October 2008

Proceedings of the Workshop on

# Harvested Wood Products in the Context of Climate Change Policies

9-10 September 2008

United Nations Palais des Nations, Geneva, Switzerland

edited by

**Sebastian Hetsch**

UNECE/FAO Timber Section

October 2008, Geneva, Switzerland

## Table of Content


   3.10 Joint Forest Sector Questionnaire (JFSQ) ..... 24

## List of Abbreviations

| | |
|---|---|
| AOSIS | Alliance of Small Island States |
| CEPF | Confederation of European Forest Owners |
| CoP | Conference of the Parties (to the Kyoto Protocol) |
| FAO | Food and Agriculture Organization |
| GHG | Greenhouse Gas |
| HWP | Harvested Wood Products |
| IEA | International Energy Agency |
| IPCC | Intergovernmental Panel on Climate Change |
| LULUCF | Land Use, Land Use Change and Forestry |
| UNECE | United Nations Economic Commission for Europe |
| UNFCCC | United Nations Framework Convention on Climate Change |

## Acknowledgements

The workshop was jointly organized by the Swiss Confederation, Federal Office for the Environment (FOEN), the UNECE/FAO Timber Section, the Ministerial Conference on the Protection of Forests in Europe (MCPFE) Liaison Unit Oslo.

The organizers express their sincere appreciation in particular to Adrienne Grêt-Regamey (Swiss FOEN) and Sebastian Hetsch (UNECE/FAO) for the main organization of the workshop. Karen Taylor assisted substantially in making the practical arrangements for the workshop.

The organizers like to thank the Christian Küchli (Swiss FOEN) for chairing of the workshop and Maxim Lobovikov (FAO) for chairing the panel discussion.  The contribution of the following speakers is appreciated for helping to stimulate lively discussions: Murray Ward, Maria Jose Sanz Sanchez, Peter Hofer, Andreas Fischlin, Leif Gustavsson, Kim Pingoud, Sebastian Rüter, Anna-Leena Perälä, Estelle Vial, Tobias Stern, Alex McCusker, Christian Kofod, Reid Miner, Trevor Hesselink, Hannes Bötcher, Christer Segerstéen, and John Perez-Garcia, Paulo Canaveira.

The background paper was prepared by Adrienne Grêt-Regamey, Eugene Hendrick, Sebastian Hetsch, Kim Pingoud, and Sebastian Rüter.

The organizers wish to place on record its appreciation of the financial contributions from the Swiss Confederation, Federal Office for the Environment (FOEN).

## 1. Introduction

Forests are not only carbon storage, but also deliver wood, which can be used as a substitute for fossil fuels and non-renewable construction materials like steel or concrete. Utilizing wood instead reduces overall greenhouse gas emissions, since carbon released when burning wood has already been recovered from the atmosphere while the tree was growing. In addition, the carbon stored in harvested wood products is bound for a certain amount of time, as it is not released immediately to the atmosphere once the tree is cut and harvested. Thus the use of wood from sustainable sources is one way for the forest sector to mitigate climate change, alongside with carbon sequestration in the forest.

International climate policy has so far only provided the possibility to account for carbon sinks in forests through the Kyoto Protocol. The role of Harvested Wood Products (HWP) in climate change mitigation through carbon storage is recognized by many countries, but it will not be accounted for over the first commitment period of the Kyoto Protocol. Negotiations under the United Nations Framework Convention on Climate Change (UNFCCC) on the post 2012 period provide a means for possible inclusion of wood products.

Accounting for harvested wood products (HWP) could help encourage silvicultural measures and forest harvesting without loosing the value of the forest carbon sink. Therefore, such an accounting could strengthen the forest sector. However, one has to assure that no perverse effects are triggered, like deforestation, forest degradation, loss of biodiversity or other forest functions. Solutions have to be found that accommodate all these different aspects, promoting the principle of sustainable forest management.

This workshop provided information on the different accounting systems for HWP, as well as experience in countries in modeling and reporting on carbon storage in HWP, and information about substitution effects of wood products. Over 100 participants discussed opportunities and challenges connected with HWP accounting and the different approaches presented. The Chairman summarized the findings of the workshop in his conclusions and recommendations, which were initially presented and discussed at the final session of the workshop. A second version was circulated by email to the participants for comments and then finalized by the UNECE/FAO secretariat.

The proceedings of the workshop are divided into three parts: first the chair’s summary and conclusions of the workshop, second a summary of the presentations given at the workshop and third the background paper to the workshop.

24 September 2008

## 2. Chair's Conclusions and Recommendations

# Workshop on Harvested Wood Products in the Context of Climate Change Policies

*The conclusions and recommendations are based on the presentations and discussions at the workshop. The text was initially presented and discussed with the participants at the final session of the workshop. A second version was circulated by email to the participants for comments and then finalized by the UNECE/FAO secretariat. The conclusions and recommendations are drafted on the Chair's responsibility.*

**Preamble**

Forests play manifold roles in climate mitigation:

a) They sequester carbon from the atmosphere when they grow, store carbon in living and dead biomass and forest soils.

b) They deliver wood as raw material which offsets greenhouse gas (GHG) emissions due to substitution of more energy and emission-intensive, non-renewable material.

c) They produce wood for energy which can substitute fossil energy.

d) Wood products are a pool of carbon that delays its release to the atmosphere.

The different aspects of forests and forest products in reducing GHG (carbon stored in forest, in harvested wood products and wood-based biofuels) are inherently connected.

## Conclusions

1. In most countries, the substitution effect of Harvested Wood Products (HWP)[1] is considered to be their key impact in climate change mitigation.

2. Carbon stock in HWP has been increasing significantly in many countries over the last years and is likely to increase further in some countries. Thus, HWP stock changes influence the atmospheric carbon balance in the short and medium term, although their contribution to the global carbon balance is still relatively small. In a long term perspective, HWP stocks will eventually reach a steady state.

3. Existing data from national and international datasets, including FAO / UNECE data, can be used to calculate HWP stock changes and flows by using the existing approaches on forests and HWP. Reporting on HWP will eventually lead to improved data on HWP, especially for final products and disposal for which data quality is lower, and geographical data coverage of HWP will increase.

4. The suggested HWP accounting methods improve the accuracy of GHG balances compared to the IPCC default approach. An important difference between the different HWP accounting approaches is to whom the responsibility for the carbon emissions from HWP is assigned, in particular with respect to trade.

5. Considering the time schedule of the climate negotiations, countries have to explore the implications of the different approaches on how to account for HWP before mid 2009 in order to still be able to address HWP treatment in a potential agreement in Copenhagen in December 2009.

6. In certain circumstances, for instance in areas with high growing stock in managed forests with species not fully site-adapted, further increase of growing stocks can lead to increasingly severe impacts of risks from natural disturbance (e.g. storm, insect calamities, fires) leading to release of GHG emissions. Direct accounting for HWP can be an incentive for silvicultural measures and harvest, which could lower this risk.

7. A “cascaded” use of harvested wood – first for wood products that can be recycled, then for energy – is in most cases preferable to the direct use of wood for energy from the point of view of GHG emissions. Accounting for carbon stored in HWP can be an incentive to use wood as material before using it for energy generation following “cascade” principles.

8. Consumers and the general public are often not aware of the role of HWP in GHG balance.

---

[1] HWP includes all wood material (including bark) that leaves harvest sites. Slash and other material left at harvest sites should be regarded as dead organic matter […] and not as HWP. (IPCC 2006 guidelines)

## Recommendations

1. When drawing up national responses to climate change through the forest sector, different strategies including carbon sequestration by forests, storage in wood products, and substitution of fossil fuels and energy-intensive materials could be considered and combined.

2. Coordination, cooperation and mutual information between climate change country focal points and the forest sector is needed, as well as within the forest sector, while recognizing that reporting must be fit for the purpose.

3. International organizations should work together to improve and harmonize reporting on forests, forest products including HWP, taking into account the existing reporting requirements for parties to the UNFCCC.

4. Simple, but feasible accounting approaches for HWP should be preferred to sophisticated solutions, which are difficult to implement

5. Accounting for HWP or incentives to increase the use of wood must not compromise sustainable forest management domestically or in other countries.

6. Some participants advocated that the following principles would be appropriate to apply:

   a) Reporting of HWP in national GHG emission inventories under the UNFCCC should be consistent with the whole reporting system of the Land Use, Land-Use Change and Forestry sector. HWP accounting should be grounded on the above basic reporting system.

   b) Countries that elected forest management as additional activity under Article 3.4 of the Kyoto Protocol should also be able to account for HWP in order not to penalize forest management in the future.

   c) Countries choosing to account for HWP should also account for forest management in order not to compromise sustainable forest management.

   d) If HWP is accounted for in the future, countries have to ensure that the imports that they account for come from sustainable sources to avoid perverse incentives.

7. Governments should consider whether the benefits in terms of GHG emissions of an HWP accounting system outweigh the accounting and negotiation costs.

8. Governments, with the participation of all stakeholders, should take the lead to develop policies and strategies to strengthen the “cascaded” use of wood.

9. Governments and sectoral associations should cooperate to communicate the benefits of wood use to consumers and the general public.

## 3. Summary of Presentations

### 3.1 Estimation, Reporting and Accounting of Harvested Wood Products

*Maria-Jose Sanz Sanchez*, UNFCCC Secretariat. Bonn, Germany. Email: msanz@unfccc.int

Harvested wood products (HWP) according to the IPCC good practice guidance (2003) include wood and paper products. It does not include carbon in harvested trees that are left at harvest sites. Methodologies and good practice for estimating and reporting of emissions and removals from HWP can be found in the IPCC GPG LULUCF 2003. New methodologies are available in the IPCC 2006 Inventory Guidelines.

**Brief history of HWP**

SBSTA-15 requested the secretariat to prepare a technical paper on HWP accounting, taking into account socio-economic and environmental impacts, including impacts on developing countries. SBSTA considered and took note of the technical paper at its nineteenth session. IPCC Expert Meeting in Dakar (1998) identified four approaches for accounting of changes in carbon stocks and GHG emissions from forest harvesting and wood products: IPCC default method, stock change approach, production approach, and atmospheric-flow approach. A major difference between the approaches relates where and when changes in carbon stocks or emissions occur.

At SBSTA19 it was decided to continue discussing HWP at SBSTA21 and mandated a Workshop before. The workshop took place in Lillehammer, Norway, in 2004 (FCCC/SBSTA/2004/INF.11). An important output of the workshop was that an assessment of the application of each approach was needed to support any future decision on the selection of one, compared to the application of the IPCC default approach. Participants proposed some elements for such an assessment, these being: (a) Approach environmental integrity in relation to reporting and/or accounting, and its consistency with the ultimate objective of the Convention, (b) Equity between consuming and producing countries, (c) Accountability, (d) Provision of incentives for, inter alia, increased use of biofuels, reduction of emissions and sustainable forest management, (e) Simplicity and practicality, (f) Cost-effectiveness.

SBSTA 21 noted the need to further analyze the socio-economic and environmental implications, impacts on forest carbon stocks and emissions in Annex I and non-Annex I Parties, impacts on sustainable forest management, and impacts on trade, of reporting GHG emissions resulting from the production, use and disposal of HWP, including those arising from the application of the accounting approaches.

SBSTA 23 considered methodological issues, including data and information on changes in carbon stocks and emissions of GHG from HWP and experiences with the use of relevant guidelines and good practice guidance of the IPCC to generate such data and information were submitted by Parties (FCCC/SBSTA/2005/MISC.9, Add.1 and 2). An information note (FCCC/SBSTA/2005/INF.7) by the secretariat presenting information on HWP contained in previous submissions from Parties and in national inventory reports.

SBSTA 24 invited Parties to voluntarily report on HWP in their national inventories in a manner consistent with current UNFCCC reporting guidelines. The SBSTA agreed to return to the consideration of this item at its twenty-sixth session under two separate context: to discuss reporting of harvested wood products in the context of its consideration of the 2006 IPCC Guidelines; and to also consider other issues associated with harvest wood products

At SBSTA26 it was decided to discuss reporting of HWP in the context of its consideration of the 2006 IPCC Guidelines (SBSTA30). Further, it was agreed to consider these other issues relating to HWP in the context of the consideration of broader issues relating to land use, land-use change and forestry, at future sessions.

The AWG-KP is considering now the possible changes to the rules and modalities for the treatment of LULUCF for the second commitment period of the Kyoto Protocol, including accounting for HWP.

### 3.2 HWP - an Incentive for Deforestation?

*Andreas Fischlin*, Systems Ecology, Institute of Integrative Biology: Ecology, Evolution, and Disease, Department of Environmental Sciences, ETH Zurich. Zurich, Switzerland. Email: andreas.fischlin@env.ethz.ch

Forests provide many provisioning, regulating, as well as cultural, spiritual and social services (Figure 1). Forests are relevant in the context of climate change in several ways: Firstly forests are a renewable natural resource providing humans with many goods such as wood (global harvest ~3 billion m3/a, Nabuurs et al., 2007). Secondly forests are to a significant extent involved in regulating the carbon cycle. Together with other terrestrial ecosystems they sequester large amounts of carbon (globally about 25% of anthropogenic emissions, Denman et al., 2007) and store that carbon typically permanently in above-ground biomass and soil organic carbon. Total carbon stocks of the terrestrial biosphere have recently been estimated to amount to 3449 PgC (Fischlin et al., 2007), which is roughly 4.5 times more than is currently contained in the atmosphere (777 PgC). 48% of this carbon is stored by forests. Thirdly forests are subject to many pressures and changes leading at present to large losses of carbon, mainly through land-use changes.

Although average emissions have not changed much in absolute terms, they gradually decreased from one quarter to one sixth relative to total anthropogenic emissions (Table 1).

