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REVIEW ARTICLE

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Harvested wood products accounting in the post Kyoto commitment period

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Abstract An increase in the amount of harvested wood products (HWP) from sustainable forestry would help to reduce levels of atmospheric carbon. In the first commitment period of the Kyoto Protocol (2008–2012), this carbon stock effect of HWP is ignored, and forest harvesting is treated as an instantaneous emission of carbon dioxide. However, in the next commitment period of the United Nations Framework Convention on Climate Change from 2013, the carbon stock changes resulting from HWP will be taken into account in the national greenhouse gas inventories. The Japan Wood Research Society called for a roundtable conference of eight research societies, industrial associations, and nongovernmental organizations that are involved with wood utilization. At the conference, accounting approaches for HWP were discussed and a consensus was reached that the stock change approach should be adopted in the next commitment period.

Key words Harvested wood products · National greenhouse gas inventories · Accounting approaches · United Nations Framework Convention on Climate Change · Carbon stock effect

Introduction

Many of the readers of this journal may not know about the accounting issues relating to harvested wood products (HWP). This term is used in the context of the United Nations Framework Convention on Climate Change (UNFCCC) and the Intergovernmental Panel on Climate Change (IPCC). Briefly speaking, these issues involve how to take into account the carbon stock of HWP in the national greenhouse gas inventories. This article explains the details of HWP issues and the opinions expressed at the roundtable conference on HWP accounting that our research society called for.

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Details of HWP accounting

Against the backdrop of an increasing threat of global warming, the IPCC was founded in 1988 under the auspices of the World Meteorological Organization and the United Nations Environment Programme. In 1992, the UNFCCC was adopted. It became effective in 1995 and the Conference of Parties (COP) started.

The IPCC proposed revised 1996 IPCC guidelines for national greenhouse gas inventories[1] in 1997, in which greenhouse gas removal by forest sinks was described, but it was assumed that HWP stock would not change in the medium and long terms. No stock change of HWP means that the same amount of carbon stored in wood harvested from forests is emitted during wood utilization. If there is any difference between harvested wood carbon and emitted carbon, then the HWP stock will change. This accounting approach is called the default approach.

In 1997, COP3 adopted the Kyoto Protocol; countries that ratified the protocol have to reduce their greenhouse gas emissions in the first commitment period from 2008 to 2012. In the first commitment period, the default approach is used to take into account the removal of atmospheric carbon by forest sinks.

The IPCC understood that quantitative information on HWP stock changes must be included in the global carbon flow. The IPCC also understood that further discussion would be needed because when the 1996 IPCC guidelines were being proposed, there was not enough time to discuss the methodology of HWP accounting.

In 1998, an expert meeting was held in Dakar and three approaches, the stock change, production, and atmospheric flow approaches, were proposed.[2] All three approaches can evaluate the global carbon flow of forests and HWP correctly; however, in each approach, the system boundaries

of the estimation differ from national boundaries, and different results are obtained for each country. In 2003, the IPCC published Good Practice Guidance for Land Use, Land Use Change and Forestry[3] to complement the 1996 IPCC guidelines. In the appendix, this guidance describes HWP calculation methods under three accounting approaches that do not appear in either the main text or in the annex.

Discussions on HWP are carried out by the Subsidiary Body for Scientific and Technological Advice (SBSTA) of COP. At the request of SBSTA15 in 2001, the UNFCCC secretariat produced a technical report in 2003 on the socio-economic and environmental impacts of HWP accounting.[4,5] This report describes how each approach would affect traded timber prices and quantity and how sustainable forestry in non-Annex I countries, which do not have a reduction commitment, would be affected.

The simple decay approach[6] was first proposed in 2003, but this approach has the same estimation system boundary as the production approach and it gives the same results. In 2004, the IPCC started to work on the 2006 IPCC guidelines, which will be used in the next commitment period from 2013. These guidelines[7] were completed in 2006. Section 12 (Harvested Wood Products) of Chapter 4 (Agriculture, Forestry and Other Land Use) describes methods for calculating HWP using the three approaches.

