising flexible approaches and approaches adapted to the situation; help to shape the tropical forest agenda in the UNFCCC

[38] Stern argues for avoided deforestation as one of four 'key elements' of a global climate change mitigation strategy, pointing out that it would be a "highly cost-effective way of reducing greenhouse gas emissions … fairly quickly."

7 Conclusions and Recommendations for Action

Over the past few months there has been a dramatic recognition worldwide that climate change is happening and that its effects will be visible and felt within the current generation (see the summaries for policy makers of the fourth assessment report of IPCC released in February and April 2007). In the various international fora that deal with the consequences of climate change, forests have been recognized as one of the important pillars for mitigating the negative effects of climate change and as a vehicle to help to reduce vulnerability. Maintaining existing forests, reducing deforestation and eliminating forest degradation are important elements of a future climate change scenario that integrates the role of forests and forestry. Hence ITTO, as one of the main international stewards of tropical forests, is requested to muster its full strength to help to shape a forest and climate change agenda. Indeed, SFM, one of the two pillars of ITTO's mandate, also offers the most promising perspectives on the climate change mitigation front. Hence, ITTO and its member countries are challenged to actively contribute to the climate change policy agenda.

Recommendations are addressed to ITTO member countries and to ITTO as an organisation. Within the member countries, it would be of utmost importance to create a functional relationship between the forestry stakeholders, mainly the forest administration and the organisations/institutions and government bodies that deal with climate change.

The main recommendations to ITTO member countries as follows:

1. Clarify the current pace/rate of deforestation and forest degradation in the country, including
    a. Gross emissions
    b. Net emissions
    c. Key drivers

2. Estimate the future pace/rate of deforestation and forest degradation, in particular deforestation that is not considered as needed for long-term sustainable economic development.
    a. Gross emissions
    b. Net emissions
    c. Key drivers

    Countries could inventory and set aside those forests included in the permanent forest estate that are made available as committed forests to an international forest carbon incentive scheme (market or not-marked driven)

3. Estimate their potential for emission reductions
    a. National (through policies and enforcement)
    b. Local (through projects on committed forest as a carbon reservoirs)

4. Estimate the costs and benefits of REDD
    a. Under different management practices
    b. Overall products and services
    c. Set against realistic long term opportunity costs and benefits based on local conditions
    d. REDD costs e.g. quantifying C, validating or verifying the projects, monitoring REDD

5. Define a negotiation strategy for
    a. Prompt action
    b. Future commitment periods (after 2012)

6. Undertake pilot projects and promote exchange of experiences, knowledge and technology

The role of ITTO as an organisation is that of support to its member countries in the implementation of the six recommendations for actions, through:

- Facilitating SFM as a means for REDD in the UNFCCC process and helping to shape the further development of REDD within the UNFCCC.
- Promoting capacity building in ITTO producing member countries to ensure their full understanding of the issues and opportunities of a future REDD scheme in the UNFCCC and the consequences in respect to SFM.
- Supporting producer countries to identify their priorities for negotiation and to create a knowledge base in practical REDD.
- Helping to formulate and finance pilot actions and projects in ITTO member countries to help develop a sustainable and feasible REDD scheme.

- It is further recommended to include REDD as a thematic area in the new ITTA, 2006.

Complementarily, we propose some activities in line with the time frame of the negotiations within the UNFCCC.

Immediate action (from May to December 2007, when the COP 13/MOP 2 will be held from 3rd to 14th December, 2007 in Bali, Indonesia):

- Follow the decisions from SBSTA and COP 13 as well as from any inter-session process.
- Prepare and conduct an ITTO side event during COP 13 to demonstrate experiences on SFM, including C&I, and ongoing and evaluated projects on conservation, SFM and forest restoration, and promote exchange.
- Develop further the concept of SFM as a valuable REDD alternative

Long-term action (from December 2007 onwards):

- Support pilot projects aimed at testing the potential benefits and risks of REDD payments and incentives in the framework of SFM and the timber trade.
- Actively participate in UNFCCC process related to forest or timber in the tropics and ensure that ITTO experience, know-how and tools are submitted to the relevant UNFCCC processes.
- Regularly inform the UNFCCC Secretariat of ongoing ITTO processes and pilot projects that are related to REDD and vice-versa; maintain ITTO members informed on UNFCCC decisions and opportunities that can be relevant for SFM and the timber market.