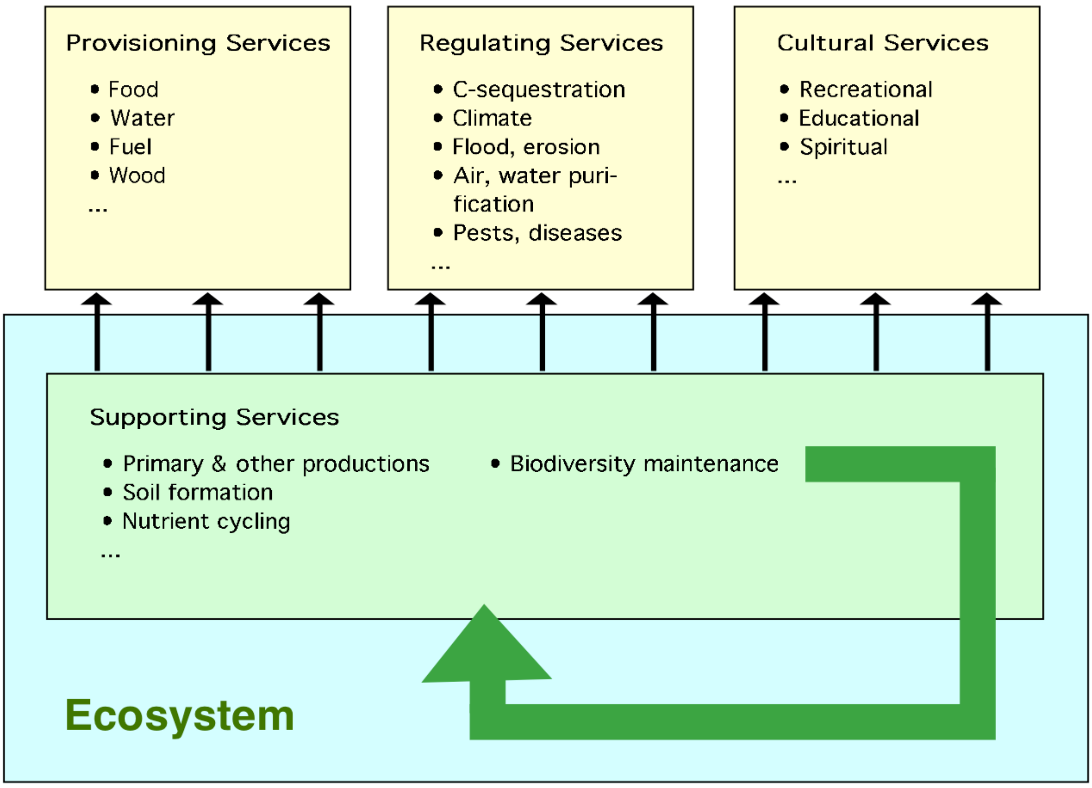



**Figure 1: Services provided by forest ecosystems (after Fischlin, 2007).**

| Period | Emissions from land-use change, notably deforestation | Percentage of total anthropogenic $CO_2$ emissions | Source |
|---|---|---|---|
| 1980es | 1.7 ± 0.8 | 24% | (Watson et al., 2000, Table 2, p. 5) |
| | 1.7 (0.6-2.5) | 24% | (Prentice et al., 2001, Table 3.1, p. 190) |
| | 1.4 (0.4-2.3) | 21% | (Denman et al., 2007, Table 7.1, p. 516) |
| 1990es | 1.6 ± 0.8 | 20% | (Watson et al., 2000, Table 2, p. 5) |
| | 1.6 (0.5-2.7) | 20% | (Denman et al., 2007, Table 7.1, p. 516) |
| Present | 1.5 | 16% | (Canadell et al., 2007) |

**Table 1: Evolution of significance of anthropogenic emissions from land-use change, notably deforestation, expressed as percentage of total anthropogenic $CO_2$ emissions in recent decades.**

Attractive mitigation options (Watson et al., 2000) emerge from the services or roles, respectively, forest ecosystems play in the climate system, notably the global carbon cycle.

Article 4(d) of the UNFCCC[2] states that it is desirable to conserve or enhance reservoirs and/or sinks to mitigate climate change. Because of the significant losses through land-use changes (Table 1) reducing those emissions (cf. REDD[3] under UNFCCC) appears to be most effective compared to all other forest and forestry related mitigation measures, including the enhancement of sinks or the substitution of fossil fuels by fuel wood (Nabuurs et al., 2007), let alone storing carbon in harvested wood products (HWPs).

Nevertheless, it appears obvious that accounting HWPs under the UNFCCC as another mitigation measure, e.g. in the context of the Kyoto Protocol, would offer advantages for the following reasons:

- Current accounting schemes ignore the partial continued storage of carbon in harvested wood and debit the harvesting country with a complete $CO_2$ loss, even in cases where it exports wood. This constitutes a disincentive to harvesting and/or the long-term uses of wood products.
- Accounting of HWPs, however, would defer at harvest the accounting of the actual $CO_2$ emissions and would debit more accurately the factual emitters.
- Accounting of HWPs would create incentives for harvesting wood and is used in place of less climate-friendly materials and/or processes.

On the other hand accounting of HWPs may create unwanted side-effects such as:

- Incentives to unsustainable harvesting including deforestation in industrialized as well as developing countries

---

[2] United Nations Framework Convention on Climate Change http://www.unfccc.int

[3] REDD – Reducing Emissions from Deforestation in Developing Countries is an agenda item of current UNFCCC negotiations (see also keyword "Bali Roadmap") http://www.unfccc.int

- Industrialized countries seeking credits to offset fossil fuel emissions may use HWP accounting while the wood needed to generate those credits is harvested in developing countries where additional land-use changes may result, possibly also in competition for land needed for the production of biofuels
- HWP potential is more limited than that of carbon sequestration in forest soils, since the latter offers in many circumstances unlimited storage capacity, albeit sequestration rates are low. Intact ecosystems provide an infinite storage capacity
- The substitution effect of using wood in place of alternative high emission products is significantly higher than the sequestration of carbon in HWPs and is already credited in current accounting schemes
- Unless wood is extremely efficiently harvested and processed, there may arise risks of permanent $CO_2$ transfers into the atmosphere compared to a mere sequestration in forest ecosystems (Fischlin, 1996)

In conclusion mitigation priorities in the forest sector are in the sequence given: REDD, sink enhancement, substitution of fossil fuel, and HWPs (e.g. Nabuurs et al., 2007). To curb the disadvantages of HWPs, some debiting of non-sustainable forest management as currently achieved through Article 3.4 of the Kyoto Protocol appears a necessity. Until effective REDD activities are implemented that provide true disincentives to deforestation, HWPs may continue to create some risk of furthering deforestations in developing countries that are not bound by the Kyoto Protocol’s Article 3.4. On the other hand, if HWP accounting is done as part of a LULUCF scheme (Schlamadinger et al., 2007) that minimizes risks of promoting deforestation and non-sustainable harvesting, HWP accounting is to be welcomed as a means to help promoting the utilization of the climate-friendly, renewable natural resource wood. The latter would help humans to progress towards a more sustainable society.

## References

Canadell, J.G., Le Quere, C., Raupach, M.R., Field, C.B., Buitenhuis, E.T., Ciais, P., Conway, T.J., Gillett, N.P., Houghton, R.A. & Marland, G., 2007. Contributions to accelerating atmospheric $CO_2$ growth from economic activity, carbon intensity, and efficiency of natural sinks. *PNAS*, **104**(47): 18866-18870. doi: 10.1073/pnas.0702737104

Denman, K.L., Brasseur, G., Chidthaisong, A., Ciais, P., Cox, P.M., Dickinson, R.E., Hauglustaine, D., Heinze, C., Holland, E., Jacob, D., Lohmann, U., Ramachandran, S., da Silva Dias, P.L., Wofsy, S.C. & Zhang, X., 2007. Couplings between changes in the climate system and biogeochemistry. In: Solomon, S., Qin, D., Manning, M., Chen, Z., Marquis, M., Averyt, K.B., Tignor, M. & Miller, H.L. (eds.), *Climate change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC).* Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, pp. 499-587.

Fischlin, A., 1996. Conflicting objectives while maximizing carbon sequestration by forests. *NATO ASI Series*, **I-40**(452): 163-172

Fischlin, A., 2007. Leben im und mit dem Klimawandel – Lebensgrundlagen in Gefahr? Systems Ecology, ETH Zurich, Zurich, Switzerland, 17 pp.

Fischlin, A., Midgley, G.F., Price, J.T., Leemans, R., Gopal, B., Turley, C., Rounsevell, M.D.A., Dube, O.P., Tarazona, J. & Velichko, A.A., 2007. Ecosystems, their properties, goods and services. In: Parry, M.L., Canziani, O.F., Palutikof, J.P., van der Linden, P.J. & Hanson, C.E. (eds.), *Climate change 2007: Impacts, adaptation and vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel of Climate Change (IPCC).* Cambridge University Press, Cambridge, UK, pp. 211-272.

Nabuurs, G.J., Masera, O., Andrasko, K., Benitez-Ponce, P., Boer, R., Dutschke, M., Elsiddig, E., Ford-Robertson, J., Frumhoff, P., Karjalainen, T., Krankina, O., Kurz, W., Matsumoto, M., Oyhantcabal, W., Ravindranath, N.H., Sanz Sanchez, M.J. & Zhang, X., 2007. Forestry. In: Metz, B., Davidson, O.R., Bosch, P.R., Dave, R. & Meyer, L.A. (eds.), *Climate change 2007: Mitigation. Contribution of Working Group III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC)*. Cambridge University Press, Cambridge, UK, pp. 541-584.

Prentice, I.C., Farquhar, G.D., Fasham, M.J.R., Goulden, M.L., Heimann, M., Jaramillo, V.J., Kheshgi, H.S., Le Quéré, C., Scholes, R.J. & Wallace, D.W.R., 2001. The carbon cycle and atmospheric carbon dioxide. In: Houghton, J.T., Ding, Y., Griggs, D.J., Noguer, M., van der Linden, P.J., Dai, X., Maskell, K. & Johnson, C.A. (eds.), *Climate change 2001: The scientific basis. Contribution of Working Group I to the Third Assessment Report of the Intergovernmental Panel on Climate Change (IPCC)*. Cambridge University Press, Cambridge a.o., pp. 183-237.

Schlamadinger, B., Bird, N., Johns, T., Brown, S., Canadell, J., Ciccarese, L., Dutschke, M., Fiedler, J., Fischlin, A., Fearnside, P., Forner, C., Freibauer, A., Frumhoff, P., Hoehne, N., Kirschbaum, M., Labat, A., Marland, G., Michaelowa, A., Montanarella, L., Moutinho, P., Murdiyarso, D., Pena, N., Pingoud, K., Rakonczay, Z., Rametsteiner, E., Rock, J., Sanz, M.J., Schneider, U., Shvidenko, A., Skutsch, M., Smith, P., Somogyi, Z., Trines, E., Ward, M. & Yamagata, Y., 2007. Options for including LULUCF activities in a post-2012 international climate agreement. Part I – Synopsis of LULUCF under the Kyoto Protocol and Marrakech Accords and criteria for assessing a future agreement. *Environ. Sci. Pol.*, **10**(4): 271-282

Watson, R.T., Noble, I.R., Bolin, B., Ravindranath, N.H., Verardo, D.J. & Dokken, D.J. (eds.), 2000. Land use, land-use change, and forestry - A special report of the Intergovernmental Panel on Climate Change (IPCC). Cambridge University Press, Cambridge, 377 pp.

### 3.3 Substitution effects of wood-based construction materials

*Leif Gustavsson*, Department of Engineering and Sustainable Development, Mid Sweden University. Östersund, Sweden. Email: leif.gustavsson@miun.se

Forests can play an important role to limit the atmospheric concentration of carbon dioxide ($CO_2$). Using products made from sustainably managed forests to replace fossil fuels and energy-intensive materials can reduce net $CO_2$ emission. Such substitution will affect energy and carbon balances of wood product mainly due to four mechanisms. These are the typically lower energy demand to manufacture wood products compared with alternative materials; the avoidance of $CO_2$ emissions from cement process reactions; the increased availability of biofuels from wood by-products that can be used to replace fossil fuels; and the physical storage of carbon in forests and wood materials.

Integrating knowledge from the fields of forestry, industry, construction, and energy, a framework was employed in a life-cycle perspective to analyse substitution effects of wood-based construction materials by using a case-study approach applied to complete buildings (Gustavsson et al. 2006). A multi-storey wood-framed building in Sweden was compared to a functionally-equivalent building made with reinforced concrete structural frame. The results show that less primary energy was needed to produce the wood-framed building materials than the concrete-frame materials. $CO_2$ emission was significantly lower for the wood-frame building due to reductions in both fossil fuel use and cement process reaction emission. The most important single factor affecting the energy and carbon balances was using biomass by-products from the wood product chain as biofuel to replace fossil fuels. The heat value of biomass residues from forest operations, wood processing, construction and demolition was greater than the fossil energy inputs to produce the materials in the building. These benefits might best be realised by integrating and optimising the biomass and energy flows within the forestry, manufacturing, construction, energy, and waste management sectors.

There are several uncertainties linked to this type of analysis. To investigate these uncertainties, the changes in energy and $CO_2$ balances caused by variation of key parameters in the manufacture and use of the materials comprising the wood- and concrete-framed buildings were analysed (Gustavsson and Sathre 2006). The variation of system parameters, within practical limits, were found to have moderate effects on the carbon-balance difference between wood-frame and concrete-frame buildings, and the wood-frame construction had consistently lower net $CO_2$ emission. These robust results suggest that the use of wood building material instead of concrete, coupled with the greater integration of wood by-products into energy systems, would be an effective means of reducing fossil fuel use and net $CO_2$ emission.

Eriksson et al. (2007) analysed different forest management regimes in Sweden by using an integrated carbon analysis approach to quantify the carbon fluxes and stocks associated with tree biomass, soils, and forest products. Intensified forest management that produced greater quantities of biomass led to lower net $CO_2$ emission by providing more possibility to substitute for fossil fuels and non-wood materials. The increased energy use and carbon emission required for the more intensive forest management, as well as the slight reduction in soil carbon accumulation due to greater removal of forest residues, was more than compensated by the reduction in emissions due to the product substitution effect. Changes in carbon stock in forests and wood materials could be temporarily significant, but over the complete building life cycle and forest stand rotation period the carbon stock change becomes low. In the long term, an active and sustainable management of forests, including their use as a source for wood products and biofuels, allows the greatest potential for reducing net $CO_2$ emissions.

An analysis of the effects of energy and taxation costs on the economic competitiveness of building materials in a Swedish context showed that the energy cost for material processing, as a percentage of the total cost of finished materials, was lower for wood products than for other common non-wood building materials (Sathre and Gustavsson 2007). Energy and carbon taxation affects the cost of wood products less than other materials. The economic benefit of using biomass residues to substitute fossil fuels increases as tax rates increase. In general, higher taxation rates on fossil fuels and carbon emissions increase the economic competitiveness of wood construction. An analysis of added value in forest products industries showed that greater economic value was added in the production of structural building materials than in other uses of forest biomass (Sathre and Gustavsson 2008). In Sweden, the development of multi-storey wood construction system has been helped by government policies and funding, the wood industry's interest in enhanced market for value-added wood products, and involvement of the wood research community (Mahapatra and Gustavsson 2008). Investments in knowledge creation, incentives for entry of new firms, and increased prefabrication may facilitate a transition to a growth phase in the diffusion of multi-storey wood-frame buildings.

In conclusion, the substitution of wood building material in place of more energy- and carbon-intensive materials, coupled with the greater integration of wood by-products into energy systems, can effectively reduce fossil fuel use and net $CO_2$ emission. The production of wood-based building material is favoured economically by climate change mitigation taxation policies and creates high added value within the forest products industries, suggesting that the more widespread use of wood-based materials is a viable option for reducing net $CO_2$ emission.

