Executive summary
- For technical and political reasons the role of ecosystem carbon has so far been undervalued in climate change mitigation negotiations.
- Permanence and leakage are an issue for ALL greenhouse gas emissions, not only for ecosystem carbon, like forests.
- Since 2005 ecosystem carbon is prominently back at the UNFCCC negotiations, although its exclusion from past agreements is still in force.
- REDD (Reduced Emissions from Deforestation and Degradation) holds huge socio-economic opportunities to reward the preservation of ecosystem carbon in developing countries.
- Development Aid can play a crucial role in preparing developing countries to make REDD pro-poor and development oriented.

Introduction
The growing levels of greenhouse gases (GHG) in the atmosphere are now directly and unequivocally linked with changes to the global climate (IPCC 2007). Among the anthropogenic sources of GHG the conversion of natural forests and woodlands, particularly in the tropics, is estimated to account for 12-18 % (IPCC 2007; van der Werf et al. 2009).

It is therefore remarkable that the Kyoto protocol only accepts af-/reforestation of the ecosystem carbon pool under the Clean Development Mechanisms and does not consider initiatives to halt deforestation. In 2001 the European Emissions Trading Scheme (ETS) – by far the most important carbon market of the world – excluded all ecosystem carbon emissions from forest, agriculture, peatland and any other land use. The reasons to do this were both technical and political.

Technical reasons
For reasons of permanence and leakage it was claimed that ecosystem carbon could not function as an effective sink (Meinshausen and Hare 2002; Kirschbaum 2006).

Permanence
How can we make sure that a forest area conserved today will not be destroyed tomorrow through e.g. drought, pest or fire? At least three arguments can be presented against the categorical distinction between reduction of fossil emissions and carbon management in ecosystems:

1. Given the finiteness of fossil fuels, it is likely that they will anyway end up in the atmosphere over the long run. Reduced fossil fuel use today preserving a part of the reservoirs of coal, oil and gas, carries the risk of exploitation and consumption in the future. The question of permanence is therefore not limited to forest carbon only.

2. Even if ecosystem carbon sequestration would be temporary, it will still have a positive climate mitigation effect (see the ‘ton-year approach’ discussed below).
3. To deal with permanence it is important that one party assumes liability for both fossil fuel and ecosystem carbon stocks. Non-permanence may then still be a threat, but its damaging effects to the atmosphere can then be compensated for. Dutschke and Angelsen (2008) present a list of mechanisms to deal with the permanence issue under REDD, which in fact also applies to ecosystem carbon:

a. **Temporary crediting** is being applied under the af/reforestation (A/R) clean development mechanism (CDM). Depending on the specific agreement, emissions reductions have to be either recertified or reverified after five years in order for the credit to remain valid. Temporary crediting thus creates a future debit, independently of the fate of the carbon stocks built up.

b. The so-called ‘*ton-year approach*’ was discussed in the Intergovernmental Panel on Climate Change (IPCC) Special Report on Land Use, Land-Use Change and Forestry (Watson et al. 2000). It departed from the ideas that (i) the present value of mitigation is higher today than the same mitigation effect tomorrow, and that (ii) there is a limited residence time of CO$_2$ in the atmosphere. The combination of human time preference and the natural decay period led various authors (Moura Costa and Wilson 2000; Fearnside 2002) to the calculation of an ‘equivalence period’, after which forestry mitigation could be considered permanent. With an equivalence period of 100 years, keeping 100 tons of CO$_2$ out of the atmosphere over 1 year would be equivalent to 1 ton of CO$_2$ permanently removed.

c. With **project credit buffers** only a certain share (e.g. 50%) of the credits generated is sold, while the remainder is held in an escrow account for a predetermined period. A proportion of these credits are liberated as the guarantee period ends and when no losses have occurred.

d. With **risk pooling** several projects maintain a joint credit buffer, thus minimising the risk of damages occurring simultaneously and allowing individual project buffers to be smaller than non-pooled project credit buffers.

e. **Insurance** is an advanced version of risk pooling through a third-party insurer. The risk premium is paid in emission reduction units. In case of a damage event, the insurance company replaces credits lost by the ones held in stock.

f. Another option is a **shared liability** or forest compliance partnership (FCP) where developed countries would bear a share of the liability for the permanence of REDD credits. The FCP suggests that a developed country receives preferential access to REDD credits for compliance if it shares the liability.

Several combinations of the above options are possible, illustrating that permanence can be dealt with.