8 Abbreviations

CDM	Clean Development Mechanisms
CER	Certified Emission Reductions
COP	Conference of the Parties
EB	Executive Board of the CDM
GEF	Global Environmental Facility
GHG	Greenhouse Gases
IPCC	Intergovernmental Panel on Climate Change
ITTC	International Tropical Timber Council
ITTO	International Tropical Timber Organisation
JI	Joint Implementation
KP	Kyoto Protocol
LULUCF	Land Use Land Use Change and Forestry
MAI	Mean annual increment
PCF	Prototype Carbon Fund (World Bank)
PDD	Project Design Document
RED	Reducing Emissions from Deforestation
REDD	Reducing Emissions from Deforestation and Forest Degradation
SBI	Subsidiary Body for Implementation
SBSTA	Subsidiary Body for Scientific and Technological Advice
UNDP	United Nations Development Programme
UNFCCC	United Nations Framework Convention on Climate Change
UNFF	United Nations Forum on Forests

9 Glossary

Mitigation

This section presents the definitions regarding mitigation as these are given in the decisions of the UNFCCC.

Actual net greenhouse gas removals by sinks is the sum of the verifiable changes in carbon stocks in the carbon pools within the project boundary, minus the increase in emissions of the greenhouse gases measured in CO2 equivalents 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 boundary, attributable to the afforestation or reforestation project activity under the CDM.

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.

Baseline net greenhouse gas removals by sinks is the sum of the changes in carbon stocks in the carbon pools within the project boundary that would have occurred in the absence of the afforestation or reforestation project activity under the clean development mechanism (CDM).

Carbon pools are those carbon pools referred to in paragraph 21 of the annex to draft decision -/CMP.1 (*Land use, land-use change and forestry*) and are: above-ground biomass, below-ground biomass, litter, dead wood and soil organic carbon.

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.

Deforestation is the direct human-induced conversion of forested land to nonforested land.

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 metres at maturity *in situ*. A forest may consist either of closed forest formations where trees of various storeys and undergrowth cover a high proportion of the ground or open forest. Young natural stands and all plantations which have yet to reach a crown density of 10-30 per cent or tree height of 2-5 metres 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.

Forest management is a system of practices for stewardship and use of forest land aimed at fulfilling relevant ecological (including biological diversity), economic and social functions of the forest in a sustainable manner.

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.

Leakage is 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 or reforestation project activity.

Long-term CER or "lCER" is a CER issued for an afforestation or reforestation project activity under the CDM which, subject to the provisions in section K below, expires at the end of the crediting period of the afforestation or reforestation project activity under the CDM for which it was issued.

Net anthropogenic greenhouse gas removals by sinks is the actual net greenhouse gas removals by sinks minus the baseline net greenhouse gas removals by sinks minus leakage.

Project boundary geographically delineates the afforestation or reforestation project activity under the control of the project participants. The project activity may contain more than one discrete area of land.

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.

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 contained here.

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 CO2 per year and are developed or implemented by low-income communities and individuals as determined by the host Party. If a small-scale afforestation or reforestation project activity under the CDM results in net anthropogenic greenhouse gas removals by sinks greater than 8 kilotonnes of CO2 per year, the excess removals will not be eligible for the issuance of tCERs or lCERs.

Temporary CER or "tCER" is a CER issued for an afforestation or reforestation project activity under the CDM which, subject to the provisions of section K below, expires at the end of the commitment period following the one during which it was issued.

Adaptation

This section provides definitions for the concepts and terms regarding adaptation as used in the Adaptation Policy Framework.

Adaptation – a process by which strategies to moderate, cope with, and take advantage of the consequences of climatic events are enhanced, developed, and implemented.

Adaptation baseline - An adaptation baseline includes a description of adaptations to current climate that are already in place. Also see Baseline.

Adaptation Policy Framework (APF) – a structured process to developing adaptation strategies, policies, and measures to enhance and ensure human development in the face of climate change, including climate variability. The APF is designed to link climate change adaptation to sustainable development and other global environmental issues. It consists of five basic components: project scope and design, assessing current vulnerability, characterizing future climate risks, developing an adaptation strategy, and continuing the adaptation process.

