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Carbon binding and forest asset accounts

Jukka Muukkonen

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1. Introduction

Forests are one of the main greenhouse gas source and sink categories¹⁾ in reporting greenhouse gases according to the UN climate convention and the Kyoto protocol. The purpose of this issue paper is to provide some basic information for the discussion of the possible need to revise the SEEA2003 forest asset accounts with respect to carbon binding of forests.

Definitions, classifications and structure of asset accounts of the SEEA2003 are compared to those used in international handbooks and manuals on greenhouse gas inventory and reporting, such as Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories, IPCC Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories, IPCC Good Practice Guidance for LULUCF and UNFCCC Guidelines on annual inventories.

An updated version on IPCC Guidelines for National Greenhouse Gas Inventories will be published in the near future. Some changes to the previous version are expected, but they are not taken into account in this issue paper. Carbon binding of harvested wood products (HWP) will be included into the updated guidelines, but it is merely an issue of physical flow accounts of the SEEA than the asset accounts.

2. The main forest asset -related issues in greenhouse gas inventory

The main greenhouse gas (GHG) source and sink categories in the GHG inventory are:

1. Energy
2. Industrial processes
3. Solvent and other product use
4. Agriculture
5. Land use, land use change and forestry (LULUCF)
6. Waste
7. Other

Memo items: International bunkers, Multilateral operations and CO₂ emissions from biomass.

Of these the category 5. The Land use, land use change and forestry is sub-divided into Forest land, Cropland, Grassland, Wetlands, Settlements and Other land.

¹⁾ Sink: Any process, activity or mechanism removing a greenhouse gas, an aerosol or a precursor of a greenhouse gas from the atmosphere. Source: Any process or activity releasing a greenhouse gas, an aerosol or a precursor of a greenhouse gas into the atmosphere.

The Forest land consists of:

1. Forest land remaining forest land
 - 1.1. Managed (intensively/extensively)
 - 1.2. Natural, undisturbed
2. Land converted to forest land
 - 2.1. Managed (intensively/extensively)
 - 2.2. Natural, undisturbed

Forest Land Remaining Forest Land are forest areas which have been forests for at least 20 years. Land Converted to Forest Land are lands converted more recently to forests by natural or artificial regeneration, afforestation or reforestation. Converted areas are considered forest, if they correspond to definition of forest adopted by the country. Conversion status follows the converted land for 20 years.

The GHG reporting covers only managed forests. According to the definition, forest management is the process of planning and implementing practices for stewardship and use of the forest aimed at fulfilling relevant ecological, economic and social functions of the forests. Managed forests are subject to periodic or ongoing human interventions and they include the full range of management practices from commercial timber production to stewardship in non-commercial purposes. Division between intensively and extensively managed forest is a tool in defining conversion factors of carbon binding.

Carbon pools in the GHG inventory are Living Biomass, Dead Organic Matter and Soils. For these pools changes in carbon stock are calculated, N₂O and CH₄ emissions are calculated for forest fires, and N₂O emissions also for soil organic matter mineralization, nitrogen inputs and cultivation of organic soils.

For the forests the key entity is annual change in carbon stock, consisting of following elements:

Annual change in carbon stocks =

- + **Annual change in carbon stocks in living biomass** =
 - + Increase due to biomass growth
 - Above ground biomass increment (stem, stump, branches, bark, seeds, foliage)
 - Below ground biomass increment (live roots)
 - Decrease due to biomass lost
 - Loss due to commercial fellings (extracted volume and fraction of biomass left to decay)
 - Loss due to fuelwood gathering
 - Other losses (due to disturbances)
- + **Annual change in carbon stocks in dead organic matter**
 - Change in carbon stock in dead wood (standing, lying in the ground, in the soil)
 - Change in carbon stock in litter (litterfall; leaves, twigs, small branches, fruits, flowers, bark, minus decomposition)
- + **Annual change in carbon stocks in soils**
 - Change in carbon stock of mineral soil (organic fraction)
 - Change in carbon stock of organic soil

The change in carbon stock is calculated separately for forest land remaining forest land and land converted to forest land. **Both living and dead biomass consist of biomass of trees** in greenhouse gas calculations.

