Chapter 7
Climate-Related Forest Policies and Trends

Madelene Ostwald

As part of the carbon cycle, forests have a place in climate-related forest policies and trends. By describing forest-related measures driven by international climate negotiations, such as the afforestation and reforestation under the Clean Development Mechanism (CDM) and REDD+ (Reducing Emissions from Deforestation and Forest Degradation), or the voluntary carbon market, this chapter illustrates how carbon has become an important but fuzzy commodity. The demand for carbon-focused measures is also seen in suggested activities in the Swedish context, shown with the Arctic Boreal Climate Development (ABCD) project. It can be said that due perhaps to the complexity involved in quantifying and accounting for carbon, other benefits such as energy substitution or improved hydrology from carbon-improving management strategies are being enhanced in the debate.

7.1 Climate Change and Forestry

There are few areas or sectors that have no connection to ongoing climate change, whether by experiencing its impacts or by contributing to its process. The forest sector is connected to climate change in both respects. The terrestrial system, of which forests are part, is one component of the global carbon cycle that distributes carbon (C) and carbon dioxide (CO_2) among various pools, depending on natural and human influences. Thus, forests became a consideration in the climate change science and debate at an early stage (e.g., IPCC 1990). Forests can be involved in

M. Ostwald (✉)
Centre for Climate Science and Policy Research (CSPR)/Tema V,
Linköping University, Linköping, Sweden

Centre for Environment and Sustainability (GMV),
University of Gothenburg, Göteborg, Sweden
e-mail: madelene.ostwald@liu.se

E. Westholm et al. (eds.), *The Future Use of Nordic Forests*,
DOI 10.1007/978-3-319-14218-0_7

Photo 7.1 Carbon mitigation—a new forest service

mitigation, either as a result of decreased deforestation and deforestation and the corresponding decrease in greenhouse gas (GHG) emissions, or through an increased carbon sink resulting from planting or managing forests to enhance the carbon stock (Sathaye et al. 2001). The world's four billion hectares (ha) of forest (covering 31 % of Earth's total land area) have recently been estimated to contain a carbon stock in above- and belowground biomass of 289 gigatonnes (Gt) of carbon (FAO FRA 2010), corresponding to 45 % of global terrestrial carbon (Malmsheimer et al. 2011). The United Nations Food and Agricultural Organization (FAO) Forest Resource Assessment (FRA) estimated that the amount of carbon stock in forests decreased by 0.5 Gt/year[1] from 2005 to 2010, mainly due to a reduction in the global forest area in Africa, Asia, and South America (Malmsheimer et al. 2011). On the other hand, Pan et al. (2011) used forest inventory data and long-term ecosystem carbon studies to estimate a persistent global carbon sink of 2.4 GtC/year from 1990 to 2007, including a source of emissions from tropical land use changes of 2.9 GtC/year but partially compensated for by tropical regrowth of 1.6 GtC/year. However, estimates of carbon emissions from forests vary depending on the sources and methods used. Van der Werf et al. (2009) highlight this variation, estimating forest GHG emissions at 6 % of total global emissions if uncertainties are included. If uncertainties are disregarded, they suggest 12 %, and if emissions from deforested peatlands (primarily in southeast Asia) are included, the figure is 15 %. The Intergovernmental Panel on Climate Change (IPCC 2007) makes an even higher estimate, stating that forestry GHG emissions contribute 17.4 % of the global total. Despite the great uncertainties in estimating the forest carbon stock and its emissions, forests constitute an important carbon pool and hence an important factor to consider in climate policy processes.

Greenhouse gases and especially carbon have become the dominant units in which all measurements are quantified and counted in international climate politics (Lövbrand and Stripple 2011). This carbon focus can also be observed with regard to forests, where carbon has evolved into an additional "product" alongside well established goods and services such as timber, biodiversity, and ecological services. The increased focus on carbon and its establishment as a major currency can be noted in climate policy-related science assessments such as the year 2000 IPCC Special Report on Land Use, Land Use Change, and Forestry (Watson et al. 2000), which tried to estimate where the carbon is and how it moves. The focus can also be seen in the negotiations within the United Nations Framework Convention on Climate Change (UNFCCC). One outcome of the UNFCCC Conference of the Parties (COP) meeting in December 2011 in Durban on emissions from forests was the decision that the unit to use for quantification was tons of carbon dioxide equivalent per year (tCO_2e; see footnote 1 for a definition) rather than the area of forest in hectares, for example, (UNFCCC 2011).