Adaptive capacity – the potential or capability of a system to adjust, via changes in its characteristics or behavior, so as to cope better with existing climate variability and change. It is possible to differentiate between adaptive potential, a theoretical upper boundary of responses based on global expertise and anticipated developments within the planning horizon of the assessment, and adaptive capacity that is constrained by existing information, technology and resources of the system under consideration.

Baseline (also called project baseline) – a description of current conditions, including existing or needed information on socioeconomic conditions, climate risks and hazards, and of known system vulnerabilities and adaptations. See also vulnerability baseline and adaptation baseline.

Climate change – any change in climate over time, whether due to natural variability or because of human activity.

Climate change vulnerability - the degree to which a system is susceptible to, or unable to cope with, the adverse effects of climate change, including climate variability and extremes. See also vulnerability.

Climate variability – variations in the mean state and other statistics (such as standard deviations, the occurrence of extremes, etc.) of the climate on all temporal and spatial scales beyond that of individual weather events. Variability may result from natural internal processes within the climate system (internal variability) or to variations in natural or anthropogenic external forcing (external variability).

Coping range – the range of climate where the outcomes are beneficial or negative but tolerable; beyond the coping range, the damages or loss are no longer tolerable and a society is said to be vulnerable.

Cost-benefit analysis - A quantitative method that makes a detailed comparison of the costs and benefits of a particular measure, or set of measures. A decision to fund the project depends on the ratio of benefits to costs – the higher the ratio, the more attractive the investment. Its major advantages are its verifiable bottom line and its familiarity to ministries and planning agencies. Disadvantages include limitations regarding the ability to directly address equity considerations and represent non-quantifiable benefits.

Evaluation – a process for determining systematically and objectively the relevance, efficiency, effectiveness and impact of the adaptation strategies in the light of their objectives.

Food insecurity – a situation that exists when people lack secure access to sufficient amounts of safe and nutritious food for normal growth and development and an active and healthy life. It may be caused by the unavailability of food, insufficient purchasing power, inappropriate distribution, or inadequate use of food at the household level. Food insecurity may be chronic, seasonal, or transitory. More recent literature focuses on livelihood security—an expansion of food security to include multiple stresses and sectors to which livelihoods might be exposed.

Hazard – a physically defined climate event with the potential to cause harm, such as heavy rainfall events, droughts, floods, storms, long-term changes in mean climatic variables such as temperature.

Hybrid - "Hybrid" approaches apply uniform and site-specific methods in tandem and within an iterative process to develop and assess the range of adaptation strategies.
Indicator – an item that can be clearly characterized and possibly quantified that represents an abstract concept, such as human well-being.

Logical Framework Analysis Approach/Logframe – a project planning tool that includes project goals, objectives and activities, with specific outputs and measurable indicators of achievements.

Measure – see "Policies and measures."

Monitoring – a mechanism or mechanisms to track progress in implementation of an adaptation strategy and its various components in relation to targets.

Policies and measures – usually addressed together, policies and measures address the need for climate adaptation in distinct, but sometimes overlapping ways. Policies typically refer to instruments that government can use to change economic and other behaviors. Policies are usually composed of taxes, command-and-control regulations (e.g., performance specifications for technologies), market mechanisms such as trading schemes, incentives such as subsidies for new management techniques, and information gathering (as on the likely impacts of climate change) or dissemination (as on the merits of new technologies or behavior changes). Measures are usually specific actions amenable to implementation, such as re-engineering irrigation systems, planting different crops, or initiating a new industry. Many "projects" could be also termed "measures".

Priority system - A priority system is the focus of the APF process. It is a system that is characterized as highly vulnerable to different climate hazards, as well as being strategically important at local and/or national levels. It has been identified as a priority system through a stakeholder-driven process.

Probability - defines the likelihood of an event or outcome occurring. Probability can range from being qualitative, using word descriptions such as likely or highly confident, to quantified ranges and single estimates, depending on the level of understanding of the causes of events, historical time series and future conditions.

Reference scenario – an internally coherent description of a possible future without consideration of climate change; the reference scenario is used for comparison with alternative scenarios that include consideration of climate change and options for adaptation policies and measures.

Risk (climate-related) – The result of the interaction of physically defined hazards with the properties of the exposed systems - i.e., their sensitivity or [social] vulnerability. Risk can also considered as the combination of an event, its likelihood, and its consequences - i.e., risk equals the probability of climate hazard multiplied by a given system's vulnerability.