3. *Connections between forest asset accounts and greenhouse gas inventory*

Forest land as a sink and source category of greenhouse gases has connections to SEEA2003 asset categories:

- EA.12 Soil resources,
- EA.141 Timber resources,
- EA.22 Agricultural land and associated surface water,
- EA.23 Wooded land and associated surface water,
- EA.31 Terrestrial ecosystems,
- EA.33 Atmospheric systems, and intangible assets such as
- AN.2221 Transferable licences and concessions for the exploitation of natural resources and AN.2222 Tradable permits allowing the emission of residuals.

Of these asset categories, timber resources and wooded land are rather directly linked to GHG inventory system. Timber forms an essential part of living tree biomass, and both mineral and organic soil of wooded land are sinks and sources of carbon.

In the SEEA2003 forest asset accounts availability for timber supply and authenticity or naturalness (natural, semi-natural, plantations) were used as basic classification principles. Division between managed and natural forests in the GHG inventory do not correspond to SEEA2003 availability/non availability for wood supply, because by definition management is not restricted to timber harvesting or other forestry measures. A closer correspondence can be seen in the natural/semi-natural/plantations -division: intensively managed forests equal to plantations, extensively managed to semi-natural forests, and natural to undisturbed forests in GHG inventory.

The SEEA2003 also uses classifications according to predominant tree types and eco-floristic zones in forest asset accounts. In the greenhouse gas inventory those classifications are used in defining conversion factors to different forest types in order to promote internationally valid and comparable calculation methods for the forestry sector.

In the SEEA2003, a generic asset account for a physical asset is formulated as:

- Opening stock levels
 - Increases in stock
 - Due to economic activity
 - Due to regular natural process
 - Decrease in stock
 - Due to economic activity
 - Due to regular natural process
 - Due to natural disaster (net decrease)
 - Changes due to economic classifications
- Closing stock levels

This general model has been adapted to both forest land accounts and timber accounts. In the greenhouse gas inventory the structure of changes in carbon stocks -calculation formula is to great extent similar than in the SEEA2003. The main differences are, that the SEEA only takes into account timber, when the whole tree biomass divided into living and dead biomass, and carbon in soils are included into the greenhouse gas calculations.

4. Conclusions and questions for discussion

The importance of forests as source and sink of greenhouse gases is increasing. Changes in carbon stock of tree biomass and forest soils, as calculated in the greenhouse gas inventory system take into account annual release and removal of greenhouse gases of forests by natural processes and/or human activity. Timber is one element in the sink and source function of forests; rest of tree biomass and forest soil are the other ones.

One of the questions for discussion is, whether the accounts for timber should be expanded to accounts for tree biomass in the SEEA? The main practise in the GHG calculations seems to be, that the starting point is biomass of timber, and conversion factors are used to expand the change in timber biomass to change in total tree biomass.

An other question concerns the classification of forests in the SEEA. **Would the division 'managed and natural, undisturbed forests' be more useful than the present SEEA division 'available / not available for wood supply'?** In the GHG inventory, countries have their own practises in making the distinction between managed and natural, undisturbed forests. Availability/non-availability for wood supply is not necessarily main factor in these country practices.

The direct economic importance of forests as a sink of greenhouse gases is changing due to e.g. emission trade arrangements. Thanks to GHG inventory system, data availability on physical carbon balances of both trees and forest soils has increased. The third question is on monetary valuation of forest assets: **Should valuation of total tree biomass (trees) and forest soils have an equal position with valuation of timber in the SEEA?** This would bring the present 'timber asset accounts' closer to the 'forest accounts', including carbon binding as an essential environmental service provided by forest assets.