[1] Total global emissions from all sectors and including all greenhouse gases listed in IPCC's Fourth Assessment Report (2007) are 49 Gt of CO_2 equivalents per year (based on 2004 data); 1 t of C = 3.664 t of CO_2. Due to differences in global warming potential between greenhouse gases, the term CO_2 equivalents (CO_2e) is used.

Although it is tropical forests that have been the focus of international climate policy measures and mechanisms, these international processes also have implications for boreal forests because of their contribution to global GHG emissions through deforestation. This chapter will describe a number of global trends in climate-related forest policies, such as the creation of:

1. The Clean Development Mechanism (CDM);
2. The REDD+ process (i.e., Reducing Emissions from Deforestation and Forest Degradation, plus carbon enhancement, conservation, and sustainable management of forests);
3. The voluntary carbon market; and
4. Climate-related management strategies for multiple benefits.

These processes clearly focus on carbon sequestered or stored in the terrestrial system. Here I will describe how these international policy processes may have influenced actions in the Swedish arena and boreal forest, by citing the example of a fairly new forest management initiative.

7.2 Global Trends in Climate-Related Forest Policy

Despite the considerable uncertainty involved in monitoring, reporting, and verifying (MRV) carbon fluxes and stocks, discussion of the inclusion of terrestrial processes for climate change mitigation has been lively over the last two to three decades (e.g., Alpert et al. 1992; Lasocki 2001). The issue of forest sinks was discussed within the UNFCCC from an early stage, for example, with reference to forest conservation and afforestation measures (UNFCCC 1997). Negotiations have been heated. Consequently, parties to the UNFCCC report their GHG emissions from land use, land-use change, and the forestry sector (LULUCF) to the Climate Change Secretariat as part of their GHG reporting obligations. Annex 1 countries (in essence the developed countries with commitments within the Kyoto Protocol) report annually, while non-Annex I countries (in essence the developing countries) submit their reports less frequently.

The main hurdles to the extensive use of those carbon-sink mechanisms have been associated with methodological issues. These hurdles include baseline development (e.g., what base year or period to use), guaranteeing the additionality of measures taken, guaranteeing long-term carbon storage (permanence), preventing or accounting for leakage, and, not least, funding and costs.

7.3 The Clean Development Mechanism Under the Kyoto Protocol

The idea of conserving forest to reduce GHG emissions and halt climate change was discussed as a component of the Kyoto Protocol but was excluded from it in 2003 (Henders and Ostwald 2012). The forest-related option left in the Kyoto Protocol,

an UNFCCC agreement including commitments from 37 industrialized countries that runs from 2008 to 2012, was the afforestation or reforestation (A/R) project type under the Clean Development Mechanism (CDM). CDM projects are to be hosted in developing countries where their GHG emission reductions or savings will generate certified emission reductions (CERs; 1 CER = 1 tCO_2e) saleable on a carbon market. However, due to the high uncertainty, particularly concerning permanence, A/R-produced CERs cannot be traded on the EU Emission Trading System (ETS). Of the approximately 3,900 CDM projects registered in early 2012 covering 15 project types, 36 are A/R projects. Most of the A/R projects have been registered in the last 4 years. Sweden is participating in two of the 36 A/R projects, one in Moldavia and one in Uganda, through the Swedish Energy Agency.

There are only a few A/R CDM projects, generating a small amount of carbon removal in terms of carbon sequestration and they are affecting only a small geographical area. Nevertheless, the process of testing, discussing, and improving the whole portfolio of institutional, methodological, and technical setups for performance-based carbon terrestrial sink policies has had great learning value (see e.g., the IPCC Good Practice Guidance for Land Use, Land-Use Change, and Forestry Penman et al. 2003).

7.4 The Issue of REDD+

Although not yet operational, REDD+, or Reducing Emissions for Deforestation and Forest Degradation[2] in developing countries, has been the central mechanism discussed in climate-related forest policies since the topic was reintroduced in negotiations during the COP 11 climate meeting, held 2005 in Montreal. Two years later at COP 13 in Bali, UNFCCC decided to promote REDD+ through pilot projects and capacity building, which were followed by the frantic acceleration of efforts to understand and reduce the hurdles to such a mechanism. In essence, these are the same methodological hurdles mentioned earlier, namely, baseline setting, additionality, permanence, leakage, and funding. These obstacles are more or less inherent to forest and land-use projects that are required to prove performance.