Scenario – a plausible and often simplified description of how the future may develop, based on a coherent and internally consistent set of assumptions about driving forces and key relationships. Scenarios may be derived from projections, but are often based on additional information from other sources, sometimes combined with a narrative storyline.

Sector – a part or division, as of the economy (e.g., the manufacturing sector, the services sector) or the environment (e.g., water resources, forestry).

Site-specific approaches – These approaches seek to develop and assess detailed adaptation strategies on the basis of specific perceptions of vulnerability that have emerged from the full range of stakeholders at the site level (e.g., local communities, local project).

Socioeconomic vulnerability - an aggregate measure of human welfare that integrates environmental, social, economic and political exposure to a range of harmful perturbations . See also vulnerability.

Stakeholder – those who have interests in a particular decision, either as individuals or as representatives of a group. This includes people who influence a decision, or can influence it, as well as those affected by it.

Strategy – a broad plan of action that is implemented through policies and measures. Strategies can be comprehensive (i.e., focusing on national, cross sectoral scales) or targeted (i.e., focusing on specific sectors, regions, or measures).
System - a system may be a region, a community, a household, an economic sector, a business, a population group, or other systems, such as an agricultural system, that are exposed to varying degrees to different climate hazards, defined in TP 4 as events with the potential to cause harm (see priority system).

Uncertainty – an expression of the degree to which a value (e.g., the future state of the climate system) is unknown.

Uniform approaches – These approaches seek to develop and assess broad adaptation strategies on the basis of a comprehensive perception of vulnerability that may exist – for example across sectors, across regions, across development challenges.

Vulnerability – The degree to which an exposure unit is susceptible to harm due to exposure to a perturbation or stress, and the ability (or lack thereof) of the exposure unit to cope, recover, or fundamentally adapt (become a new system or become extinct). It can also be considered as the underlying exposure to damaging shocks, perturbations or stresses, rather than the probability or projected incidence of those shocks themselves. See also socioeconomic vulnerability and climate change vulnerability.

Vulnerability baseline - A vulnerability baseline includes a description of current vulnerabilities to climate variability and events. Also see Baseline.

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11 Annexes

11.1 Countries with commitments for the Kyoto Protocol

Party[a]	Mt C/yr
Australia	0.00
Austria	0.63
Belarus	
Belgium	0.03
Bulgaria	0.37
Canada	12.00
Croatia	0.265[b]
Czech Republic	0.32
Denmark	0.05
Estonia	0.10
Finland	0.16
France	0.88
Germany	1.24
Greece	0.09
Hungary	0.29
Iceland	0.00
Ireland	0.05
Italy	2.78[d]
Japan	13.00
Latvia	0.34
Liechtenstein	0.01
Lithuania	0.28
Luxembourg	0.01
Monaco	0.00
Netherlands	0.01
New Zealand	0.20
Norway	0.40
Poland	0.82
Portugal	0.22
Romania	1.10
Russian Federation	33.00[c]
Slovakia	0.50
Slovenia	0.36
Spain	0.67
Sweden	0.58
Switzerland	0.50
Ukraine	1.11
United Kingdom	0.37

[a] The list of countries in this table differs from that found in decision 5/CP.6 as a result of consultations undertaken during the session.
[b] This figure has been added by decision 22/CP.9.
[c] This figure is changed from 17.63 to 33.00 by decision 12/CP.7.
[c] This figure is changed from 0.18 to 2.78 by decision 8/CMP.2.

11.2 Background on key decisions of the COP with regard to LULUCF

Article 3, paragraph 3

- **Background**

Art 3.3 establishes that net changes in greenhouse gas emissions by sources and removals by sinks resulting from direct human-induced land-use change and forestry activities, limited to afforestation, reforestation and deforestation since 1990, measured as verifiable changes in carbon stocks in each commitment period, shall be used to meet the commitments under this Article of each Party included in Annex I.[39]

- **Decisions and Rules for Article 3, paragraph 3 (Decision 16/CMP.1)**

A set of specific rules and modalities related to Article 3.3 were also decided on CMP.1, specifically:

- anthropogenic greenhouse gas emissions by sources and removals by sinks resulting from LULUCF activities shall be reported in annual inventories.
- eligible activities are those direct human-induced ARD activities that take place at any time between 1 January 1990 and before 31 December 2012.
- for the purposes of determining the area of deforestation to come into the accounting system, each Party shall determine the forest area using the same spatial assessment unit as is used for the determination of afforestation and reforestation, but no larger than 1 hectare.
- for the first commitment period, debits resulting from harvesting during the first commitment period following A/R since 1990 shall not be greater than credits accounted for on that unit of land.
- each Party included in Annex I shall report, in accordance with Article 7, on how harvesting or forest disturbance that is followed by the re-establishment of a forest is distinguished from deforestation.