In 2005, Annex I countries, which have a reduction commitment, reported their respective HWP stocks to SBSTA23. In 2007, COP13 adopted the Bali Action Plan and established the Ad Hoc Working Group on Further Commitments for Annex I Parties under the Kyoto Protocol (AWG-KP). HWP accounting has been discussed in this AWG-KP. The Forestry Agency and the Ministry of the Environment of Japan have sent delegates to AWG-KP sessions for international discussions. SBSTA will investigate and compare technologies for assessing HWP. HWP accounting will be adopted at COP15 to be held in Copenhagen at the end of 2009.

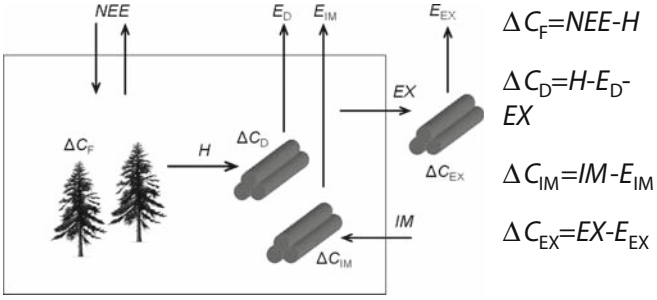

Fig. 1. Basic concepts of flows and stock changes. *NEE*, net ecosystem exchange; *H*, harvested carbon; *ΔC*, carbon stock change; *E*, carbon emission; *EX*, *IM*, exported (imported) carbon; suffixes *F*, *D*, *EX*, and *IM* denote forest, domestic, exported, and imported, respectively. The boundary denoted by the *black line* indicates the national border

Forestry and wood utilization for carbon dioxide reduction

To reduce carbon dioxide, which has an atmospheric concentration of only 0.04%, the most economic, feasible, and efficient method is to increase the amount of carbon fixed in forests and wood by expanding forests and restoring degraded forests. When a forest does not undergo harvesting (H), the absorption and emission of carbon dioxide reach an equilibrium, and the carbon stock in the forest levels off ($\Delta C_F = 0$), resulting in the forest losing its ability to reduce atmospheric carbon dioxide ($NEE = 0$; see Fig. 1). Under sustainable forestry, which involves harvesting less than the growth, the carbon stock in the forest does not decrease ($\Delta C_F > 0$), and the forest continues reducing atmospheric carbon dioxide and producing wood ($H > 0$). Increasing the amount of wood products so produced ($\Delta C_D + \Delta C_{IM}$ or $\Delta C_{EX} > 0$) results in trapping the carbon produced by human society and reducing the concentration of atmospheric carbon dioxide.

Therefore, the maximum reduction of the atmospheric carbon dioxide concentration can be achieved by maximizing the amount of carbon fixed in forests and wood products ($C_F + C_D + C_{IM}$ or C_{EX}). Increases in carbon stock in forests and increases in wood products should be mutually balanced. Of the carbon fixed in a tree, about 30% will be stored in long-life products. Thus, wood products should be used for a long time, and, wood should be appropriately recycled not only to increase its usage.

Wood produced from sustainable forestry is carbon neutral, and burning wood instead of fossil fuels reduces emissions. Another effective way to reduce emissions is to use wood products, which can be produced with little energy, instead of products that require much energy to produce. To maximize the effects, the cycle of using wood resources should be promoted worldwide; in other words, the demand for wood products needs to be increased. This increase in wood products would substitute for alternative materials, and increased demand for wood would increase the wooden residuals that can be used as fuel.

Discussions on the default approach

The default approach (see Fig. 2) used in the first commitment period assumes that the amount of carbon in trees harvested during 1 year is equivalent to the amount of carbon emitted to the atmosphere by disposing of wood products ($H = E_D + E_{EX}$), i.e., it does not consider the effects of increasing wood products on carbon stock ($\Delta C_D + \Delta C_{IM}$ or $\Delta C_{EX} = 0$).