The basic idea of REDD+ is to create a system that compensates the actors driving deforestation and forest degradation by giving incentives or payments that exceed the gains from alternative land-use practices, thus creating a value for forest conservation. While the REDD+ process has developed since 2007 as a successful component of the climate negotiations, in which it has been perceived as among the most advanced texts supported by a high degree of consensus, it has also been the subject of intense debate and actions by actors outside the Convention. The climate negotiations have largely failed to concretize the future beyond the Kyoto Protocol's first commitment period that ended in 2012, which has also hampered the progress of all smaller components, such as REDD+.

[2] The "+" refers to carbon enhancement, forest conservation, and sustainable management of forests.

Uncertainty over a future climate agreement has to some extent hijacked the slow process of the international negotiations. For that reason, discussions of REDD+ have moved partly outside the UNFCCC policy process, with the support of several actors on the REDD+ pilot scene, such as nations strongly supporting REDD+, for example Norway (Westholm et al. 2011), and programs under the UN and the World Bank. UN-REDD, the Forest Initiative Program (FIP), the Forest Carbon Partnership Facility (FCPF), and the Congo Basin Forest Fund (CBFF) are all examples of REDD+ initiatives at global or regional scales that aim to prepare tropical forest nations for REDD+. Approximately 45 tropical forest nations are in one way or another involved in this early phase of preparation, in which baseline setting, institutional capacity, and tenure issues are key areas of concern (Westholm 2010). The former French President Sarkozy initiated a conference on forests in Paris in March 2010 that summoned high-level representatives from 64 nations focusing on reducing deforestation. The result of the meeting included an additional USD one billion to support REDD+ and the launching of the REDD+ Partnership, which consists of 72 partner countries including both donors and hosts of potential REDD+ projects. Sweden is one of its members and pledged SEK 500 million toward REDD+ in May 2010. Apart from funding already committed to forest-related aid activities, the Swedish Government has also chosen to earmark SEK 100 million for the Global Environmental Facility (GEF). Interest in REDD+ investments peaked in 2009, the same year as the most visited and media-covered COP was held in Copenhagen. According to the self-reporting database of the REDD+ Partnership, the amount of funds pledged by donors exceeded USD 3,000 million in 2009. In 2011, the pledged amount was USD 1,500 million; from a donor's or investor's perspective, storing carbon in standing forest as discussed under UNFCCC auspices might not be a good investment.

7.5 The Voluntary Markets

Due to certain restrictions on the tradability of offsets from land- and forest-based projects, geographical restrictions, and the MRV requirements within the UNFCCC, voluntary markets, which are markets outside the UNFCCC-regulated market, have developed. Here actors can choose to certify their carbon according to standards such as the Verified Carbon Standard (VCS) for trading on markets such as the over-the-counter market and the Chicago Climate Exchange (Forest Trends 2011). Forest-based projects in general have been central to the voluntary markets, accounting for 46 % of market sales in 2010, according to Forest Trends (2011). The largest portion, 29 %, of transactions on the voluntary markets in 2010 occurred in the REDD+/avoided conversion sector (Forest trends 2011) and the first REDD+ credit was issued for a Kenyan carbon project in February 2011. The development of overall market value indicates a sector in great demand: from just USD 8.5 million in 2005, the value of the forest carbon market increased to USD 177.6 million as of 2010 (Diaz et al. 2011). Due to the set-up of the various voluntary market initiatives, the potential to involve the boreal forest is greater in the voluntary markets than in the UNFCCC compliance market.

7.6 Climate-Related Forest Management with Multiple Benefits

As the forest, climate, and carbon debate has proceeded, using REDD+ as the dominant framework over the last half decade, new considerations have emerged (Malmsheimer et al. 2011). The idea of forest management with carbon sequestration as a component has emerged, resulting in ideas for promising win–win situations or even more preferable win–win–win situations. Biological diversity, energy substitution, hazard protection, erosion control, and improved hydrology are goals presented as potential benefits of correct forest management strategy. These goals are often structured by governments into payment for environmental services (PES). Titles such as "Managing forests because carbon matters: Integrating energy, products and land management policy" (Malmsheimer et al. 2011) have appeared in special issues of international scientific journals. Apart from storing carbon or reducing emissions to save the climate, environmental services can be generated and are in demand. These types of environmental services include downstream water management, climate regulation, measures to prevent natural hazards, saved or improved biodiversity, and sustainable livelihoods. With this development, forest policy within climate policy has been a platform or bridge by which new actors and sectors can become involved.