Article 3, paragraph 4

- **Background**

Article 3.4 states that parties should provide data to establish its level of carbon stocks in 1990 and to enable an estimate of its changes in carbon stocks in subsequent years. It also allows the inclusion of additional mitigation activities in the agricultural soils and the land-use change and forestry sector (very specifically forest management). Decisions would apply in the second and subsequent commitment periods, however, parties may choose to apply these additional activities for its first commitment period, provided that these activities have taken place since 1990.[40]

- **Decisions and Rules for Article 3, paragraph 4(Decision 16/CMP.1 Annex)**

- A Party may choose to account for anthropogenic greenhouse gas emissions by sources and removals by sinks resulting from any or all of the following human-induced activities, other than afforestation, reforestation and deforestation, under Article 3, paragraph 4, in the first commitment period: revegetation, forest management, cropland management and grazing land management.
- Upon election, a decision by a Party will be fixed for the first commitment period.
- During the first commitment period, a Party shall demonstrate that activities mentioned in the first paragraph, have occurred since 1990 and are human-induced.
- If emission by sources and removals by sinks are already for under Art .3.3 Parties cannot account for these under Art 3.4.

[39] Kyoto protocol 1998.
[40] Kyoto protocol 1998.

- For the first commitment period, accountable anthropogenic GHG emissions by sources and removals by sinks resulting from cropland management, grazing land management and revegetation, shall be equal to anthropogenic GHG emission by sources and removals by sinks in the commitment period, less five times the anthropogenic GHG emissions by sources and removals by sinks resulting from these eligible activities in the base year, avoiding double accounting.

- If a Party's ARD activities result in more emissions than removals, then the Party may offset these emissions through forest management activities, up to a total level of 9 megatons of carbon per year for the five year commitment period.

- For the first commitment period only, the extent to which forest management activities can be accounted for to help meet emission targets beyond 9 megatons shall not exceed the value inscribed for each Party in the appendix to 16/CMP.1, times five [41].

Decision 8/CMP.2

- Decides that, for the first commitment period, additions to and subtractions from the assigned amount of Italy, resulting from forest management under art 3.4, shall no exceed 2.78MtC/year, times five[42]

Decisions that involves Art3.3 and Art 3.4, related to Article 12. (**16/CMP.1)**

- Accounting of emissions and removals resulting from land use change and forestry activities under Art 3, paragraphs 3 and 4, shall begin with the onset of the activity or the beginning of the commitment period, whichever comes later.

- Once land is accounted for under Article 3.3 and 3.4, all emissions and removals on this land must be accounted for throughout subsequent and contiguous commitment periods.

- Each Party shall ensure that areas of land subject to LULUCF activities under Art 3.3 and 3.4, are identifiable and should be provided information about these areas in their National Inventories.

Decisions that involves Art3.3 and Art 3.4 **(17/CMP.1**) [43]

Good practice guidance for land use, land-use change and forestry (GPG-LULUCF) [44], as developed by the IPCC in a manner consistent with the Kyoto Protocol, with decision 16/CMP.1 and with the annexes to this decision, for the purpose of providing information on anthropogenic GHG emissions by sources and removals by sinks from LULUCF activities under Art 3.3 and if any, elected activities under Art 3.4 should be used.

Decisions that involve Art 3.3 and Art 3.4 (18/CMP.1)[45]

- a Party included in Annex I to the Convention shall not issue removal units pursuant to paragraph 26 of the annex to decision 13/CMP.1 for a specific activity under Article 3, paragraph 3, or a specific elected activity under Article 3, paragraph 4, associated with a year of the commitment period, if the magnitude of the adjustments to that activity, as defined in the annex to this decision, exceeds 9 per cent for that year;

- for any adjustments relating to an activity under Article 3, paragraph 3, or an elected activity under Article 3, paragraph 4, associated with a year of the commitment period, the review reports under Article 8 of the Kyoto Protocol shall include the magnitude of the adjustments to that activity as the percentage calculated in accordance with the previous paragraph.