Therefore, this approach gives no incentive to expand the amount of carbon stored in long-life wood products such as buildings. Only the use of wood as an energy source has been promoted, because burning wood instead of fossil fuel is considered to reduce emissions. Wood recycling is not promoted even though it is highly effective in saving resources and prolonging the storage cycle of carbon. Contributions by sustainable forestry are not considered either, although the changes in carbon stock in forests are approach-

$$D=\Delta C_F=NEE-H$$

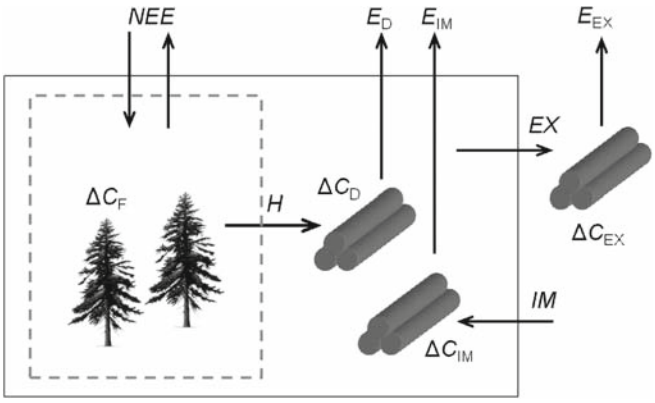

Fig. 2. The default approach (*D*). The *dashed lines* indicate the system boundary of the default approach

$$AF=\Delta C_F+\Delta C_D+\Delta C_{IM}-IM+EX=NEE-E_D-E_{IM}$$

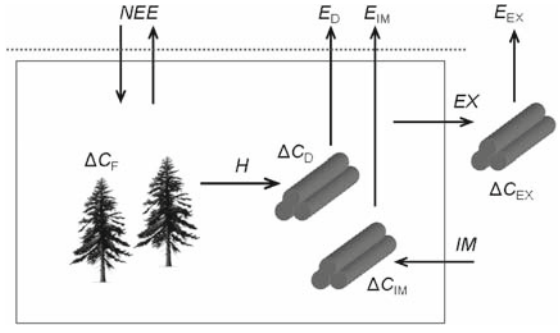

Fig. 3. The atmospheric flow approach (*AF*). The *dotted lines* indicate the system boundary of the approach

ing zero ($\Delta C_F = 0$) in the steady state, but wood is continuously produced ($H > 0$).

Discussions on the atmospheric approach

The atmospheric flow approach (see Fig. 3) estimates the carbon absorption/emission of forests and wood utilization in a country. This approach assigns the carbon absorption score to the country where the forest grows. Thus, it assumes that the carbon emitted by using wood, which is carbon neutral, is the same as that from fossil fuels, which is not carbon neutral. Thus, under this approach, carbon emissions are considered to be smaller from fossil fuels than from wood because the latter is less energy efficient than the former.

Because increases in carbon stock by importing wood cannot exceed the amount of imported wood ($IM > \Delta C_{IM}$), the approach does not give any incentive to use imported wood. Importing sawn wood and paper is more advantageous than importing raw timber because emissions from residuals and black liquor are assigned to the exporting country. The timber industry, which imports timber and produces residuals, is considered to emit carbon. Because exporting timber counts as carbon absorption, this approach may encourage countries to destroy forests for export as timber.

$$P=\Delta C_F+\Delta C_D+\Delta C_{EX}=NEE-E_D-E_{EX}$$

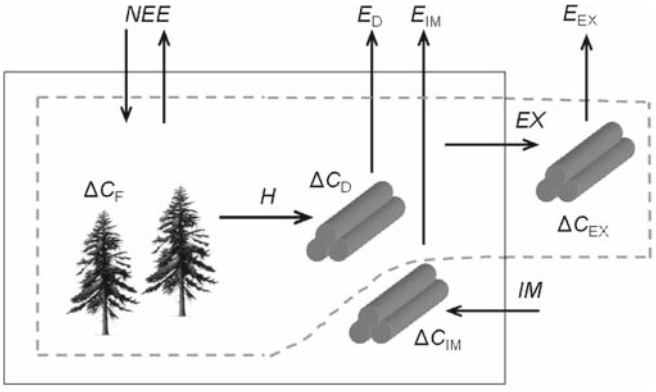

Fig. 4. The production approach (*P*). The *dashed lines* indicate the system boundary of the approach

Discussions on the production approach

The production approach (see Fig. 4) does not count changes in carbon stock from imported wood. Thus, it gives no incentive to countries having few forest resources to increase the use of wood and does not lead to greater worldwide use of wood. It is difficult to separate imported wood from domestic wood in the data used as the basis of reporting. The usage of wood is unknown and the results of calculations are not reliable. Exporting countries cannot control the use of wood in imported countries, and there is no relationship between the political responsibility of a country and the assessment received.