7.7 Carbon for the Sake of the Climate and Boreal Forests

How have all these global carbon stock, emissions, and climate discussions and processes influenced the Swedish forest sector and the boreal forest, which constitutes 18 % of the global forest area? The hottest issue in the UNFCCC climate negotiations, REDD+, excludes boreal forests, while the voluntary market is open to all countries and provides more opportunities for this forest type. As a boreal forest nation, Canada was early in entering the voluntary carbon market with forest-based offsets (Henschel and Gray 2007). As described in the "Transformation of the Canadian forest sector" by Sten Nilsson (Chap. 9), management strategies have undergone great changes in recent decades. This new forest thinking was also accelerated by the timely synchronized discussions of mitigation and adaptation in the light of climate change. In 2008, the Darkwoods Forest Carbon Project was the first Canadian forest carbon project that met the Verified Carbon Standard (VCS) (www.vcsprojectdatabase.org).

In Sweden, one recent sign of the impact of international climate-related forest policy the establishment of the ABCD project in 2009. The ABCD project represents collaboration between the mining company LKAB, one of the largest forest owners in Sweden, Sveaskog, the municipality of Övertorneå, and the county council and administrative board of Norrbotten. The ABCD project aims to reduce the concentration of atmospheric CO_2 and establish a system for trading carbon offsets

(Övertorneå kommun 2011). The two participating companies hope to lead the way to a future offset trading scheme in Sweden and help make Sweden climate neutral by 2025 (Sveaskog 2011). In November 2011, the first payment of SEK 300,000 to Sveaskog was made by LKAB, which estimated that their CO_2 emissions increased by 300,000 tons per year due to increased production (Ny Teknik 2011). The project seeks to improve and increase the forest biomass through better management practices, such as fertilizing the soil with organic carbon and nutrients later in the rotation cycle when the root systems are developed and uptake is improved, to reduce the risk of nutrient leaching. The biomass increase through these carbon sequestering measures will be the additional carbon generated. The earnings will represent the difference between the baseline in a business-as-usual scenario, defined as the minimum requirements stated by the Forestry Act (SVL 2012) for regeneration, management, and harvesting, and the projected baseline under the changed management. The area consists of 50,000 ha, of which Sveaskog owns 40,000 ha and the rest belongs to some 20 private forest owners (Ny Teknik 2011). The idea is to enter or create a carbon market and generate carbon offsets. Apart from increasing the carbon sink in the identified forests, the project also highlights the aims to achieve multiple benefits (Övertorneå kommun 2011). These include:

- Improved forest regeneration
- Increased needle and leaf production over the whole rotation
- Optimal rotation periods
- Gaining experience of creating and handling carbon offsets and the carbon market
- Developing a system for marketing the carbon and offering investments in carbon offsets to private persons and businesses
- Increasing biomass resource for energy production to replace fossil fuels

The project's estimated baseline is that the measures will enhance carbon sequestration by 80,000 tCO_2 per year over and above the business-as-usual scenario. However, as pointed out in the media by representatives of the Swedish Energy Agency, terrestrial sink offsets are ineligible for the regulated EU market (Ny Teknik 2011), so the project owners are strategically directed toward the voluntary markets. The stakeholders' action strategies, which is expanded on in Chap. 8 "Actors' Perceptions and Strategies" by Karin Beland Lindahl is therefore relevant at this stage.