**References**

Eriksson, E., Gillespie, A., Gustavsson, L., Langvall, O., Olsson, M., Sathre, R. and Stendahl, J. (2007) Integrated carbon analysis of forest management practices and wood substitution. *Canadian Journal of Forest Research* Vol. 37, pp 671-681

Gustavsson L., Pingoud K. and Sathre R. (2006) Carbon dioxide balance of wood substitution: comparing concrete and wood framed buildings, *Mitigation and Adaptation Strategies for Global Change* Vol. 11, No. 3, pp 667-691

Gustavsson L. and Sathre R. (2006) Variability in energy and carbon dioxide balances of wood and concrete building materials. *Building and Environment* Vol. 41, No. 7, pp 940-951

Mahapatra, K. and Gustavsson, L. (2008) Multi-storey timber buildings: Breaking industry path dependency. *Building Research & Information* (accepted)

Sathre R. and Gustavsson, L. (2007) Effects of energy and carbon taxes on building material competitiveness *Energy and Buildings* Vol. 39, No. 4, pp 488-494

Sathre, R. and Gustavsson, L. (2008) Process-based analysis of added value in forest product industries (journal manuscript)

## 3.4 Alternative Approaches for Accounting for HWP

*Kim Pingoud*, VTT Technical Research Centre of Finland. Espoo, Finland. Email: kim.pingoud@vtt.fi

There are four basic approaches for reporting carbon balance of forest and HWP stocks:

- IPCC default approach
- Stock change approach (SCA)
- Production approach (PA) / Simple decay (SD)
- Atmospheric flow approach (AFA)

In addition, a hybrid of SCA and PA is considered, called stock change approach for HWP of domestic origin (SCAD). In IPCC default approach only C balance of forest pools is accounted, the HWP stock assumed constant in time. Decrease in forest stock is accounted as emission. In SCA forests are included as above, but added with the pool of HWP within the borders of the reporting country, stock decrease considered as emission and increase as removal. PA is like SCA, but the C pools consist of forests and HWP originated from the forests of the reporting country, regardless of where the end-use of HWP takes place. Thus it is a kind of lifecycle approach for HWP. In AFA the flux of C to the forests of the reporting country and the C flux from HWP pool to the atmosphere are considered. The HWP pool is here same as in SCA, HWP within borders of the reporting country. The accounted emission in AFA is the difference between the flux from HWP to the atmosphere and flux from the atmosphere to forests. In the hybrid SCAD the HWP pool consists of those HWP which are produced from domestic roundwood and are located within the reporting country. Decrease in the forest and above HWP pool is accounted as emission. Other hybrid approaches could be created, where the origin of roundwood could be restricted not only to domestic roundwood but e.g. to Annex I or to some other group of countries.

Within the national GHG emission inventories under UNFCCC it is already now allowed to report the C balance of HWP in the Land Use, Land-Use Change and Forestry (LULUCF) sector. Because there is no international agreement on the approach to be applied, countries can freely use in reporting any of the approaches for the moment. The topical issue is whether HWP should be included in the next commitment period (post-2012) in GHG accounting, i.e.

if HWP could be used in the emission reduction obligations or not. In the Kyoto Protocol there is an activity-based accounting of forests (Articles 3.3 and 3.4) which is not on full-carbon basis (3.4), so even IPCC default approach is in fact not used in the accounting under Kyoto. If HWP were included in the next commitment period, the approach to be chosen must be balanced with the accounting of forest C balance, and possibly this accounting will not be equivalent with any of the basic four approaches for forests and HWP. An important question is also, whether HWP in landfills should be included or not.

The advantage of the IPCC default approach is that no new elaborated accounting system for HWP has to be established. As a disadvantage the true atmospheric C balance of wood based material is not taken into account. SCA is the simplest of the approaches including HWP. The system boundary coincides with the country boundary, so national statistics can most easily be applied. The basic problem in PA is that countries have to report C balance of pools outside there national boundaries. It would be difficult to verify this kind of estimates where stock changes of HWP in the export markets should be included. Further, AFA is inconsistent with the general accounting system in LULUCF, setting wood-based and other biomass in totally different position ("discontinuity"). Hybrid approaches are more complicated and they would need – with the exception of the simplest one (=SCAD) – elaborated data on international trade flows not included in the FAO statistics. The potential incentives of the approaches are discussed in the presentation. In a EU funded study the C balance of HWP in all the Annex I was estimated by the HWP model of the 2006 IPCC GL using different approaches. The country data used in the model were downloaded from the FAO database ForesSTAT. Examples of these calculations are shown and their uncertainties discussed in the presentation.

## 3.5 Harvested wood products versus forest sinks: CO2-effects in Swiss forestry and timber industry

*Peter Hofer*, GEO Partner AG. Zürich, Switzerland. Email: hofer@geopartner.ch

Shall we and eventually how account for harvested wood products (HWP) in the next commitment period of the Kyoto Protocol or shall we only take into account the forests? The following contribution gives arguments to this discussion based on results of a case study conducted over several years in Switzerland and some experiences with a similar research for the Swedish forest and timber industry.

**Aims and methodology of the study**

The purpose of the Swiss study was to investigate the $CO_2$-effects of the Swiss forestry and timber industry. The hypothesis was that the contribution to the $CO_2$-balance would be optimal, if a maximum possible wood increment in the forest was achieved and fully harvested. The goal were thus to develop a range of management options for a future $CO_2$-optimized policy for Switzerland.

The thematic scope was divided in four parts, for which models were developed to investigate the effects of different management strategies on the $CO_2$-balance.

- A forest model for the development of forest structure and living volumes the change in the carbon content of the soil (YASSO), based on surveys of Swiss National Forest Inventory.
- A dynamic wood flow model incorporating all relevant wood stocks and fluxes in Swiss technosphere including building sector, paper cycle, fuel wood, wood residue and waste wood.

- The substitution effect was estimated using a LCA model based on a national and international database. Greenhouse gas emissions generated by a structural wood component were compared over their entire life cycle with those of a functionally equivalent substitute component.
- The resulting $CO_2$-effects were then split into effects in-country and those abroad.

The models were combined to obtain a total $CO_2$-effect including C stocks and substitution effects and run for a period from 2000 to 2096 or 2150 respectively.

**Scenario building**

Built up scenarios consist of realistic policy elements as for harvesting, consumption, processing, etc.

- In a "baseline" scenario, the forest is managed as before, linked with a moderate increase in harvesting of 20%. Wood is then consumed proportionally to harvesting.
- In the "optimized increment" scenario forests are managed in a way to obtain the highest possible increment, then to use the forests increment as extensively as possible for the production of long-lived wood products with subsequent end-utilization for energy generation. The harvest increases by 90%. Larger volumes of slash and bark are removed from forests for energy use.

  The sub-scenario "building" is linked with a strong increase in consumption of structural wood, finish wood and other wood products. The sub-scenario "energy" shows a constant consumption of wood products but a strong increase in the consumption of fuel wood.
- The "Kyoto-optimized" scenario quests for a balance between forest sinks and wood utilization. The growing stock increases annually by the volume that can be accounted for under the Kyoto-rules. Harvesting is lower than in the "optimized increment" scenario, but HWP-consumption increases as in the sub-scenario "building". Priority of utilization is given to the building sector.
- The "reduced forest maintenance" scenario provides evidence for the effects of a significant reduction in wood harvesting as compared with today's volumes. Consumption is adapted to the reduced quantity of available wood.

**The results of the Swiss study**

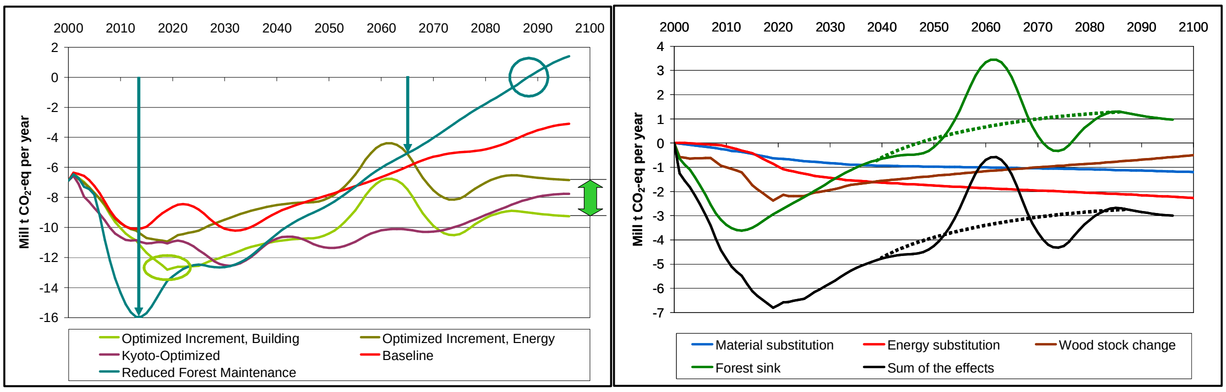
The global results are the sum of the annual $CO_2$-effects in Switzerland and abroad, including C stock in forests, in techno sphere and the substitution effects over a period of 100 years. The "reduced maintenance" and the "optimized increment, building" scenario show the most different characteristics.

- In a first period the "reduced maintenance" scenario shows a high $CO_2$-mitigation of max. 16 Mio. t $CO_2$-equv. per year. This is due to a high increase of growing stocks caused by reduced harvesting. The mitigation effect is continuously decreasing after 15 years, reaching zero in the year 2090. Stopping harvest leads sooner than later to reduced increment and unstable forests.

- The "optimized increment, building" scenario shows a relevant contribution to GHG mitigation over the whole period. Compared with "reduced maintenance" results are inferior during the first 25 years, equal for another 15 years. They come out best after approximately 70 years.

- The "optimized increment, energy" scenario shows less interesting results than "building" over the whole period. The "Kyoto-optimized" scenario is over the whole period very close to “optimized increment, building”. The characteristic of the “baseline” scenario is quite similar to the one of “reduced maintenance”.

Figures: Left: global effects of different strategies; right: net effects of “optimized increment, building” scenario in Switzerland




Effects in Switzerland are similar to the global one‘s. “Reduced maintenance” shows best results for 45 years, but the mitigation effect already gets lost after 75 years. As “reduced maintenance” scales down harvest to accessible forest areas and where security could be affected the combination of this scenario in a first period with “increased increment” later on is hardly possible. If a strategy change occurs after 40 years, forests are far away from an optimized increment and some of them instable. To increase growing stocks makes sense until the maximal increment is reached.

The maximum sum of net effects in-country in the “optimized increment, building” scenario is approx. 7 Mio. tons $CO_2$-equiv., which corresponds to about 13% of the whole Swiss $CO_2$-emission level.

- The forest sink effect is the most important for the first 25 years, until optimized increment and a higher harvesting level is achieved. By harvesting the whole increment, a certain amount of slash remains in the forests, what creates the $CO_2$-emissions up from 2050.
- The increase of the wood products stock due to the higher consumption level is the second important effect at the beginning. This increase tends to zero in the steady state situation in 2150.
- Material and energetic substitution effects are both constantly growing. In 2040 the energetic substitution, in 2070 the material substitution get more important than the wood stock change.
- By utilizing wood first as a product and by energetic use after end of life, the benefit is doubled. This makes the difference of the sub-scenarios “building” and “energy”.

Employment effects are of interest in the context of sustainability in general. An estimation of Swiss forest and timber industry faded out effects abroad and in other branches. The “optimized increment, building” and “Kyoto-optimized” scenarios have both almost the same and highest employment effect. In contrast, the “reduced maintenance“ scenario is linked with an important loss of working places.

**The Swedish example**

In a comparable study for the Forest faculty at SLU, the Swedish University for Agricultural Sciences in Umeå the same methodology as in the Swiss study was applied, using the following scenarios.

- In two "baseline" scenarios maximum harvest of the actual increment was assumed, which means about +12% of today's yield. Consumption and exports where raised proportionally. The "baseline full potential" sub-scenario accounted for supplementary slash and stump harvest.
- The scenario "increased increment" accounted for a supplementary increment by means of fertilizing and new thinning techniques, achieved in a 30 years period. This supplementary increment is fully harvested, as far as possible utilized in-country or exported respectively.
- It was assumed that all exported wood products substitute non-wood products abroad and that exported pulp and paper-quantity was the same in the three scenarios and therefore neglected.

The study shows a clear superiority of the "increased increment" scenario. In comparison with the baseline scenarios it reaches the double of $CO_2$-savings in-country and about 40% more abroad. Following this results it is worthwhile to invest in higher increment and to harvest it. As the home market in Sweden is limited, the harvested wood products have to be exported. As for possible $CO_2$-savings in-country "increased increment" shows a stable result, but a reduction in the baseline scenarios.

In the baseline scenarios the reduced increase of growing stock in-country and the supplementary production emissions can not be compensated by the additional consumption of wood products. In contrast, this is more or less the case in the "increased increment" scenario. Looking at the global results, the substitution effects abroad bring the $CO_2$-emissions savings of the baseline scenarios to the start level, whereas there is an important net effect in the "increased increment" scenario.

Storm Gudrun – occurred in 2005 – is clearly noticeable. It turned the forest sink into a source. As most of the wind-thrown wood was utilized in the following years, it can be concluded, that the accounting for HWP would give a more accurate image of what happens in reality. HWP-accounting reduces the negative effect of forests as emitter in the $CO_2$-balance.

**Reflexions on the accounting for harvested wood products in the $CO_2$-balance**

Countries with high production of wood products combined with a high export rate are a special case. In their $CO_2$-balance they are charged with high production emissions whereas $CO_2$-savings occur abroad, where the wood products substitute non-wood products. In a long-range perspective the wood stock change effect is marginal to zero. As wood stocks in the technosphere are stable, there is low risk, that they are destroyed or reduced on a large scale as it could happen in the forests. To give an incentive for investments in a higher wood consumption level, the accounting for HWP is advisable.

The positive substitution effect in-country is awarded by an improvement of the fossil fuel balance. The incentive for improvements are Pigouvian taxes or / and high costs for fossil fuels. However, it is not possible to identify the extent to which the reduced or increased consumption of fossil fuels is dictated by the production and use of wood and the corresponding substitution effects.

The longer the lifetime of the products the larger is the capacity of the stocks. Accounting of HWP should therefore reward long-lived wood products. In a resource-economical perspective an accounting approach should rather give incentives for high increment in forests than for high growing stocks.

**Reference**

Taverna R., Hofer P., Werner F., Kaufmann E., Thürig E. 2007: The $CO_2$ Effects of the Swiss Forestry and Timber Industry. Scenarios of future potential for climate-change mitigation. Environmental Studies no. 0739. Federal Office for the Environment, Bern. 102 pp. online: www.bafu.admin.ch/publikationen

### 3.6 Model for estimating carbon storage effects in wood products in Germany

*Sebastian Rueter*, Johann Heinrich von Thuenen-Institute (vTI), Federal Research Institute for Rural Areas, Forestry and Fisheries, Institute for Wood Technology and Wood Biology. Hamburg, Germany. Email: sebastian.rueter@vti.bund.de

On behalf of the German Federal Ministry of Food, Agriculture and Consumer Protection (BMELV), a model has been developed for estimating the carbon storage potential as well as the annual $CO_2$-emissions from wood products in Germany. For this purpose, the 2006 IPCC Guidelines for National GHG Inventories describe various possible calculation methods (tiers) (IPCC 2006).