This approach is not in keeping with the spirit of the Kyoto Protocol, which mentions that efforts should be correctly evaluated, because the person who most contributes to increasing the carbon stock should be the final user who selects wood products. Some consider that carbon is absorbed in the country that exports wood, but the idea of using wood resources is that consumption of wood promotes the production of wood. It is important to understand that forests not used for wood production will someday mature and will no longer absorb any carbon. Because points for increasing carbon stock are assigned to exporting countries, this approach does not prevent forest destruction for timber production.

Discussions on the stock change approach

The stock change approach (see Fig. 5) gives incentives to countries that have few forest resources and need to import

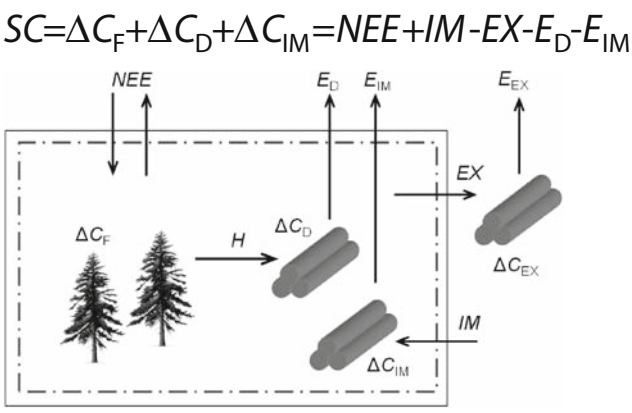

Fig. 5. The stock change approach (*SC*). The *chained lines* indicate the system boundary of the approach

wood to actively use wood and to increase carbon stock in the form of wood products. It encourages the trading of wood and gives economic benefits to countries that have forest resources.

Increasing the economic value of forestry will suppress forest destruction, leading to increases in forested areas. Expansion of sustainable forestry will also reduce the pressure for cutting natural forests, which must be protected. On the other hand, this approach may accelerate excessive cutting of forests in developing countries that are not bound by reduction commitments today, and thus policies are needed to ensure appropriate forest management for long-term benefit, such as a forest authentication system in a broad sense.

Of the proposed three approaches, the stock change approach results in the smallest gap in assessment scores among parties and conveys a positive message to both wood industries and consumers who select wood products that they are helping to mitigate global warming. Because the assessment focuses on changes in stock, the use of wood as fuel is still carbon neutral. There will be an appropriate competitive relationship between recycling wood, which helps to conserve resources and to maintain the carbon stock, and using wood as fuel, and the two processes are expected to be in balance.

Roundtable conference on HWP accounting

Believing that HWP accounting has socio-economic importance and also affects wood-related industries and research organizations, the Global Environment Committee, chaired by Nobuaki Hattori of the Japan Wood Research Society (JWRS), decided to call for a roundtable conference on HWP and to solicit opinions.

Invitations to participate in the roundtable conference were sent to the following academic societies and industrial associations by Chairman Ohta of the JWRS: Architectural Institute of Japan (Global Environment Committee), The Japanese Forest Research Society, Japan Federation of Wood Industry Associations, Japan Plywood Manufacturers' Association, Japan Fiberboard and Particleboard Manufacturers' Association, Japan Paper Association, and Friends of the Earth Japan, an international environmental NGO.

Based on the results of two preliminary meetings, three roundtable conferences, and many unofficial discussions, the third roundtable conference held on November 26, 2008, adopted the opinions (Fig. 6) and announced the opinions at the following symposium. Many newspapers and journals[8–10] reported the roundtable conference and the opinions signed by the representatives were handed to the Director General of the Forestry Agency by Chairman Hattori.