Art. 6 (Joint Implementation): experiences and lessons learned that could be useful in addressing REDD

[41] See Appendix 16/CMP1
[42] See Appendix 16/CMP1
[43] 17/CMP1
[44] GPG-LULUCF 2003. Actually the 2006 Guidelines for National GHG inventories are being developed to replace the 1996 Guidelines and the GPG-LULUCF2003. The LUCF and Agriculture sector will be combined into the Agriculture, Forestry and Other Lan Use (AFOLU) sector. Consequently some issues associated with the stock change approach, that have been raised with respect to wood products, are applicable also to the whole AFOLU sector (Cowie et al 2005)
[45] 18/CMP1

Background:[46]

For the purpose of meeting its commitments under Article 3, any Party included in Annex I may transfer to, or acquire from, any other such Party emission reduction units (ERU) resulting from projects aimed at reducing anthropogenic emissions by sources or enhancing anthropogenic removals by sinks of greenhouse gases in any sector of the economy, provided that: (a) Any such project has the approval of the Parties involved; (b) Any such project provides a reduction in emissions by sources, or an enhancement of removals by sinks, that is additional to any that would otherwise occur; (c) It does not acquire any emission reduction units if it is not in compliance with its obligations under Articles 5 and 7; and (d) The acquisition of emission reduction units shall be supplemental to domestic actions for the purposes of meeting commitments under Article 3.

Joint Implementation (JI) and the Clean Development Mechanism (CDM) are the two project-based mechanisms of the Kyoto Protocol that may be used by Annex I Parties to fulfil their Kyoto targets. In other words, under JI, an Annex I Party (with a commitment inscribed in Annex B of the Kyoto Protocol) may implement an emission-reducing project or a project that enhances removals by sinks in the territory of another Annex I Party (with a commitment inscribed in Annex B of the Kyoto Protocol) and count the resulting emission reduction units (ERUs) towards meeting its own Kyoto target. An Annex I Party may also authorize legal entities to participate in JI projects.

Any JI project shall have the approval of the Parties involved and provide a reduction in emissions by sources, or an enhancement of removals by sinks, that is additional to any that would otherwise occur. Projects starting as of the year 2000 may be eligible as JI projects if they meet the relevant requirements, but ERUs may only be issued for a crediting period starting after the beginning of the year 2008.

Recent Decisions relating to Article 6 of the Kyoto Protocol taken by the COP/MOP

Decision 9/CMP.1 ("Guidelines for the implementation of Article 6 of the Kyoto Protocol"[47]), including in its annex the "JI guidelines" stated that:

- projects under Art 6 aimed enhancing anthropogenic removals, by sinks shall conform to definitions, accounting rules, modalities and guidelines under Art 3.3. and Art 3.4 of the Kyoto Protocol.
- The ANNEX established definitions, the role of the COP and participation requirements.
- This decision also includes, an Appendix that describes the procedures for the accreditation of independent entities, and another Appendix, that describes the criteria for baseline setting and monitoring.

Decision 10/CMP.1 Implementation of Article 6 of the Kyoto Protocol[48] decides:

- to establish the JI supervisory committee
- designated operational entities under the CDM may act provisionally as accredited independent entities under Art 6 until the JISC has approved its procedures for accreditation. Such entities may continue to act provisionally as accredited independent entities until a final accreditation decision is taken and will be valid only after the accreditation of the independent entity is finalized.

Decision 3/CMP.2 Guidance on the implementation of Article 6 of the Kyoto Protocol [49] states that:

- the role of the JISC includes, *inter alia*: General management and organization of its work, including the establishment of subcommittees, panels and/or working groups and definitions of the services and administrative support functions.

includes a paragraph with notes about resources for the work on joint implementation.