7.8 Concluding Remarks

Outlined broadly, I have tracked the development of carbon as an issue, from being regarded only as part of the global carbon cycle, through a few processes associated with international climate negotiations that are relevant to forestry, and ending in how this development has influenced ideas for boreal forest management. A few conclusions can be drawn that may be relevant to the future:

- Complicated concerns are associated with accounting for forest CO_2 emissions, since they are linked to rewards or penalties. In the cited Swedish case, it will not

be possible to trade allowances from the cap-and-trade system under the auspices of UNFCCC and its Kyoto Protocol. This creates the possibility of a voluntary market or an independent offset system. Whatever accounting system is seen in the future of Swedish forest-based carbon-saving initiatives, there is the risk of double accounting, meaning that the same ton of carbon is counted twice, by both the carbon project and Sweden's UNFCCC and Kyoto Protocol GHG inventory. This is a risk, since connections between the different markets, for example, the voluntary market and the Kyoto Protocol market, are often lacking. This has low credibility from a climate efficiency perspective.

- From a biogeochemical perspective, climate change will affect the biomass production of boreal forests, since increased temperatures and growing periods as well as elevated CO_2 concentrations will increase the sink. Estimates indicate increased biomass production in the boreal forest over the next 50–100 years in the order of 12–33 % (Kirilenko and Sedjo 2007; Poudel et al. 2011). This means that the baseline on which a management intervention for carbon offsetting is measured might change in the near future for purely natural reasons and not due to changed practice; hence, the additionality of the intervention can be questioned.
- The form of future international climate commitments, for example whether these will occur under a large-scale umbrella as in the case of the Kyoto Protocol, through more focused and smaller-scale packages (e.g., sinks), or not at all, will influence the forest, climate, and carbon focus of the future.
- Despite the uncertainties concerning international climate commitments under the UN, the voluntary market is flourishing, particularly for forest-based offsets. This indicates that voluntary buyers do have an interest in forest carbon, which means that carbon might continue to be a tradable commodity even without a climate-driven international agreement.
- Forest management strategies including multiple benefits have received increased attention in the scientific literature and in policy processes related to climate initiatives and national strategies. One of these benefits that is often cited is carbon sequestration or storage in the biomass or soil, which is launched as a mitigation measure. The Swedish ABCD project stands as a good example of this multiple strategy, in which carbon, energy substitution, and increased production are seen as products of the same intervention. The idea of generating carbon as a product includes payments based on performance, which in turn require proper MRV and accounting systems to be climate efficient. The outcome of this remains to be followed and evaluated.

Acknowledgments This chapter that was written in early 2013 is based on ideas, discussions, and writings developed jointly with my colleague Lisa Westholm, whom I would like to greatly acknowledge here. I would also like to thank Sabine Henders, Eva Lövbrand, Eskil Mattsson, Reidar Person, and Hans Petersson for their input regarding the text, as well as those involved in the Swedish research network Focali (www.focali.se).

References

Alpert, S. B., Spencer, D. F., & Hidy, G. (1992). Biospheric options for mitigating atmospheric carbon dioxide levels. *Energy Conservation and Management, 33*(5–8), 729–736.

Diaz, D., Hamilton, K., & Johnson, E. (2011). *State of the forest carbon markets 2011*. Washington, DC: Ecosystem Marketplace.

FAO FRA. (2010). *Global forest resource assessment 2010* (FAO forestry paper 163). Rome: Food and Agriculture Organization of the United Nations.

Forest Trends. (2011). *Back to the future state of the voluntary carbon markets 2011*. Washington, DC: Ecosystem Marketplace.

Henders, S., & Ostwald, M. (2012). Forest carbon leakage quantification methods and their suitability for assessing leakage in REDD. *Forests, 3*, 33–58.

Henschel, C., & Gray, T. (2007). *Forest carbon sequestration and avoided emissions*. Kananaskis: Canadian Boreal Initiative/Ivery Foundation.

IPCC. (1990). *Climate change: The IPCC impact assessment 1990*. Canberra: Australian Government Publishing Service.

IPCC. (2007). In Core Writing Team, R. K. Pachauri, & A. Reisinger. (Eds.), *Climate change (2007) synthesis report: Contribution of Working Groups I, II and III to the fourth assessment report of the Intergovernmental Panel on Climate Change*. Geneva: IPCC, 104 pp.

Kirilenko, A., & Sedjo, R. A. (2007). Climate change impacts on forestry. *Proceedings of the National Academy of Science of the United States of America, 104*, 19697–19702.

Lasocki, T. J. (2001). Climate change mitigation through forestry: Theory and practice. *Journal of Sustainable Forestry, 14*, 147–166.