Issues arising on the approaches to HWP accounting

The stock change approach, the production approach (including the simple decay approach), and the atmospheric flow approach are now proposed in AWG-KP for assessing the effects of increasing HWP on carbon stock. Unlike the default approach, these approaches assess the carbon stock in HWP. The approaches differ in terms of which country receives the credit for emissions reduction from traded wood materials; the approaches are the same when wood produced in one country is used within that country. For the entire globe, they yield the same evaluation results.

HWP accounting will change the international trade in wood products, which in turn will have an indirect impact on the forestry and wood industry of each country. HWP accounting is a very sensitive political matter because it is related to the economy of each country.

In brief, the atmospheric flow approach gives a strong incentive to export and a strong disincentive to import, the production approach gives an incentive to export, and the stock change approach gives an incentive to import. Incentives to export lower the trade price, and incentives to import raise the price. In general, because of the respective national benefits, exporting countries support the production approach or the atmospheric flow approach, and importing countries support the stock change approach.

To assess the effects of carbon stock in the form of wood, it is necessary to decide whether to assess wood in solid waste disposal sites on the same footing as wood used in buildings. Land filling is cheaper and easier than energy or material recycling but it does not reduce the consumption of fossil fuels or resources. Thus, it is not in accord with the spirit of the Kyoto Protocol, which states that efforts should be correctly evaluated, and increases in carbon stock by land filling should be not treated as emissions reduction.

To make matters even more complicated, two new approaches have been proposed by AWG-KP. One is a kind of simple decay (production) approach that ignores the carbon emission from the HWP stock that existed before the new commitment period starts. The other is also a kind of production approach; it takes into account only domestic (i.e., national) HWP stock and not exported HWP. However, neither approach can estimate the global wood carbon flow accurately.

Fig. 6. The opinions from the roundtable conference on "Harvested Wood Products"

Opinions

Promoting the sustainable use of wood for the benefit of the environment, economy and society

"Harvested Wood Products Accounting" for the post Kyoto Protocol period

We have held roundtable conferences and discussed "Harvested Wood Products Accounting" in the Framework Convention on Climate Change. As the Chair, I hereby summarize our opinions and conclusions.

The default approach is being used for the first commitment period (2008 to 2012) of the Kyoto Protocol. The approach assumes that carbon dioxide absorbed by forests is emitted when the trees are harvested, but does not evaluate the effects of carbon stock in harvested wood products.

To reduce the carbon dioxide concentration in the atmosphere, the stock of sound forests should be increased worldwide, and the amount of carbon stock in wood buildings, wooden materials, and other wood products including paper should be increased by prolonging the life of produced wood and recycling wood materials. It is also effective to reduce the consumption of fossil fuels by appropriately promoting the use of wood biomass energy and wood products that require less energy to produce instead of products that require much greater energy.

Wood produced by sustainable forestry is carbon neutral and inexhaustible. However, forest resources are unevenly distributed. To increase the worldwide presence of wood resources, measures are needed to encourage all parties to increase the economic importance of forestry in countries that have forest resources by reinvesting in forests and evaluating carbon stocks in harvested wood products in wood-consuming countries.

The accounting approach should be revised for the next commitment period (from 2013) to evaluate harvested wood products and promote sustainable forestry, the independence of wood resources and the circulation of wood by giving top priority to the worldwide benefits. The majority of the member parties accepted the view that the stock change approach should be adopted to promote the use of wood that is environmentally, economically, and socially sustainable. It was also agreed that a system is needed for ensuring appropriate forest control in exporting developing countries to prevent excessive felling of trees.

We propose that this information should be announced to the public and be considered by the governmental organizations in charge of discussions at the Ad Hoc Working Group on Further Commitments for Annex I Parties under the Kyoto Protocol (AWG-KP) and on the framework of the next period.

November 26, 2008

HATTORI, Nobuaki
Chair
Roundtable conference on "Harvested Wood Products"

Conclusions

HWP issues are part of the overall forest sink and also are a small part of the reduction framework. But these issues are also related to humanity's future strategies for resource utilization.

When this article was written, problems such as the carbon reduction commitments of the developing countries had not been resolved; however, all such issues might have been settled when this article is published. Because global warming is a long-term issue to be resolved, the importance of wood utilization will remain into the distant future. We believe that the HWP accounting approach to be adopted should be the best one for promoting wood utilization around the world.

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