The effects of carbon storage are mainly determined by the duration of the wood products service life. This depends on their final purpose which complies with the technical properties of the individual products. Therefore, the IPCC tier 3 method was chosen to estimate the contribution of wood products to LULUCF by taking into account following relevant information:

A) Data from the Federal Statistical Office on production and foreign trade of intermediate and finished wood products

B) Existing data on the utilization of wood products in different market sectors (building, furniture and packaging)

C) Specific service life data for wood products, particularly in the building sector

After the digitization and appropriate organization of the data in databases, these different datasets were combined by means of adjusted algorithms for the individual product categories. The model also allows the variation of different calculation parameters, for example using an average service life method or decay functions for the calculation. Furthermore, it allows calculating different scenarios until the year 2030, simulating a changing consumption, as well as a shift in the market use and the service lifetime. Thus, the model indicates ways to optimize the contribution of wood products consumption in Germany to mitigate $CO_2$-emissions, and shows benefits and shortcomings of various calculation methods.

In fact, 2003 IPCC Good Practice Guidance for LULUCF allows for the inclusion of wood products in the national GHG inventories in case their consumption increases (Nabuurs et al. 2003), but in the current commitment period from 2008 to 2012 wood products are not considered. However, accounting for wood products in a future post-Kyoto regime could provide positive incentives to sustainable forest management and cascade use of wood. In the course of a post-2012 LULUCF workshop in Graz, a set of criteria was compiled that should be met by any future accounting approach. This includes e.g. the essential need to avoid perverse incentives (e.g. deforestation) or leakage effects, as well as the requirement for methodological consistency within LULUCF. As a result, a restricted stock-change approach was proposed which suggests restricting the availability of wood products accounting to only those countries that are accounting for the effects of forest management (i.e. electing Article 3.4 FM KP). Furthermore, it would be limited to those products that are produced by countries that are accounting for activities under Article 3.3 and 3.4, or even to only products that have been produced domestically (Henschel et al 2008).

**References**

IPCC, 2006. IPCC Guidelines for Greenhouse Gas Inventories – Vol 4 Agriculture, Forestry and other Land Use. In: Eggleston, S. Buendia, L., Miwa, K., Ngara, T. and Tanabe, K. (Eds.), IPCC National Greenhouse Gas Inventories Programme, Technical Support Unit, Hayama, Kanagawa, Japan. [available at http://www.ipcc-nggip.iges.or.jp/public/ 2006gl/ vol4.html]

Nabuurs, G.-J., Ravindranath, N.H., Paustian, K., Freibauer, A., Hohenstein ,W., Makundi, W. (Coordinating lead authors), 2003. LUCF sector good practice guidance. In: J. Penman, M. Gytartsky, T. Hiraishi, T. Krug, D. Kruger, R. Pipatti, L. Buendia, K. Miwa, T. Ngara, K. Tanabe, F. Wagner (Eds), Good Practice Guidance for Land Use, Land-Use Change and Forestry. Intergovernmental Panel on Climate Change National Greenhouse Gas Inventories Programme, Institute for Global Environmental Strategies (IGES), Kanagawa, Japan, pp.3.1–3.312 [available at www.ipcc-nggip.iges.or.jp/public/gpglulucf /htm].

Henschel, C., Ward, M., Rueter, S., Ashton, R., Bird, N., Frieden, D., Lehtonen, A., Schlamadinger, B., Silvius, M., Tuerk, A., Zanchi, G., 2008. Options for improving the treatment of LULUCF in a Copenhagen agreement: forest and wetland degradation, factoring out, harvested wood products and approaches for fuller accounting. Working paper [available at http://www.climatetrategies.org/uploads/3_Options_for_improving_the_treatment_of_LULUCF_in_a_Copenhagen_agreement_August_18_2008.pdf]

## 3.7 HWP inventory in Finland

*Anna-Leena Perälä*, VTT Technical Research Centre of Finland. Espoo, Finland. Email: Anna-Leena.Perala@vtt.fi

In this lecture the harvested wood products inventory (HWP) in Finland is introduced. Use of wooden materials in construction is very common in Finland. Nowadays more than 70 % of annual sawn wood consumption in Finland is used in construction. The volume of Finnish building stock construction was in 2005 about 1.94 bill.$m^3$ building space. Of this stock about 42 % consisted of housing, 21 % of industrial and storage buildings, 18 % of public and commercial buildings and 19 % of agricultural and other buildings. The stock of long-lived wood products in buildings is increasing. The method presented is country-specific and based mostly on national statistics and related research projects.

The building stock in Finland is very well known unlike in many other countries. VRK (National register centre) maintains the building stock register and Statistics Finland publishes the Building stock statistics. In addition VTT has developed it further to a more detailed database including some additional building types and the civil engineering sector.

The building stock statistics include information about floor areas in different 15 main buildings type categories. The building stock statistics do not include free-time residential buildings (holiday homes), many outbuildings or agricultural buildings. Official building permits include information about gross floor area ($m^2$), building volume ($m^3$), bearing structure materials, facade materials, floors etc. VTT has done during last decades more detailed questionnaires about new building and used materials by many building types. Typical use of wooden materials in buildings can be estimated in different decades. Stock loss in buildings varies between 0.3-2 percent depending on building type, the average being about yearly about 1 %. Almost 65 % of the building stock has been built after 1970.

Harvested Wood Products (HWP) reported in the Finnish national inventory includes basically carbon balance of all wood products, which are in use in Finland, calculated by the stock change approach. HWP are divided in solid wood products (sawn wood, wood-based panels and round timber in long-term use, e.g. poles) which are included in the direct stock inventory. Paper products (paper and paperboard), furniture, wooden packages, roundwood stocks are excluded from the direct inventory, but the stock and stock-change of paper products are estimated by the IPCC HWP model using the default value for the half-life of paper.

Inventories of carbon stock in wood products in building stock have been performed earlier regarding the years 1995, 2000 and 2005 and were utilized in estimation of the carbon balance in HWP including all construction wood and wood products in fittings - and were utilized in estimation of the carbon balance in HWP. The carbon stock of 1995, 2000 and 2005 concerning construction wood is relatively comprehensive.

Use of wood varies much by the15 building types (kg/cub m in building). Wood intensity by building space is higher in older building stock than in new buildings, but buildings are nowadays bigger than before. The quantity of building construction varies also much annually. The market share (%) of wood in bearing structures is changing some percents yearly and it depends on the structure of new buildings.

The total carbon stock used in construction (including building stock, construction with and without building permits and civil engineering ) was estimated to be 18.6 Mt C in 2005. The carbon stock in total building stock has increased during last years.

### 3.8 Contribution of the Austrian Forest Sector to Climate Change Policies – Industrial Marketing Implications

*Tobias Stern*, Kompetenzzentrum Holz GmbH (Wood K plus). Vienna, Austria. Email: tobias.stern@boku.ac.at

The Austrian Competence Centre for Wood Composites and Wood Chemistry (Wood K plus) focuses on industrially oriented technical research and development. The technical research is supported by a market research team, which ensures that the newly developed products and processes meet market demands and requirements. The Wood K plus market research team faces the topic of climate change policies in various ways. First is the assessment of wood products as a potential carbon sink which was started several years ago (Baur, 2003). As an industrially oriented research and development centre it is clear that a strong focus is laid on the industry related implications of the research results. Hence the market research team recently started to investigate impacts of carbon sequestration in wood products from a marketing point of view. This paper aims to introduce key findings as well as methodological aspects (including major problems), conclusions and an outlook on future research actions.

In studies of Wimmer (1992) and Baur (2003) the so called stock-change approach was used to analyse long-term storage effects of harvested wood products (HWP) in Austria. In its simplest and most realisable form the stock-change can be derived from some kind of input-output analysis. For the calculation regarding storage effects the determination of the HWP's application fields is essential as it has a major impact on expected life spans. Two data sets supplied by Statistik Austria (the national statistical agency) allow for quantifying the utilization of wood and wood products.

Certain problems occur in relation to the available data. First of all the data sets cover only about 75% to 90% of the wood processing (companies) in Austrian (Baur, 2003). Furthermore, for some wood products the statistics do not cover the produced weight or mass but only the number of items and value. According to Baur (2003) such problems should be solved by defining an international catalogue of long-term wood products for which information in context to carbon accounting should be collected by the national statistical agencies. Average life spans for different products in different applications are very hard to assess and the assumptions differ considerably in different studies. Similar problems occur in respect to the process of converting wood products volumes into carbon masses. A major influencing factor for example is the water content which can range between 10 and 28% of the wood mass.

According to Wimmer (1992) the carbon stored annually in long term wood products in Austria was at 0.6 million tons in 1992 whereas Baur (2003) refers to some 1.0 million tons in 1999. In relative terms these figures differ a lot but still appear quite plausible. It can be assumed that the annual wood products consumption increased significantly between 1991 and 1999. Remaining differences are very likely depending on different assumptions and definitions. Again it is very important to mention that these results target quite comparable dimensions so that these are suitable to assess the possible contribution of long-term wood products on carbon balances in Austria.

Both authors conclude that doubling the annual consumption of long-term wood products in Austria would be equivalent to a reduction of the annual Austrian emissions by 6.0% (Wimmer, 1992) to 4.3% (Baur, 2003). Paradoxically Baur's (2003) considerations start from a higher level (1.0 to 0.6 million tons) but his effects on the emissions are lower compared to Wimmer (1992). Hence we must conclude that Austria's carbon dioxide emissions have showed a stronger increase than the long term wood products consumption between 1991 and 1999. Of course we can therefore assume that the prevention of emissions is a much stronger trigger in respect to carbon balances than wood product consumption. The two figures (4.3% and 6.0%) produced by the two independent studies (Wimmer, and Baur) still target a similar level. What do these results mean if we wish to assess the potential of long term wood products as carbon sink?

In order to answer this question a more detailed analysis of the results is needed. According to Wimmer (1992) and Baur (2003) we can conclude that the construction sector (by 66%) is by far the most important field of application in relation to carbon sequestration in wood products. The construction sector not just stores the greatest amounts annually it also delivers the longest life spans for the products. During the last 10 years wood in construction increased in Lower Austria (Austrian province) by 16% in terms of buildings and by 4% in terms of volumes built (Stern & Huber, 2008). Assuming similar values for whole Austria, this would result in an additional storage effect equal to approx. 0.5% of the annual emissions. Wimmer (1992) suggested improving the carbon storage effects among other by increasing wood utilization in construction, substitution of other materials by wood and development of new applications.

How could this be achieved? One idea that might be to promote the wood products positive effects on carbon balances. Environmental oriented consumers may choose wood products due to their positive effect on carbon balances. Unsurprisingly this is not a new idea. Since the early 1990ies wood industries got involved into environmental certification (e.g. Ozanne

& Vlosky, 1997; Ozanne & Smith, 1998) regarding sustainable forest management. As this is a very similar matter to carbon labelling, learning from the past can be applied.

In order to conduct a meta-study we investigated a total of 27 studies originating from 1997 to 2007 including 56 surveys covering about 33,000 observations from all over the world. The meta-analysis applied delivered several results relevant to possible carbon labelling of wood products. The frequently measured willingness to pay is more a valuation method that allows assessing an additional value perceived by the respondent and does not necessarily mean additional real payment. Anyhow, an additional value may be delivered to the consumer which can be crucial in the decision making process. Therefore environmental labelling could be a tool to increase wood products consumption if the label delivers a base for decision making (Teisl et al., 2002). Teisl et al. (2002) found that some kind of rating included in the labels would be preferable to the consumers to distinguish between products.

In context to carbon storage and wood products two bases for such ratings are possible. In the first case the amount of carbon stored in the product could be used to distinguish wood products from other materials to improve substitution. The second rating could refer to the carbon dioxide produced in the production process to distinguish between wood products. Domestic wood products using state of the art production processes would become preferable to imported products.

In both cases between 33 and 56% of the customers can be expected to perceive additional value. These proportions seem to be depending on the recent economic situation and the kind of product. For houses smaller proportions of respondents stated a lower willingness to pay for the certification than for other wood products. Many authors noticed a certain consumer segment (e.g. females, environmental concerned) most likely to buy environmental certified products. Although it might be possible to target these consumers by certain marketing activities socio-demographic factors have been proven bad predictors of consumer behaviour (Haley, 1968). More likely the product usage context is a key factor to assess values perceived by consumers (Warlop & Ratneshwar, 1993).

Therefore the greatest challenge uncovered by the meta-analysis in relation to carbon storage and wood products is the rather weak adequacy of houses as objects for environmental certification, especially as the construction sector was found the most effective application field in terms of carbon storage. This topic definitely needs further considerations and research e.g. by analysing the effects of subsidies and consumer information campaigns.

## References


Baur, 2003, Study: The possible contribution of the Austrian Forest Sector to climate change policies and implications of the Kyoto-Protocol, Wood K plus, Vienna, 111

Haley, R.I. 1968. Benefit segmentation: a decision-oriented research tool. Journal of Marketing. 32: 30-35.

Ozanne, L.K., and P.M. Smith. 1998. Segmenting the market for environmentally certified wood products. Forest Sciences. 44(3): 379-389.

Ozanne, L.K. and R.P. Vlosky. 1997. Willingness to pay for environmentally certified wood products: a consumer perspective. Forest Products Journal. 47(6): 39-48.

Stern, T. and Huber, W., 2008, Timber construction in Lower Austria – Project support report of the Wood K plus Market Research Team (In German), Vienna. 4

Teisl, M.E., Peavey, S., Newman, F., Buono, J., Hermann, M., 2002. Consumer reactions to environmental labels for forest products: a preliminary look. Forest Products Journal 52 (1),44–50.

Warlop, L. and S. Ratneshwar. 1993. The role of usage context in consumer choice: A problem solving perspective. Advances in Consumer Research 20: 377-382.

Wimmer, 1992, Can increasing wood consumption help to mitigate the $CO^2$-problem in Austria? (in German), "Holzforschung und Holzverwertung, 44(4):59-61

### 3.9 HWP modeling and reporting in France

*Estelle Vial*, Institut technologique FCBA: Forêt, Cellulose, Bois - construction, Ameublement. Paris, France. Email: Estelle.VIAL@fcba.fr

Harvested wood products are not included yet as a sink in the national greenhouse gas inventories. Following the current IPCC guidelines for the agriculture, forest and land use sectors (AFOLU), carbon is considered as being released as the tree is harvested. Nevertheless, products are manufactured from harvested trees and can store carbon over long periods of time. Negotiations are under way to include carbon storage in harvested wood products in the national inventories for the post-2012 period of the Kyoto Protocol. IPCC guidelines exist already for such a reporting which is for now done only on a voluntary basis.

The French Ministry for Agriculture and Fisheries has commissioned FCBA, assisted by Jean Malsot Consultant and the Ernst & Young consulting firm, to calculate the harvested wood product (HWP) contribution to France's greenhouse gas inventory provided to the United Nation Convention on Climate Change (UNFCCC) for the year 2005.

The method used in the study is consistent with chapter 12 of the 2006 IPCC guidelines for National Greenhouse Gas inventories dealing with harvested wood products. The method used for products in use corresponds to TIER 3 which corresponds to the best level of precision and specificity. For products placed in solid waste disposal site, the method used is « TIER 2 ».