[46] Kyoto Protocol 1997.
[47] See 9/CMP.1 Annex (FCCC/KP/CMP/2005/8/Add.2)
[48] See 10/CMP.1 Annex (FCCC/KP/CMP/2005/8/Add.2)
[49] See 3/CMP.2 Annex (FCCC/KP/CMP/2006/10/Add.1)

11.3 ITTO member countries' data in the National Communications

ITTO Producing Countries – AFRICA

Country	**Sector**	**Gross CO2 emission (Gg)*** (emissions)	**Gross CO2 removal (Gg)*** (removals)	**Net CO2 emission (Gg)*** (emissions minus removals)	**Rating Year / National Commu-nication**	**Annual Forest Cover Change 1990 – 2000** (in 1000 ha)	**Total closed natural tropical forest** (in 1000 ha)
Cameroon	LUCF	28.196	- 6.216	+ 21.979	1994 / 1	-222 (-0,9%)	19.985
Central African Republic	LUF	1.534	- 140.000	- 138.466	1994 / 1	-30 (-0,1%)	4.826
Congo	Forest	n.a.	n.a.	- 70.120	1994 / 1	-17 (-0,1%)	22.000
Cote d'Ivoire	LUCF	n.a.	n.a.	- 22.246	1994 / 1	-265 (-3,1%)	3.248
Democratic Republic of the Congo	LUCF	414.248	- 597.579	- 183.331	1994 / 1	-532 (-0,4%)	126.236
Gabon	LUCF	2.307	- 503.280	- 500.973	1994 / 1	-10 (n.a.)	21.800
Ghana	LUCF	5.738	- 25.618	- 19.878	1994 / 1	-120 (-1,7%)	1.634
Liberia	LUCF	9.500	- 50.000	- 40.500	n.a.	-76 (-2%)	4.124
Nigeria	LUCF	n.a.	n.a.	+ 75.542	1994 / 1	-398 (-2,6%)	4.456
Togo	LUCF	n.a.	n.a.	+ 19.964	1995 / 1	-21 (-3,4%)	272

* (+) stands for CO2 emission and (-) for CO2 removal

ASIA & PACIFIC

Country	**Sector**	**Gross CO2 emission (Gg)*** (emissions)	**Gross CO2 removal (Gg)*** (removals)	**Net CO2 emission (Gg)*** (emissions minus removals)	**Rating Year / National Communi-cation**	**Annual Forest Cover Change 1990 – 2000** (in 1000 ha)	**Total closed natural tropical forest** (in 1000 ha)
Cambodia	LUCF	n.a.	n.a.	- 19.636	1994 / 1	-56 (-0,6%)	5.500
Fiji	LUCF	2.149	- 9.989	- 7.840	1994 / 1	-2 (-0,2%)	747
India	LULUCF	37.675	- 23.533	+ 14.142	1994 / 1	38 (0,1%)	22.500
Indonesia	LUCF	559.471	-403.846	+ 155.625	1994 / 1	-1.312 (-1,2)	100.382
Malaysia	LUCF	7.636	- 68.717	- 61.081	1994 / 1	-237 (-1,2%)	19.148
Myanmar	LUCF	n.a.	n.a.	- 9.402	1990 / n.a.	-517 (-1,4%)	32.700
Papua New Guinea	LUCF	n.a.	n.a.	+ 413	1994 / 1	-113 (-0,4%)	30.150
Philippines	LUCF	65.549	- 68.323	- 2.774	1994 / 1	-89 (-1,4%)	5.288
Thailand	LUCF	99.577	- 39.101	+ 60.476	1994 / 1	-112 (-0,7)	10.127
Vanuatu	LUF	n.a.	n.a.	- 1	1995 / 1	1 (0,1)	442