**Leakage**

Forest protection or reforestation in one area is completely ineffective if it stimulates deforestation in another area. E.g. leakage could occur if slash-and-burn farmers simply move and cut another part of the forest outside a newly established national park. Carbon emissions are perfectly fungible: to reduce emissions to the atmosphere it does not matter where the carbon emission reduction is happening. Globally, fossil fuel emissions increased by 29% between 2000 and 2008 (Le Quéré et al. 2009).

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Fig. 1 (a) Production and (b) consumption of CO$_2$ emissions (Pg C/year) in Annex B and non-Annex B countries (Le Quéré et al. 2009). The difference is largely due to embodied trade.
For many years only the production of CO₂ emissions was considered, creating the impression that Annex B countries were successful in curbing the increase of their emissions (Fig. 1a). However, Fig. 1b illustrates that the increasing emission contributions from emerging economies are not only due to e.g. the increased use of coal, but also to the production for international trade of goods and services. An increasing share of carbon emissions from developed countries has thus been outsourced to non-Annex B countries that are not bound by the Kyoto protocol (Peters and Hertwich 2008). This illustrates that leakage is not uniquely reserved for ecosystem carbon.

**Political reasons**
National governments and non-governmental organizations (NGO’s) have taken varying positions on mitigation measures such as planting trees and avoiding deforestation (Fearnside 2006). Major European environmental NGOs such as Greenpeace (Leggett 1990) and Friends of the Earth-UK (Myers 1989) published reports in which both planting trees and reducing tropical deforestation were put forward as high priorities in the fight against global warming. However, soon after the Kyoto Protocol was signed in December 1997, the European governments and Europe-headquartered NGO’s would abruptly turn against all forms of “sinks”, including avoiding tropical deforestation.

**Free riding?**
The motivation of European NGO’s was not only resentment of the United States for its foreign policies, including that country’s role as the largest single emitter of greenhouse gases and its repeated obstruction of progress in climate negotiations (Fearnside 2006), but also the fear for free riding. Free riding refers to the idea that first world countries might buy their way out rather than make a transition themselves towards a low-carbon economy. The March 2001 withdrawal of the Bush administration from the negotiations for the Kyoto Protocol’s first commitment period (2008-2012) led to reactions of disappointment, not only from many European NGO’s, but also from the remaining countries.

**Economic competition**
For European governments a different agenda became dominant: “If the doors could be effectively closed to purchase of significant quantities of carbon credits from projects in developing countries, then the United States would be forced to sharply increase its domestic fossil fuel prices in order to reduce emissions to the quota agreed in Kyoto, thereby levelling the competitive playing field with Europe (Fearnside 2006). At the UNFCCC session in Bonn in July 2001 avoided deforestation for credit under the CDM was ruled out (Fearnside 2006).

**Sovereignty**
Countries like Brazil felt that their sovereignty – and rightful development - could come under threat by accepting carbon funds for tropical forests to be kept as carbon sink.

**Why the current change in attitude?**
The Coalition of Rainforest Nations has been successful in highlighting the importance of tropical forest since the international climate change negotiations in Montréal in December 2005 (COP-11). Sovereignty issues are less of an issue now that Brazil has its own REDD proposals. Influential reports (Stern 2006; Eliasch 2008) indicate that it will not be possible to keep temperature increases below 2 °C without addressing GHG produced from land-use change.

**Conclusions**
Ecosystem carbon emissions and mitigation cannot be left out of the carbon equation and should be part of future climate agreements. Growing consensus on this point amongst the UNFCC parties (including the support of 15 developing countries) has resulted in the recent COP-16 agreement which confirms REDD as the way forward. However, insufficient progress was made on the framework to execute the program. To avoid leakage, the justified call for monitoring, reporting and verification (MRV) for ecosystem carbon should also be applied to the other (fossil fuel) emissions and be applied at a global scale.

**Implications for development aid**
Development aid could help to acquire the needed capacity for improved ecosystem
carbon management by integrating research and capacity building in planned programs on increased food security, better land use management and poverty reduction. Investments can be made in increased institutional capacity of the relevant ministries (energy, environment forestry, agriculture, economics,...) of individual countries in a learning-by-doing mode. Both government administrations and the private sector in Annex-B countries could be encouraged to participate in pilot projects to ensure that REDD is pro-poor and development oriented. The COP-16 REDD agreement states that these and other safeguards should be promoted and supported, but fails to specify how they should be effectively operationalized. More case studies to test various approaches will be needed. Universities from both North and South could make significant contributions to this effort.

References


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Cover photo: Intensive tree use in East-Java Photo by B. Verbist; (b) Forest frontier Photo by B.Muys