The study analyses five stocks or pools of carbon downstream of the forest in the wood chain and the paper sector: housing, furniture, packaging, energy, and pulp and paper.

For each sector, the stocks are identified (intermediate technical stocks and final in service stocks), and then quantified. Depending on the lifetime of the products considered, different methods have been used to calculate the stocks. For short lived products, the accumulation rate method has been used (wood energy except firewood, intermediate stocks, paper and board, light packaging). For products having a lifetime longer than one year, the demographic method has been used (firewood, construction products, heavy packaging, and furniture). The furniture and construction products have much longer lifetime than the other products: up to 25 years for furniture and up to 75 years for construction products such as wood frames.

In the study, a development is also done on the question of the acceptability of imported forest products. An alternative to the stock change approach is put forward. Annex I countries which have elected forest management as a 3.4 activity have the obligation to report carbon stock from forest remaining forest in their national inventory. For these countries, both gains in carbon stock variation for harvested wood products and potential losses of stock in managed forest can be compared. To ensure such a comparison for the calculation of stock variation in harvested wood products, only imports from Annex 1 countries which have elected forest management as a 3.4 activity could be accounted for. This exclusion of non

Annex 1 countries and of Annex1 country which have not elected forest management could lead to a decrease of the contribution of harvested wood products of 33%.

### 3.10 Joint Forest Sector Questionnaire (JFSQ)

*Alex McCusker*, UNECE/FAO Timber Section. Geneva, Switzerland. Email: stats.timber@unece.org

The JFSQ is administered by four international organizations: FAO, UNECE, Eurostat and the International Tropical Timber Organization. Each organization requests information from its countries (with no overlap) and distributes this to the other organizations. This procedure has been in effect since 1998 and replaces the individual questionnaires (28!) previously sent. Each country should have only one international contact and the same figure for the same parameter should be in all databases.

The JFSQ has the following components

- JQ1 – removals of wood and production of primary products (see back)
- JQ2 – trade in wood and primary products (value and volume)
- JQ3 – trade in secondary products (furniture etc.) (value only)
- DOT1 & 2 – trade flow in major products between countries (volume only). Data for most countries is collected through UN/COMTRADE rather than DOT.
- ECE/EU – trade in roundwood and sawnwood by species (value and volume)
- EU1 – removals by ownership category
- EU2 – intra-EU trade
- ITTO1 – trade in tropical species
- ITTO2 – forecast of production and trade of major tropical products
- ITTO3 – comments on changes in tariffs and NTBs

The JFSQ is issued in the spring with the initial response requested by June for questionnaires JQ1 & 2. These are published as provisional data by UNECE and FAO. The other organizations receive data through the year, finalizing it in October and November. Each organization disseminates the data as required by their separate mandates. The objective is to disseminate all information collected by the end of the year following the data reference year (i.e. data for 2007 are published by the end of 2008). The primary global dissemination is through FAOSTAT at http://faostat.fao.org/site/626/default.aspx

The four partners have agreed to validate data for arithmetic issues, year-on-year change, apparent consumption (no negative data), unit value and, more recently, roundwood availability. Due to the various data cycles and queries put forth by each organization, the validation process extends over several years and during this time figures in the databases will not necessarily coincide.

The structure of the JFSQ has largely been dictated by the desire to follow the Harmonised System (HS) trade classification. Changes to the questionnaire generally must follow the item classification used in the HS.

### 3.11 Industries Concerns regarding Accounting for Carbon Store in HWP

*Christian Kofod,* Association of Danish Woodworking and Furniture Industries / CEI-bois

Kopenhagen, Denmark. E-mail: cjk@di.dk

With the finalisation of the post Kyoto protocol moving closer, it is becoming ever more evident that the role of wood as a raw material for products, is threatened. This threat is primarily fuelled by the global quest to decarbonise the energy sector, and secondly by a public misunderstanding of the grounds for deforestation.

Including the carbon storage in HWP in the post Kyoto Protocol, will not only increase the accuracy of the aggregated emissions, it is also the only way to secure the future of the wood processing industries.

As yet, industry input for an accounting scheme for carbon sequestration in HWP, is not complete. This work is currently underway and is forecasted to be finalised ultimo 2008. Several of the concerns, included in the work, are summarised in the following.

**Carbon leakage:** Deforestation is one of the largest single emitters of GHG. Therefore, HWP shall be sourced from sustainably managed forests. Existing certification schemes are part of the solution, but can not stand alone.

**Existing mature forests**: Existing mature forests are not included in the present protocol. Their role as a carbon pump, pumping carbon into the HWP carbon pool, is obviously disregarded. An accounting scheme for carbon sequestration, should therefore seek to motivate existing forests to place sustainably sourced wood on the market for inclusion in HWP. Woody biomass for energy production does not add to the carbon pool, and should therefore be treated differently.

**Carbon storage in HWP**: By acknowledging the carbon pool stored in products (of a defined lifespan) in the end-user country, ratifying countries will be encouraged to increase the use of HWP nationally. Likewise, this system should encourage the recycling of used products and by-products. Where appropriate, used-wood-products and by-products should be recycled as $CO_2$-neutral energy sources.

**Burn the right wood**: Burning wood for energy purposes does not increase the carbon store. Fuel wood can not be treated as other HWP. The right wood should be forest fractions unsuitable for industrial use or end-of-life HWP and by-products.

**Substitution of carbon intensive technologies/products**: Increasing the use of HWP will not reduce the emission of GHG, if the use carbon intensive technologies/materials are not reduced simultaneously. If ratifying countries/consumers are to increase the use of GHG friendly HWP and increase the carbon pool in society, they must be motivated to choose the climate friendly alternatives. Therefore, the possibility of broadening the scope could be discussed.

**Tackle Climate Change - Include HWP**: It is crucial for the survival of our industry, that HWP are included in a fair and balanced way in the new protocol. If not, there is a large risk that the primary wood flow will be diverted away from the processing industry and the consumers, directly to the furnaces.

### 3.12 The implications of Harvested Wood Products Accounting to the Pulp and Paper Industry

*Reid Miner*, National Council for Air and Stream Improvement (NCASI). Cary, North Carolina, USA. Email: rminer@ncasi.org

The carbon stored in products is an important part of the carbon and greenhouse gas profile of the forest products industry. At a global level, approximately 600 Tg $CO_2$ eq. per year are added to stocks of carbon in forest products in use and in landfills. This is enough to offset a significant fraction of the industry's global value chain emissions. For the US, the carbon added to product carbon stocks is enough to offset all of the industry's direct emissions plus all indirect emissions attributable to purchased electricity.

The wood products sector and the paper sector cannot be neatly separated because they are connected by mass flows and by economics. In many countries, residues form wood products manufacturing are sold to papermakers, representing an important income stream for the wood products sector and an important raw material for the paper producers.

While most of the carbon added to stocks of HWP carbon is contained in wood products, especially construction materials, the additions to stocks of carbon in paper products are not insignificant, especially those in landfills. In the US alone, it is estimated that paper-derived carbon stocks are growing at approximately 20 Tg $CO_2$ eq. per year, equal to approximately one-third of the direct emissions from the US pulp and paper industry.

Accounting for the carbon in landfills should not be construed as promoting landfilling. The net balance between methane emissions and carbon storage in a landfill depends on many things, especially the design and operation of the landfill and the type of product. Some products in certain landfills will be long-term net sources of greenhouse gases to the environment while others may be net sinks. In any event, it is important, when examining the forest products value chain, to include both the methane released from decomposition and the carbon that remains in the landfill, especially that biomass carbon that remains in the landfill for a very long time.

While concern has sometimes been expressed about the accuracy of estimates of HWP carbon stocks and flows, it is important to understand that they are no less accurate than many other estimates included in national inventories. In addition, these estimates will improve as countries develop data to calibrate the HWP models and as new science yields more robust parameter values for these models. Important new information on the fate of forest products-derived carbon in landfills is expected soon from researchers in Australia and the US.

There is an ever present danger that HWP carbon accounting approaches and methods will become unnecessarily entwined with policy considerations. This is to be avoided because it invites unintended consequences and does not do justice to the science. Regardless of the merits, or lack thereof, of landfilling, paper recycling, biofuels, biomass energy, waste-to-energy and other practices that can affect atmospheric carbon, these practices should be encouraged or discouraged by targeted policies, not by tinkering with carbon accounting approaches and methodologies.

Ultimately, however, it is fair to say that the industry is less concerned about international HWP accounting approaches than about the national policies that could put them at a disadvantage relative to overseas competitors and competing materials. This could happen if national policies fail to recognize the value of sustainable forest management practices, carbon stored in HWP, biomass energy and the other carbon and greenhouse gas attributes of the forest products industry value chain.

### 3.13 Crediting HWPs: missing the mitigation story?

*Trevor Hesselink*, Canadian Parks and Wilderness Society. Toronto, Ontario, Canada. Email: trevor@wildlandsleague.org

It is not surprising that even a well-educated audience finds itself somewhat puzzled by the attention that Harvested Wood Products (HWP) are getting in this mitigation arena. They can appreciate that Carbon resides in products, and likely recognize that wood products are generally more eco-friendly than other options. But they begin struggling when we begin talking about providing “credit” for this pool – will landfilling products solve our problem or induce mitigating behaviour? Are we going to produce more products to save us from climate change? Their disbelief is probably not without some merit, particularly in the short-medium term “action” window where we need results.

In exploring the utility of Harvested Wood Products in carbon accounting, it important to carefully examine its context:

1. **How comprehensive is our capacity to compare net Carbon transactions over time, versus a natural baseline?**

   These carbon transactions are numerous and complex, and include fossil fuel inputs and opportunity costs that continuously undermine the benefits associated with wood products, many in unknown ways and extents. Understanding the real net C story of C/time when a product cycle is compared to a natural baseline is only as good as our understanding of these transactions.

2. **If HWPs are counted, what other specific Carbon transactions are at least as worthy of counting from a Climate Change mitigation perspective?**

   Perhaps many of these will be included in forest deforestation / degradation accounting, but the resolution of monitoring and accounting for degradation warrants much more attention from a mitigation perspective, for example. While more careful tracking of all aspects of the cycle is desirable, investment of resources would benefit from mitigation-benefit prioritization.

3. **Would crediting HWP storage produce other un-anticipated environmental effects?**

   Many of the commonly cited concerns about counting HWPs are associated with a resulting increase in logging to attain increased HWP stocks. Increased deforestation, degradation, fragmentation and habitat loss effects, landfill effluent, fly-ash disposal and so forth are all examples of this.

   IF an increase in the rate of additions to the HWP pool occurs, then these concerns need to be answered and if it doesn’t, the mitigation benefits of counting HWPs is hard to see.

## 3.14 Harvested Wood Products and Bioenergy for Climate Change Mitigation: Competing Services?

*Hannes Böttcher*, International Institute for Applied Systems Analysis (IIASA). Laxenburg, Austria. Email: bottcher@iiasa.ac.at

Harvested Wood Products (HWPs) and biofuels impact the carbon cycle of the land-use sector in similar ways. HWPs postpone emissions of carbon after biomass harvest by building up a product carbon stock. When burned for energy generation, both offer substitution services that can lead to a slower depletion of fossil carbon stocks due to less fossil fuels burned. This requires a cascaded use of HWPs in a tight recycling chain with final bioenergy use. The effectiveness of climate services of HWPs and biofuels depends on a) the efficiency of the bioenergy chain, b) reference system to be substituted and c) the lifetime of products. While direct wood production for biofuel use is usually the more efficient carbon mitigation option compared to HWPs, mitigation potential of HWPs emerges from the mere extent of forests available for timber production. In a future integrated carbon market an inclusion of HWPs would offer incentives for mitigation options in the entire forestry sector. Long-lasting HWPs and an efficient recycling cascade would buffer emissions from harvest and avoid additional costs for forest owners.

### Bibliography

Chladna, Z., 2007. Determination of optimal rotation period under stochastic wood and carbon prices. Forest Policy and Economics 9 (8), 1031-1045.

Farrell, A. E., R. J. Plevin, B. T. Turner, A. D. Jones, M. O'Hare and D. M. Kammen, 2006. Ethanol can contribute to energy and environmental goals. Science 311 (5760), 506-508.

Freibauer, A., H. Böttcher, Y. Scholz, V. Gitz, P. Ciais, M. Mund, T. Wutzler and E.-D. Schulze, submitted. Setting priorities for land management to mitigate climate change. Climatic Change.

International Institute for Applied System Analysis (IIASA) GGI Scenario Database, 2007. Available at: http://www.iiasa.ac.at/Research/GGI/DB/

Nilsson, 2007. The Three Fs: Food, Fiber and Fuel. IIASA Conference 2007 on Global Development: Science and Policies for the Future. http://www.iiasa.ac.at/Admin/INF/conf35/docs/speakers/speech/ppts/nilsson.pdf

Zah, R., H. Böni, M. Gauch, R. Hischier, M. Lehmann and P. Wäger, 2007. Ökobilanz von Energieprodukten: Ökologische Bewertung von Biotreibstoffen. Empa, Bern. http://www.news-service.admin.ch/NSBSubscriber/message/attachments/8514.pdf.

### 3.15 Forest Owners' position on HWP accounting and carbon storage in wood products

*Christer Segersteen*, Confederation of European Forest Owners (CEPF).

The risks projected by the climate change may in some regions have devastating consequences. What is seen is that the northern region gets warmer and wetter while the southern region gets warmer and dryer, which in the latter case results in an increased risk of forest fires. Increased fire hazard and other factors such as more frequent storms are aspects that are important to take into consideration in the forest management. An increased mobilization of wood is a key factor to mitigate climate change as forests fill the important functions of carbon sequestration, storage and fossil fuel substitution. Even the substitution of non-renewable construction material is a great possibility for the benefits of the forests carbon sinks. Forest harvesting must be undertaken in a balanced approach of sustainable forest management and the private forest owners must be able to meet reasonable conditions when it comes to carbon sink commitments.

CEPF believe that the carbon sinks in forests should be accounted, although on a national/state or regional basis, not on a property level. The carbon sink accounting will increase the bureaucracy and generate new cost, which has to be paid by some part. If these cost fall on the private forest owners then the purpose of the emission rights go lost. CEPF believe that forest owners shall get paid by the products delivered and therefore this system has to be simple, clear and easy interpreted. The user-friendliness is important as 60% of the European forests are owned by families, which on average has small properties and more limited resources. Although the total share makes a great affect.