Lövbrand, E., & Stripple, J. (2011). Making climate change governable: Accounting for carbon as sinks credits and personal budgets. *Critical Policy Studies, 5*, 187–200.

Malmsheimer, R. W., Bowyer, J. L., Fried, J. S., Gee, E., Izlar, R. L., Miner, R. A., Munn, I. A., Oneil, E., & Stewart, W. C. (2011). Managing forests because carbon matters: Integrating energy, products and land management policy. *Journal of Forestry, 109*, S5–S50.

Ny Teknik. (2011). *LKABs gröna arbete sågas av EU-regler*. Published 7 December 2011. http://www.nyteknik.se/nyheter/energi_miljo/miljo/article3361669.ece. Last accessed 20 Jan 2012.

Övertorneå kommun. (2011). *ABCD – Arctic Boreal Climate Development*. Retrieved December 02, 2011, from http://www.overtornea.se/naringsliv/Projekt/ABCD---ARCTIC-BOREAL-CLIMATE-DEVELOPMENT/#Delprojekt

Pan, Y., Birdsey, R. A., Fang, J., Houghton, R., Kauppi, P. E., Kurz, W. A., Philips, O. L., Shvidenko, A., Lewis, S. L., Canadell, J. G., Ciais, P., Jackson, R. B., Pacala, S. W., McGuire, A. D., Piao, S., Rautiainen, A., Sitch, S., & Hayes, D. (2011). A large and persistent carbon sink in the world's forests. *Science, 333*, 988–993.

Penman, J., Gytarsky, M., Hiraishi, T., Krug, T., Kruger, D., Pipatti, R., Buendia, L., Miwa, K., Ngara, T., Tanabe, K., & Wagner, F. (2003). *Good practice guidance for land use, land-use change and forestry* (p. 593). Published by the Institute for Global Environmental Strategies (IGES) for the IPCC.

Poudel, B. C., Sathre, R., Gustavsson, L., Bergh, J., Lundström, A., & Hyvönen, R. (2011). Effects of climate change on biomass production and substitution in north-central Sweden. *Biomass and Bioenergy, 35*, 4340–4355.

Sathaye, J. A., Makundi, W. R., Andrasko, K., Boer, R., Ravindranath, N. H., Sudha, P., Rao, S., Lasco, R., Pulhin, F., Masea, O., Ceron, A., Ordones, J., Deying, X., Zhang, X., & Zoumin, S. (2001). Carbon mitigation potential and costs of forestry in Brazil, China, India, Indonesia, Mexico, the Philippines and Tanzania. *Mitigation and Adaptation Strategies for Global Change, 6*, 185–211.

Sveaskog. (2011). LKAB köper koldioxidkrediter av Sveaskog. *Pressmeddelande* www.sveaskog.se/Press-och-nyheter/Pressmeddelanden/2011/LKAB-koper-koldioxidkrediter-av-Sveaskog/. Last accessed 8 Nov 2011.

SVL (2012). Skogsvårdslagstifningen – gällande regler 1 januari 2012. Skogsstyrelsen. ISBN 978-91-88462-92-3.

UNFCCC. (1997). Report on the Subsidiary Body for Scientific and Technological Advice on the work of its fifth session, Bonn, 25–28 February 1997. FCCC/SBSTA/1997/4.

UNFCCC. (2011). Guidance on system for providing information on how safeguards are addressed and respected and modalities relating to forest reference emission levels and forest reference levels as referred to in decisions 1/CP.16. Draft Decision -/CP.17

Van der Werf, G. R., Morton, D. C., DeFries, R. S., Olivier, J. G. J., Kasibhatla, P. S., Jackson, R. B., Collatz, G. J., & Randerson, J. T. (2009). CO2 emissions from forest loss. *Nature Geoscience, 2*, 737–738.

Watson, R., Nobel, I. R., Bolin, B., Ravindranath, N. H., Verardo, D. J., & Dokken, D. J. (2000). *Land use, land-use change and forestry: IPCC special report*. Cambridge: Cambridge University Press.

Westholm, L. (2010). High hopes and fast pace in the REDD+ arena. *Focali Brief* 2010:04, Gothenburg.

Westholm, L., Ostwald, M., Henders, S., & Mattsson, E. (2011). *Learning from Norway – A review of lessons learned for REDD+ Donors* (Focali report no 2011:03). Gothenburg.