* (+) stands for CO2 emission and (-) for CO2 removal

LATIN AMERICA

Country	**Sector**	**Gross CO2 emission (Gg)*** (emissions)	**Gross CO2 removal (Gg)*** (removals)	**Net CO2 emission (Gg)*** (emissions minus removals)	**Rating Year / National Commu-nication**	**Annual Forest Cover Change 1990 – 2000** (in 1000 ha)	**Total closed natural tropical forest** (in 1000 ha)
Bolivia	LUCF	38.617	- 4.537	+ 34.080	1994 / 1	-161 (-0,3%)	47.999
Brazil	LUCF	n.a.	n.a.	+ 776.331	1994 / 1	-2.309 (-0,4%)	489.515
Colombia	LUCF	16.540	n.a.	+ 14.505	1994 / 1	-190 (-0,4%)	51.437
Ecuador	LUCF	n.a.	n.a.	+ 45.543	1990 / 1	-137 (-1,2%)	10.854
Guatemala	LUCF	3.245	- 42.904	- 39.659	1990 / 1	-54 (-1,7%)	2.824
Guyana	LUCF	2.531	- 29.195	- 26.664	1994 / 1	-49 (-0,3%)	16.916
Honduras	LUCF	54.111	- 52.763	+ 1.380	1995 / 1	-59 (-1%)	3.811
Mexico	LULUCF	99.760	- 12.883	+ 86.811	2002 / 3	-631 (-1,1%)	33.120
Panama	LUCF	20.455	- 11.732	+ 8.722	1994 / 1	-52 (-1,6%)	3.052
Peru	LUCF	82.488	- 45.290	+ 37.197	1994 / 1	-269 (-0,4%)	64.204
Suriname	LULUCF	5.340	- 3.862	+ 1.477	2003 / 1	n.a.	14.100
Trinidad and Tobago	LUCF	n.a.	- 1.524	- 1.524	1990 / 1	-2 (-0,8%)	250
Venezuela	LUCF	35.780	- 50.138	- 14.360	1999 / 1	-218 (-0,4%)	49.926

* (+) stands for CO2 emission and (-) for CO2 removal

ITTO Consumer Countries

Country	**Sector**	**Gross CO2 emission (Gg)*** (emissions)	**Gross CO2 removal (Gg)*** (removals)	**Net CO2 emission (Gg)*** (emissions minus removals)	**Rating Year / National Commu-nication**	**Annual Forest Cover Change 1990 – 2000** (in 1000 ha)
Australia	LULUCF	47.675	- 45.800	+ 1.875	2003 / 4	-282 (-0,2%)
Canada	LUCF	276.094	- 297.927	- 21.833	1999 / 3	n.a.
China	LUCF	23.713	- 431.192	- 407.479	1994 / 1	1.806 (1,2%)
Egypt	LUCF	n.a.	- 9.900	- 9.900	1990/91 / 1	2 (3,3%)
European Union:						
Austria	LUCF	287	- 13.060	- 12.773	2003 / 4	8 (0,2%)
Belgium/ Luxem-bourg	LULUCF	n.a.	n.a.	- 3.359 (Gg equiv.)	2003 / 4	-1 (-0,2%)
Denmark	LUCF	n.a.	n.a.	- 1.204 (Gg equiv.)	2003 / 4	1 (0,2%)
Finland	LULUCF	n.a.	n.a.	- 17.880	2003 / 4	8 (n.a.)
France	LUCF	107.048	- 160.121	- 53.073	2003 / 4	62 (0.4%)
Germany	LULUCF	42.301	- 78.554	- 36.252	2004 / 4	n.a.
Greece	LULUCF	n.a.	n.a.	- 5.533	2003 / 4	30 (0,9%)
Ireland	LUCF	n.a.	n.a.	- 629	2001 / 3	17 (3%)
Italy	LUCF	n.a.	n.a.	- 16.444	2000 / 3	30 (0,3%)
Nether-lands	LUCF	5.324	- 2.563	+ 2.761	2003 / 4	1 (0,3%)
Portugal	LUCF	n.a.	n.a.	- 3.195	2004 / 4	57 (1,7%)
Spain	LUCF	15.504	- 55.622	- 40.118	2003 / 4	86 (0,6%)
Sweden	LUCF	117.640	- 139.139	- 21.499	2003 / 4	1 (n.a.)
United Kingdom	LUCF	n.a.	n.a.	- 3.542	2004 / 4	17 (0,6%)
Japan	LUCF	445.557	- 142.262	- 96.705	1995 / 4	3 (n.a.)
Nepal	LUCF	22.895	- 14.778	+ 8.117	1994/95 / 1	-78 (-1,8%)
New Zealand	LULUCF	18.400	- 42.900	- 24.400	2003 / 4	39 (0,5%)
Norway	LULUCF	2.500	- 23.400	- 20.900	2003 / 4	31 (0,4%)
Republic of Korea	LUCF	2.121	- 11.569	- 9.488	2001 / 2	n.a.
Switzerland	LUCF	n.a.	n.a.	- 1.700	2003 / 4	4 (0,4%)
United States of America	LUCF	n.a.	n.a.	- 990.400	1999 / 3	388 (0,2%)

* (+) stands for CO2 emission and (-) for CO2 removal

* * *