### 3.16 Harvested Wood Products, International Trade and Lifecycle Assessments: Their Role in Climate Change Policies

*John Perez-Garcia*, University of Washington. Seattle, Washington, USA. Email: perjohm@u.washington.edu

The presentation has three parts. It describes the effects international trade of wood products has on different HWP accounting systems. It includes information on the work of Consortium on Renewable Resources and Industrial Materials (CORRIM) on life-cycle assessment (LCA) of harvested word products (HWP). It offers a general outlook for HWP accounting and inclusion of HWP in the post-Kyoto process. Data from the forest sector show that HWP pools are increasing globally. The accounting for HWP rather than accepting the default assumption of immediate oxidation at harvest time produces more realistic emission estimates, even though different accounting approaches lead to different national estimates of emissions. If the forest products industry became financially responsible for harvest emissions, the selection of an accounting approach could significantly affect the industry. Studies completed by CORRIM show how the forest and HWP sinks are interrelated and the need for sink-enhancing activities to report their effects on both the forest and HWP sinks. An activity that creates the substitution of wood for fossil-intensive substitutes may be considered a sink-enhancing activity, but measuring the offset is complex. LCA can have a positive role in protocols to measure product leakage. Activities aimed at producing offsets or tradable credits can be subjected to a life-cycle assessment to quantify the unintended effects any activity might have and reduce the uncertainty associated with forest management offsets. Incorporating LCA into a forest offset protocol can contribute to the resolution of the conflicting positions held by conservation and commercial forestland use on forest management offset projects.

## 4. Background paper

# Challenges and Opportunities of Accounting for Harvested Wood Products

Grêt-Regamey, Adrienne[4]; Hendrick, Eugene[5]; Hetsch, Sebastian[6]; Pingoud, Kim[7]; Rüter, Sebastian[8].

### 4.1 Abstract

The background paper *Challenges and Opportunities of Accounting for Harvested Wood Products* (HWP) gives the reader an overview on the importance of HWP in climate change mitigation, different methods for accounting, and their challenges and opportunities.

Wood products can contribute to climate change mitigation in a number of ways. Long-lived wood products form a storage pool of wood-based carbon. As a raw material and energy source, wood can substitute for more energy-intensive materials and fossil fuels. So far, however, the international climate policy has only provided the possibility to account for carbon sinks in forests through the Kyoto Protocol. While the value of harvested-wood-products (HWPs) is recognized by many countries, the carbon storage effect of wood products will not be accounted for over the first commitment period of the Kyoto Protocol. Negotiations on the post 2012 period provide a means for possible inclusion of wood products. In this paper, we provide background information related to HWP, including an historical overview of the international HWP negotiations, measures to increase the role of HWPs in climate change mitigation, a description of the accounting approaches for HWP, a list of possible incentives and disincentives associated with the applications of these approaches, and the illustration of the potential scale of carbon sequestration by HWP for several countries and the different accounting approaches. The goal is to provide workshop participants with a common technical knowledge on HWP in order to provide a basis for broader discussion of the role of HWP in climate change mitigation. The paper closes with some leading questions in order to stimulate debate.

---

[4] Swiss Federal Office for the Environment, Worblentalstrasse 68, 3063 Ittigen, adrienne.gretregamey@bafu.admin.ch

[5] National Council for Forest Research and Development COFORD, Arena House, Arena Road, Sandyford, Dublin 18, Ireland, Eugene.Hendrick@coford.ie

[6] UNECE/FAO Timber Section, Palais des Nations, CH 1211 Geneva, Switzerland, sebastian.hetsch@unece.org

[7] VTT Technical Research Centre of Finland, CO2 emission control & mitigation, Biologinkuja 7, Espoo, P.O. Box 1000, FI-02044 VTT, Finland, kim.pingoud@vtt.fi

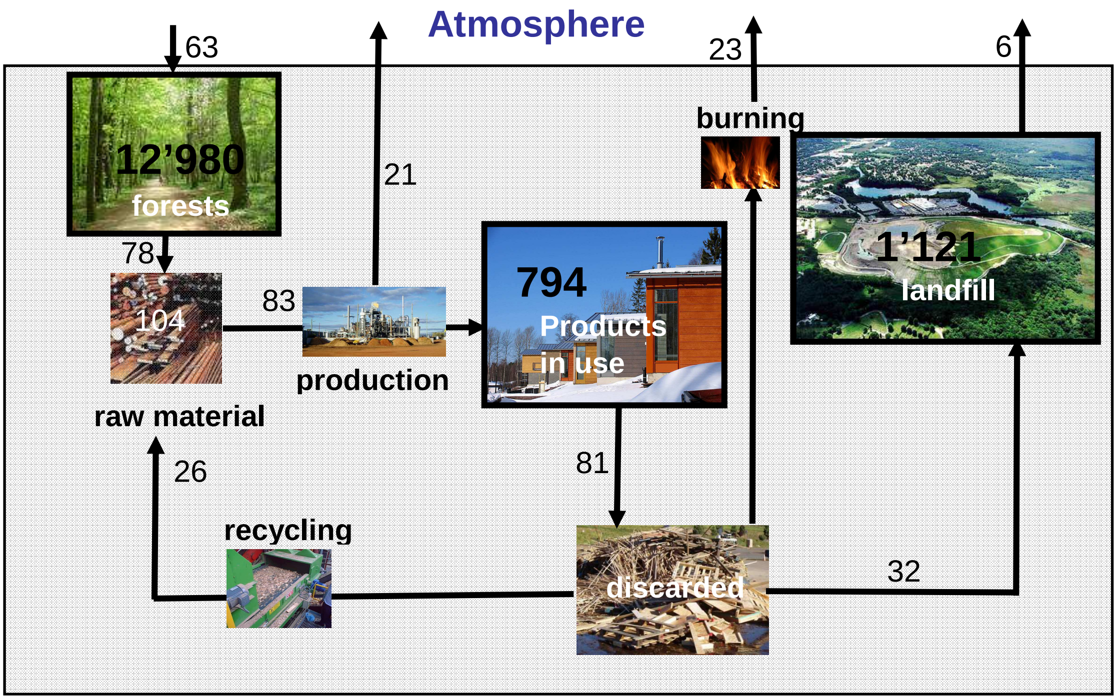
[8] Federal Research Institute for Rural Areas, Forestry and Fisheries, Institute for Wood Technology and Wood Biology, Leuschnerstrasse 91, 21031 Hamburg, Germany, sebastian.rueter@vti.bund.de

### 4.2 Role of Harvested Wood Products in mitigating greenhouse gas emissions

As policymakers seek ways to reduce greenhouse gas (GHG) emissions to mitigate the effects of global climate change, the role of forests and forestry becomes an important discussion point. There is little disagreement that forests sequester carbon as they grow and convert atmospheric carbon dioxide ($CO_2$) to benign forms, such as carbon in wood and soil organic matter. While the value of HWP is recognized by many countries, the carbon storage effect of wood products will not be accounted for over the first commitment period of the Kyoto Protocol. Negotiations on the post 2012 period provide a means for possible inclusion of wood products.

HWP are defined as wood-based materials harvested from forests, which are used for products such as furniture, plywood, and paper and paper-like products, or for energy[9]. HWP exclude, however, logging residues that are left at harvest sites.

HWP form an integral part of the carbon cycle. They have an effect on the carbon cycle because, on the one hand, the $CO_2$ pool of long-lived wood products can stay at the same level, increase or decrease (by decay or combustion) within the accounting framework. Figure 1 shows carbon fluxes and stocks in wood products for Europe in 2000[10]. The carbon in HWP moves through different stages and storage levels until it is finally released back into the atmosphere. Harvested roundwood is manufactured into wood and paper products. After their use, which may last either days or centuries, the products are burned, recycled, or landfilled, where they slowly decay. Changing the demand for wood products can thus have an important role in the global carbon cycle and the fight against climate change.




---

[9] UNFCCC (2003): Estimation, reporting and accounting of harvested wood products. Technical paper. FCCC/TP/2003/7. http://unfccc.int/resource/docs/tp/tp0307.pdf

[10] Eggers, Th., 2002: The impacts of manufacturing and utilization of wood products on the European carbon budget, European Forest Institute, Internal Report 9, 2002. http://www.efi.int/portal/virtual_library/publications/technical_reports/9/

**Figure 1.** Carbon fluxes and stocks in wood products for Europe in 2000. Fluxes are indicated as arrows, stocks with boxes. The units are in teragrams ($10^{12}$) of carbon per year (Eggers, 2002)[2].

The obvious climate mitigation provided by HWP and illustrated in Figure 1 is the formation of a **physical pool** of carbon. Another significant climate mitigation effect is obtained by using wood products as a **substitute for more energy intensive materials** or **to reduce fossil fuel use by substituting woody biomass**. The manufacturing and transport of wood products requires less fossil fuel than energy-intensive construction materials such as aluminium, steel, and concrete. Recent comparisons show that the production of steel and concrete as building material requires up to two times more energy than wood-based products, with concomitant greater generation of green house gasses (GHG)[11]. Ideally from a mitigation point of view, a combination of these two substitution effects should be aimed at wood products, which should first be used as building materials, where they store carbon and substitute for more energy intensive material, and then at the end of the wood product lifecycle to generate energy as a substitute for fossil fuel. This **cascade use of wood** would help to optimize the climate mitigation effect of the use of wood products[12]. However, there are also studies that do not see significant benefits from cascading e.g. energy and carbon balances of wood cascade chains[13].

### 4.3 Measures to increase the role of wood products for climate change mitigation

Harvested timber is converted into a wide variety of wood products. The carbon in the wood is fixed in products until they decay or are burned and the carbon is subsequently released back into the atmosphere. Incentives to use HWP are implicitly provided in the Kyoto Protocol because of the substitution effect**:** wood-based fuels can be used as a substitute for fossil fuels and solid HWP are being used as a substitute for more energy intensive materials, reducing CO2 emissions. As of now, however, carbon stock changes in HWP are not accounted for. In this section several options are introduced on how to increase carbon stocks in wood products. The implementation of theses options depends on national policies and measures.

---

[11] Taverna, R., Hofer, P., Werner, F., Kaufmann, E., Thürig, E., 2007: The $CO_2$ effects of the Swiss forestry and timber industry. Scenarios of future potential for climate-change mitigation. Environmental studies no. 0739. Federal Office for the Environment, Bern, 102 pp.

[12] See for example, Dornburg, V. and Faaij**,** A**.** Cost and $CO_2$-emission reduction of biomass cascading-Methodological aspects and case study of SRF poplar. IEA Task 38 – Greenhouse Gas Balances of Biomass and Bioenergy Systems - Workshop on: *Greenhouse Gas Aspects of Biomass Cascading Reuse, Recycling and Energy Generation*. Dublin, Ireland, 25 April, 2005

[13] Roger Sathre, and Leif Gustavsson, 2006: Energy and carbon balances of wood cascade chains. Resources, Conservation and Recycling. Volume 47, Issue 4, July 2006, Pages 332-355.

Wood and paper products are among the most commonly used materials for recycling into the same or new products. For example, in Europe, recovered paper accounts for more than 40% of annual paper production and is predicted to increase[14].

Extending the lifespan of wood products not only brings longer service but also longer carbon storage and less energy consumption for replacement through new materials. The service life of wood products can be extended by using the appropriate timber species for particular end-uses, good specification and detailing, by applying wood protection against fungi and insect attack, and by wise use and maintenance of the products themselves

Building legislation can play a major role as an incentive for the use of wood; for example multi-storey wood buildings of more than two floors are becoming more common, following changes in national building regulations.

Certification of forest products can contribute to increase their market share, by informing consumers that the wood products come from sustainably managed forests.

Further measures to promote the use of wood also for climate change mitigation are national, multinational, and regional initiatives. Examples are the “Plan Bois-Construction-Environment” and its accompanying “Charter” in France, “Wood for good” in the UK, “Centrum Hout” in the Netherlands, “Promo_legno” in Austria and Italy, the “Swedish Wood Association”, the “Danish Timber Information Council”, “Wood Focus” in Finland, the “Centre Interfédéral d’Information sur le Bois” in Belgian, and the “Nordic Timber Council” in Finland, Norway and Sweden, the “German Timber Promotion Fund” (Holzabsatzfond), as well as regional Spanish initiatives.

Research plays a key-role in developing new applications, improving process efficiency, and product quality and extending product life spans, which could increase the market share of wood products.

Several countries are trying to include specific clauses in public tenders to encourage the use of wood because of climate change benefits (better insulation, energy efficiency, use of renewable material).

## 4.4 HWP and UNFCCC – the history

In 1992, the United Nations Framework Convention on Climate Change (UNFCCC) was opened for signature at the “Earth Summit” in Rio de Janeiro, Brazil, and came into force in 1994. Signatories to the UNFCCC (181 governments and the European Community) have to carry out and communicate inventories on GHG emissions and removals according to the inventory formats provided by the Convention. The Intergovernmental Panel for Climate Change (IPCC) also provides guidelines for the completion of national GHG inventories.

In the first set of IPCC guidelines, the *Revised 1996 Guidelines for National GHG Inventories*, wood products are dealt in the chapter “Land-use change and forestry” (LUCF)[15]. The guidelines provide an outline of how HWP could be treated in national GHG inventories.

---

[14] European Commission, Entreprise DG Unit E.4, 2003. Comprehensive report 2002-2003 regarding the role of Forest products for Climate change mitigation, Available online at http://ec.europa.eu/enterprise/forest_based/312_en.html

[15] IPCC (2006): Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories. http://www.ipcc-nggip.iges.or.jp/public/gl/invs1.html

They recommend that storage of carbon in forest products be included in the national inventory only where the country can document that existing stocks of long-term products are in fact increasing. The default assumption is that the HWP pool in not changing, which means that the inflow to the pool is the same as the outflow of the pool. The guidelines do not provide any specific methods for estimating and reporting emissions or removals due to carbon stock changes in HWP.

In 1998, the IPCC held a special meeting in Dakar, Senegal, where experts reviewed and evaluated four different HWP accounting approaches, differing in where and when the carbon is accounted for:

- the IPCC default approach,
- the atmospheric-flow approach,
- the stock-change approach, and
- the production approach[16].

These approaches and their implications on the carbon balance are presented in section 4 of this paper.

In 2001, parties including Australia, Canada, Japan, New Zealand, Norway, the Russian Federation, Samoa, Sweden, Switzerland, and the USA, submitted their *views on approaches* for estimating and accounting for emissions of carbon dioxide from forest harvesting and wood products[17]. In 2003, Argentina, Australia, Canada, Denmark (on behalf of the EU and its Member States), Japan, Mexico, New Zealand, Samoa (on behalf of AOSIS[18]), USA, and Uruguay submitted their *views on the implications* of harvested wood products accounting, including views on different approaches and methodologies[19]. This information was then summarized into a technical paper on HWP[20], which contains a set of definitions relating to wood products, global data on stocks and trade of wood products and descriptions of methodologies for estimating HWP contribution to emissions/removals in the "Land Use, Land-Use Change and Forestry" (LULUCF) sectors.

[16] Brown, Sandra; Lim, Bo; and Schlamadinger, Bernhard (1998): IPCC/OECD/IEA Programme on National Greenhouse Gas Inventories: Evaluating Approaches for Estimating Net Emissions of Carbon Dioxide from Forest Harvesting and Wood Products. Meeting Report. Dakar, Senegal. 5-7 May 1998.

[17] UNFCCC/SBSTA (2001): Issues related to Emissions from Forest Harvesting and Wood Products. Submissions from Parties. FCCC/SBSTA/2001/MISC.1. SBSTA, 14th session. Bonn, 16-27 July 2001.

[18] Alliance of Small Island States: 43 States and observers from Africa, Caribbean, Indian Ocean, Mediterranean, Pacific and South China Sea.

[19] UNFCCC (2003) Methodological issues. Good practice guidance and other information on land use, land-use change and forestry. Implications of harvested wood products accounting. Submissions from Parties. FCCC/SBSTA/2003/MISC.1

[20] UNFCCC (2003): Estimation, reporting and accounting of harvested wood products. Technical paper. FCCC/TP/2003/7.

In 2003, the IPCC published the Good Practice Guidance for Land Use, Land-Use Change and Forestry (LULUCF), based on the IPCC Guidelines (2000), in order to guide Parties in preparing inventories related to LULUCF as outlined in Articles 3.3, 3.4, and 3.7 of the Kyoto Protocol, and subsequent agreements under the Marrakech Accords. HWP were covered under an Appendix, which presented the different accounting approaches as a basis for future methodological development[21]. In 2004, Parties including Australia, Canada, India, Ireland on behalf of the EU and its Member States, Japan, and New Zealand submitted their views on the information contained in the 2003 technical paper and this appendix on harvested wood products to the Good Practice Guidance for LULUCF[22].

In order to increase the understanding of issues relating to HWP, a workshop was organized in Lillehammer in 2004[23]. Participants at the workshop exchanged views on definitions and scope of estimation, reporting and accounting of harvested wood products; methods for estimation and reporting of emissions and removals relating to harvested wood products; and approaches for accounting of harvested wood products and the socio-economic and environmental implications of different approaches.

In 2005, Parties including Canada, Japan, UK on behalf of EU and its Member States, and the USA reported on their experiences with the use of the IPCC Revised 1996 Guidelines for National GHG Inventories and the Good Practice Guidance for LULUCF.[24]

Currently, Parties still do not have to prepare estimates for HWP. They may do so if they wish, and report in row 5.G ‘Other’ in Table 5 of the common reporting format for LULUCF. Four Annex I Parties[25] have reported emissions and removals relating to HWP in their National Inventory Reports: Australia, Canada, United Kingdom of Great Britain and Northern Ireland, and the USA. However, the substitution effect of HWPs is already implicitly included in the current accounting framework, in the same way as emissions from bioenergy, since emissions are reported but not accounted for in the energy sector.

If HWP reporting is established in the national GHG emission inventories under the UNFCCC, HWP could in principle also be incorporated in the GHG accounting system under the Kyoto Protocol framework, provided such a decision is made by the Conference of the Parties (CoP). HWPs are not referred to in the Kyoto Protocol, but they could be included, for example, as an additional human-induced activity under Article 3.4. This could happen during the period post 2012, and HWP are under currently discussion in the AWG process[26].

---

[21] IPCC (2003): IPCC Report on Good Practice Guidance for Land Use, Land-Use Change and Forestry. Institute for Global Environmental Strategies (IGES) for the IPCC. Hayama, Japan.

[22] FCCC/SBSTA/2004/MISC.9

[23] UNFCCC/SBSTA (2004): Report on the workshop on harvested wood products. FCCC/SBSTA/2004/INF.11. Buenos Aires, 6–14 December 2004.

[24] IPCC (2006): Guidelines for National Greenhouse Gas Inventories. Volume 4: Agriculture, Forestry and Other Land Use. Institute for Global Environmental Strategies (IGES), Hayama, Japan.

[25] Annex I Parties include the industrialized countries that were members of the in 1992, plus countries with economies in transition, including the Russian Federation, the Baltic States, and several Central and Eastern European States.

[26] UNFCCC/AWG (2008): Round table on the means to reach emission reduction targets. FCCC/KP/AWG/2008/CRP.1. Ad Hoc Working Group on Further Commitments for Annex I Parties under the Kyoto Protocol. 5th session. Bangkok, 31 March to 4 April 2008, and Bonn, 2-12 June 2008

## 4.5 HWP accounting approaches

Several approaches have been suggested for estimating $CO_2$ emissions and 'removals' from HWP. The approaches differ mainly in when and where emissions and 'removals' are allocated.

IPCC default approach

The 1996 guidelines suggest the default assumption that "all carbon removed in wood and other biomass from forests is oxidized in the year of removal", which is "based on the perception that stocks of forest products in most countries are not increasing significantly on an annual basis".[27] This conservative assumption has also been referred to as the IPCC default approach, though, according to the definitions of approach and method, it constitutes more of an estimation method than an approach.[28]

However, where HWP stocks are increasing and sufficient data are available, the guidelines recommend the inclusion of HWP in the national inventory reporting, and they describe a range of approaches and methods on how to estimate their contribution to emissions and removals in the LULUCF sector. Overall there are two different ways of construing emissions and 'removals' in the context of HWP.[29]

One interpretation is to see emissions and removals approximated by *changes in selected pools* (e.g. carbon stock in wood products), as is the case for estimating emissions/removals from forests (LULUCF reporting), and in the stock change and the production approaches.

On the other hand in the atmospheric approach and the simple decay approach, emissions and removals are considered as *gross fluxes* between the atmosphere and the land and wood products system.

Stock change approach

The stock-change approach is used in case where the estimation of net changes in the carbon pool is confined to domestically consumed solid wood and paper products. Thus, the approach accounts for emissions and removals based on stock changes within national boundaries, where and when they occur. Hence, exports of wood products count as emissions and imports as an increase of carbon stock, similar to removals from the forest (figure 2).

---

[27] IPCC (1996): Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories. Reference Manual (Volume 3), p. 5.17

[28] IPCC (2003): IPCC Report on Good Practice Guidance for Land Use, Land-Use Change and Forestry. Institute for Global Environmental Strategies (IGES) for the IPCC. Hayama, Japan.

[29] Cowie, A. et al. (2006). Stock changes or fluxes? Resolving terminological confusion in the debate on land-use change and forestry. *Climate Policy* 6: 161-179.

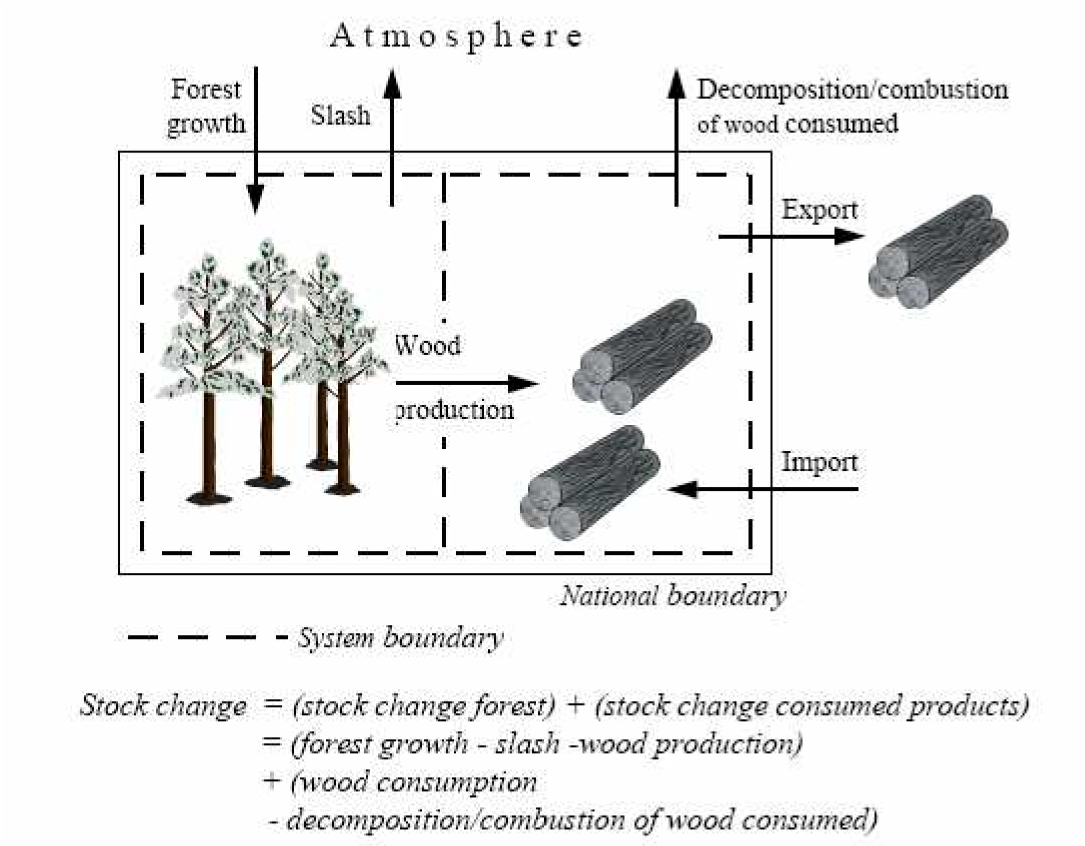



**Figure 2.** Schematic presentation of the stock change approach[30].

Production approach

For the production approach, the net change to the carbon pool from wood products is attributed to the producer country only. Contributions/removals of emissions from exported HWP is therefore credited to the HWP producing country (in contrast to stock-change approach, where exported HWP are included in the calculation of the importing country or in other words, where the HWP is consumed). Any stock of carbon that crosses a national boundary is not transferred from one country's inventory to another; the exported carbon remains in the inventory of the producing country. Effects for the consuming country are neutral in terms of reporting, but technical difficulties may arise, as there may be a need for the producing country to track exports when reporting emissions that occur outside its national boundaries. Consequently, stock changes are accounted for when, but not where they occur (figure 3).

[30] Lim , B., Brown, S., Schlamadinger, B. (1999). Carbon accounting for forest harvesting and wood products: review and evaluation of different approaches. Environmental Science and Policy, Volume 2, Issue 2, May 1999, Pages 207-216.

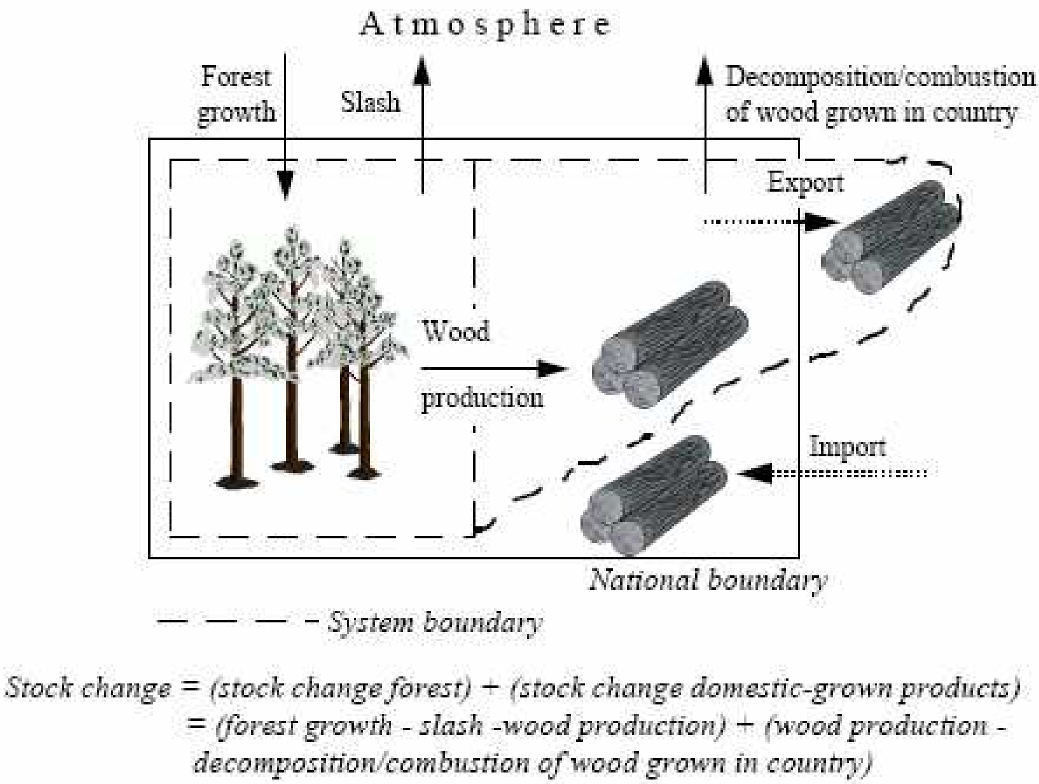



**Figure 3**. Schematic presentation of the production approach.[22]

<u>Domestic origin stock change approach</u>

In order to resolve some of the complications and allocation issues of these approaches, Cowie et al. suggested the "stock changes of domestic origin" approach. This hybrid between the stock-change and the production approach, suggests that each country should only account for those products that are produced and consumed domestically.[21]

<u>Atmospheric flow approach</u>

The atmospheric flow approach regards emissions and removals as gross fluxes between the atmosphere, the forest and the HWP pool and accounts for net emissions/removals of carbon to/from the atmosphere within national boundaries. Removals of carbon from the atmosphere due to forest growth are accounted for in the producing country, and emissions of carbon to the atmosphere from oxidation of wood products are accounted for in the consuming country (figure 4). This approach intends to cover all emissions along the forest wood chain within a country, where and when they occur.

The producing country will have to report only emissions resulting directly from harvesting, such as decay of slash. In contrast to the stock-change approach, the consuming country will not increase its pool of carbon in wood products but will have to report the emissions as imported wood products decay. Where the producing country is also the consuming country, this is translated into a direct delay of emissions from wood products.

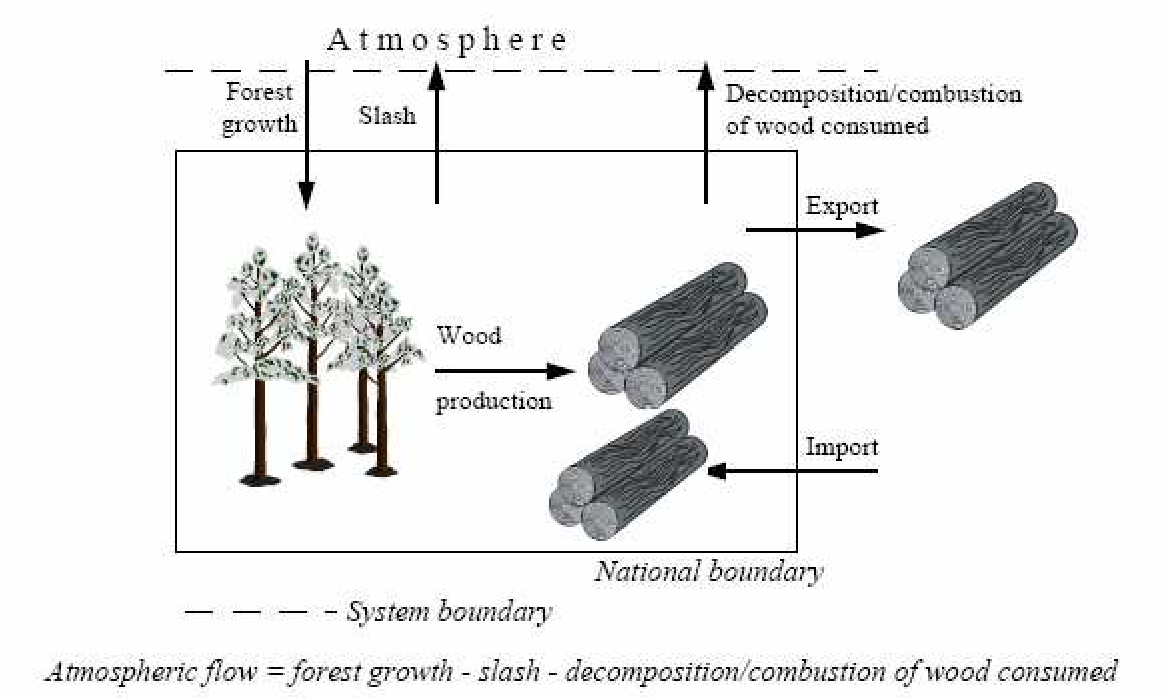



**Figure 4**: Schematic presentation of the atmospheric flow approach

4.6 Simple decay approach

Another approach is the simple decay approach or accounting for "harvesting emissions", which also sees emissions/removals as gross fluxes between the atmosphere and the land and wood products. This approach assumes that emissions from wood products are estimated over time as products decay. Rather than allocating emissions where they occur, as in the atmospheric-flow or stock-change approaches, the simple decay approach suggests that these emissions be allocated to the producer. Just like the production approach, it does not estimate emissions from existing HWP pools, but simply delays emissions from harvesting by a factor that reflects the decomposition rates of carbon in HWP.

## 4.6 Incentives/Disincentives of the different approaches

Although carbon stock changes in HWP are not currently accounted for, incentives to use HWP are in place, since HWP can substitute more energy intensive materials, and thus reducing the overall GHG balance of a country.

In this section, we give a brief introduction to the additional incentives/disincentives, which are mainly dependent on the underlying HWP accounting approaches.

5.1 Promotion of sustainable forest management

In general, the effects of HWP accounting on forest carbon stocks depend on whether forest in general[31] and forest management[32] are included in the country's GHG accounting system. Regardless as to which approach is used, accounting for HWP but not accounting for forest

[31] Article 3.3 of the Kyoto Protocol

[32] under Article 3.4 of the Kyoto Protocol

management could create an incentive to pool carbon in HWP rather than the forest, thus possibly rewarding unsustainable forest management or possibly deforestation. Therefore, one prerequisite of HWP accounting is that the country should have elected forest management under Article 3.4

The *IPCC default approach* discourages harvesting in Annex I countries. It provides an incentive to maintain and increase the carbon stock in forests and to manage forests in a way avoiding damages through natural disturbances.

One possible shortcoming of *the stock-change approach* could be the inclusion of non-sustainably produced HWP, unless one was to exclude HWP from non-sustainably harvested sources. This option, however, may not be feasible due to lack of data and complexity of validation.

The *atmospheric-flow approach* does not account for depletion of forest carbon stocks to the extent that losses in carbon stocks are exported. In this case, sustainable management of forest carbon stocks is not encouraged. Furthermore, it could promote deforestation: If wood from deforestation is exported, the emission is accounted for in the importing but not the exporting country.

### 5.2 Trade

International trade is a key issue in HWP accounting. The accounting approaches could impact international trade of HWP, since they penalize or give incentives to forest harvesting, and importing or exporting wood, depending whether countries have emission reductions commitments under the Kyoto Protocol (Annex I).

Overall, however, it is unlikely that HWP reporting and accounting will have major influence on international wood prices, since this influence will be minor compared to the main driving factors, such as roundwood production costs, tariffs, subsidies, etc.

### 5.3 Impacts on reuse and recycling

All HWP accounting approaches may provide incentives for recycling of products, thereby further delaying emissions, and possibly reducing harvest. The atmospheric-flow approach may provide the greatest incentive for recycling as long as net imports decrease as recycling increases. The production approach may provide the least incentive, because recycling of imported products would not affect national stocks of wood products.

### 5.4 Use of wood fuels

There is an incentive for all countries to use wood for energy under the Kyoto Protocol, since emissions from wood energy are not accounted for. Thus, in general an incentive is provided to import wood fuels; except under the *atmospheric-flow approach*, since in this approach emissions from wood fuels are accounted for in the consuming country. Importing wood fuels would then even be penalized since the $CO_2$ emissions per unit energy output are higher for biofuels than for most fossil fuels. Countries exporting biofuels would benefit under the *atmospheric-flow approach* since this approach leads to a decrease in national GHG emissions accounting.

### 5.5 Internalizing the carbon value of wood and national planning

HWP accounting approaches, except the IPCC default approach, provide incentives to improve national wood products inventories and thus to track the effects of different policy approaches and measures.

**Table 1.** Summary of potential impacts of the main different HWP accounting approaches

| | IPCC default approach | Stock-change approach | Production approach | Atmospheric-flow approach |
|---|---|---|---|---|
| Promotion of sustainable forest management | discourages harvesting of forests | incentive to import HWPs, possible inclusion of wood products from non-sustainably managed forests | possible increase in national production and exports of long-life products | wood exports might be promoted, imports reduced, possible focus on national wood production |
| Impacts on recycling | incentives for recycling of products, | | least incentive for recycling of products | greatest incentives for recycling of products |
| Use of wood fuels | incentives to switch from fossil-fuels to domestically-produced wood fuels, and to import wood fuels | | | |
| Internalizing the carbon value of wood and national planning | no specific incentives | incentives to improve national wood products inventories | | |
| Trade | minor influence on international wood prices | | | |

## 4.7 Quantitative outcomes for some countries

In order to estimate possible effects of applying different accounting approaches, the outcomes (calculated with IPCC HWP Model, tier 1) of the three principal approaches, stock-change, production, and atmospheric-flow approaches are illustrated in Table 1 for some selected countries in Annex I of the Kyoto Protocol. The difference in $CO_2$ emissions due to HWP accounting under the IPCC default approach are expressed in Gg $CO_2$.

**Table 2.** Excess emissions from HWPs in 2000 using the three main approaches and compared to reported base-year emissions (IPCC default approach).

| **Greenhouse gas emissions** | Total without $CO_2$ from LULUCF | $CO_2$ from LULUCF | Excess emissions from HWP **Stock change approach** | | | Excess emissions from HWP **Atmospheric flow approach** | | | Excess emissions from HWP **Production approach** | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **$CO_2$ equivalent (Gg)** | Base year 1990 | Base year 1990 | 2000 | % of total base-yr | % of LULUCF base-yr | 2000 | % of total base-yr | % of LULUCF base-yr | 2000 | % of total base-yr | % of LULUCF base-yr |
| Australia | **425175** | 78124 | -2061 | -0.5% | -3% | -443 | -0.1% | -1% | -2117 | -0.5% | -3% |
| Austria | **77388** | -9215 | -3088 | -4.0% | 34% | -3355 | -4.3% | 36% | -1835 | -2.4% | 20% |
| Belgium | **142741** | -1600 | -1443 | -1.0% | 90% | 1342 | 0.9% | -84% | -694 | -0.5% | 43% |
| Canada | **607183** | -61498 | -9207 | -1.5% | 15% | -91509 | -15.1% | 149% | -33848 | -5.6% | 55% |
| Denmark | **69360** | -916 | -1892 | -2.7% | 207% | 2286 | 3.3% | -250% | -106 | -0.2% | 12% |
| Finland | **77093** | -23798 | -2381 | -3.1% | 10% | -23582 | -30.6% | 99% | -4484 | -5.8% | 19% |
| France | **559342** | -56232 | -6707 | -1.2% | 12% | -2995 | -0.5% | 5% | -8077 | -1.4% | 14% |
| Germany | **1222765** | -33719 | -10844 | -0.9% | 32% | -6725 | -0.6% | 20% | -12566 | -1.0% | 37% |
| Greece | **104895** | 1441 | -591 | -0.6% | -41% | 1536 | 1.5% | 107% | -52 | 0.0% | -4% |
| Ireland | **53700** | -89 | -879 | -1.6% | 991% | -225 | -0.4% | 254% | -932 | -1.7% | 1050% |
| Italy | **520571** | -23532 | -6529 | -1.3% | 28% | 13733 | 2.6% | -58% | -1310 | -0.3% | 6% |
| Japan | **1246724** | -83903 | -1187 | -0.1% | 1% | 29843 | 2.4% | -36% | 5153 | 0.4% | -6% |
| Netherlands | **210347** | -1422 | -966 | -0.5% | 68% | 4792 | 2.3% | -337% | -458 | -0.2% | 32% |
| New Zealand | **73161** | -21845 | -1178 | -1.6% | 5% | -9383 | -12.8% | 43% | -4025 | -5.5% | 18% |
| Norway | **51965** | -9765 | -720 | -1.4% | 7% | -1409 | -2.7% | 14% | -182 | -0.4% | 2% |
| Portugal | **64948** | -3751 | -1146 | -1.8% | 31% | -2690 | -4.1% | 72% | -660 | -1.0% | 18% |
| Spain | **286428** | -29252 | -5512 | -1.9% | 19% | 7848 | 2.7% | -27% | -1293 | -0.5% | 4% |
| Sweden | **70566** | -20292 | -1051 | -1.5% | 5% | -18397 | -26.1% | 91% | -2808 | -4.0% | 14% |
| UK | **742492** | 8791 | -3434 | -0,5% | -39% | 15068 | 2,0% | 171% | -3073 | -0,4% | -35% |
| USA | **6130724** | -1097747 | -72571 | -1.2% | 7% | -40302 | -0.7% | 4% | -46085 | -0.8% | 4% |

**Note:** A negative emission means removal. Calculations were carried out with the EXPHWP model. The input data of the model, the production and trade data since 1961 are from the FAO database (FAOSTAT, 2002).[33]

[33] Pingoud, K., Perälä, A.-L., Soimakallio, S., and Pussinen, A., 2003, Greenhouse gas impacts of harvested wood products. Evaluation and development of methods, VTT research notes 2189, http://www.vtt.fi/inf/pdf/tiedotteet/2003/T2189.pdf

### 4.8 Outlook

The technical details and complexity of HWP accounting and its role in climate change mitigation have made the topic incomprehensible to anyone but "HWP experts". While this paper provides technical information, it aims at providing workshop participants with a common technical knowledge in order to raise the level of the workshop discussion to a more strategic level. Future approaches to HWP accounting will need to be discussed in the light of decisions about the broader climate change regime. Thus, this workshop will focus on showing how wood as energy source and construction product could be internalized in the Climate Change framework. Economic and socio-economic outcomes of promoting the use of HWP should be consistent with the desired environmental outcomes and be able to be accepted by all stakeholders.

In this light, the following questions are proposed as a way to facilitate discussions:

**(1) How does accounting for HWP transmit economic signals supportive of environmental integrity (e.g. no negative impacts on forest ecosystems, biodiversity)?**

**(2) How can the climate change mitigation benefits (carbon storage and substitution effects) of HWP be recognized and accounted for?**

**(3) What specific measures and policies can promote the role of HWP to mitigate climate change?**

**Annex I: Program of the workshop**

# Harvested Wood Products (HWP)
# in the context of climate change policies

9-10 September - UN Palais des Nation - Geneva, Switzerland
Conference Room : Salle XII

**Chairman**: Christian Küchli (Swiss FOEN)

| 9th September 2008 | | |
|---|---|---|
| | 9:30 – 9:50 | Welcome statements (Swiss FOEN, UNECE, FAO, MCPFE) |
| Topic 1 **Role of HWP for climate change mitigation** | 9:50 – 10:40 | Role of Harvested Wood Products (HWP) for climate change mitigation<br>Murray Ward (Global Climate Change Consultancy, New Zealand) |
| | | Implications of HWP accounting on Kyoto Protocol reporting *<br>Maria-José Sanz Sanchez (UNFCCC) |
| | | Discussion |
| | *10:40 - 11:00* | *Coffee break* |
| | 11:00 –12:00 | HWP vs. forest sinks – $CO_2$ effects of Swiss forestry and timber industry *<br>Peter Hofer (Geopartner, Switzerland) |
| | | HWP - an incentive for deforestation? *<br>Andreas Fischlin (ETH Zurich) |
| | | Discussion |
| | *12:00 – 13:30* | *Lunch* |
| Topic 2 **HWP accounting systems** | 13:30 – 14:50 | Substitution effects of wood-based construction materials *<br>Leif Gustavsson (MID Sweden University) |
| | | Alternative approaches for accounting for HWP *<br>Kim Pingoud (VTT, Finland) |
| | | Discussion |
| Topic 3 **National experiences with HWP modeling & reporting** | 14:50 – 15:50 | National experiences with HWP modeling and reporting:<br>• Germany * — Sebastian Rüter, (vTI Germany)<br>• HWP inventory in Finland * — Anna-Leena Perälä, (VTT, Finland) |
| | | Discussion |
| | *15:50 – 16:10* | *Coffee break* |
| | 16:10 – 17:30 | National experiences with HWP modeling and reporting:<br>• Austria * — Tobias Stern, (BOKU Vienna)<br>• France * — Estelle Vial (FCBA) |
| | | UNECE/FAO perspective on the Joint Forest Sector Questionnaire *<br>Alex McCusker (UNECE/FAO Timber Section) |
| | | Discussion - Closing of the first day |

* Summary of the presentation submitted – see section 3

| 10th September 2008 | | |
|---|---|---|
| Topic 4 Opportunities and impacts of HWP accounting | 9:00 – 10:00 | Impacts of accounting for carbon storage in HWP on wood working and construction industries * <br> Christian Kofod (Association of Danish Woodworking and Furniture Industries / CEI-bois) |
| | | Impacts on pulp and paper industries * <br> Reid Miner (US National Council of Air and Stream) |
| | | Discussion |
| | *10:00 – 10:20* | *Coffee break* |
| | 10:20 –12:20 | **Panel discussion on opportunities and impacts of HWP accounting**: <br> Point of views and impacts on: <br> - Forest management and forest owners <br> - Forest ecosystems, conservation and biodiversity <br> - Wood-processing industries <br> - Biofuels competing with wood products? <br> Moderator: Maxim Lobovikov (FAO, Forest Products Service) <br> Panelists: <br> Trevor Hesselink * (Climate Action Network, Canada) <br> Hannes Böttcher * (IIASA, Austria) <br> Christer Segerstéen * (Confederation of European Forest Owners - CEPF) <br> Christian Kofod * (Danish Woodworking and Furniture Industries) <br> Reid Miner * (US National Council of Air and Stream) |
| | *12:20 – 14:00* | *Lunch and Networking* |
| Topic 5 Outlook & Conclusions | 14:00 - 15:00 | HWP and international trade – an outlook * <br> John Perez-Garcia (University of Washington, USA) |
| | | Future HWP accounting – key decisions to be made <br> Paulo Canaveira (Ministry of Environment, Land-use Planning and Regional Development, Portugal) |
| | | Discussion |
| | *15: 00 - 15:20* | *Coffee break* |
| | 15:20-16:20 | Conclusions of the workshop and final discussion <br> Christian Küchli (Chairman, Swiss Federal Office for the Environment) |
| | 16:20 – 16:30 | Closing of the workshop |

* Summary of the presentation submitted – see section 3