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Some Key Issues in Revising the SEEA Forest Accounts

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Contents

1. Classifications

2. Monetary accounts for forest assets

3. Non-timber benefits provided by forests

ANNEXES:

Classifications used in forest accounts

A review on forest–related parts of chapter 7. and 8. of the SEEA 2003

1. Classifications

The SEEA 2003 includes eight classifications concerning forest asset accounts. Two of these are general classifications on all environmental assets in the SNA context and in the SEEA context. One classification is focused on wooded land and four classifications on forested land (forests). One classification combining three classifications of forested land is presented as alternative hierarchy for classifying forested land. Classifications on wooded land and forested land are taken from international forest statistics and forest accounting of the European Union.

Classifications concerning forest assets:

- Environmental assets within the 1993 SNA
- SEEA asset classification.
- Wooded land by cover type
- Forested land by timber availability (availability for wood supply)
- Forested land according to authenticity or naturalness
- Forested land according to predominant tree types
- Forested land by ecofloristic zones
- Alternative hierarchy for forested land:
  Forested land by timber availability, naturalness and tree types

In addition to these classifications, two supporting international classifications are used: IUCN classification on protection status of forested land and CPC - classification of products adapted to non-timber products of forests.

From the point of view of economic accounting, the SNA environmental assets, SEEA assets and timber availability are the most important starting points for forest asset accounts. Tree types are also of importance, because information by tree types is necessary for valuation of timber.

Classification according to naturalness of forests (natural/semi-natural/plantations) brings an important environmental dimension to forest asset accounting. It can rather directly be linked to SNA and SEEA asset classifications. Ecofloristic zones and predominant tree types represent to some extent environmental and ecosystem approach to forest asset accounts, and even give some basic information on biodiversity related to forest assets.

Every classification used in the SEEA 2003 forest accounting has some advantages in connecting economic and environmental dimensions of forest resources. However, the amount of classifications presented and used might be to high to international standard of forest accounting and lead to very complicated system of categories, sub-categories and links between classifications.

SNA and SEEA asset classifications form clear framework for forest asset accounts. With respect to this framework, issues to be discussed at this stage of the revision process of the SEEA are:

- Is the alternative hierarchy for forested land by timber availability, naturalness and tree types applicable, theoretically sound and practical for standard of forest asset accounts?

- What would be adequate level of sub-categories presented in classifications of forested land and in balance sheets for forests?

- Should some classifications (e.g. forested land by ecofloristic zones and by protection status) be treated as 'supplementary' classifications in standard of forest accounts?

- How should semi-natural managed forests be recorded in proposed asset classification of the SNA revision? In the present SNA, growth of timber in semi-natural managed forests can be recorded as 'Work in progress on cultivated assets', and at the same time these forest assets can be recorded as 'Non-cultivated biological resources' under the category 'Non-produced assets'.

2. Monetary accounts of forest assets

Monetary valuation of forest assets is an important part of national accounting in countries where forests play an important role in the country's economy. Valuation is focused on timber, because data availability on stocks and flows of timber resources are relatively well known, and data on timber prices exist or can be estimated on the basis of e.g. statistics on foreign trade. Also alternative methodologies for valuation of timber assets exist, and have been applied in several countries.

Valuation of non-wood products and services provided by forest ecosystems are still more at experimental level, and the value of these products and services are usually not reflected in the value of forest assets. Although the flows and monetary value of non-wood products are often well known or can be estimated, information on stocks of non-wood products is inadequate. Importance of non-timber products and services is also different in different countries, for example protective functions of forests against avalanches are crucial for some countries but only marginal for some others.

Biodiversity of forest ecosystems is only weakly linked to value of forests with the value of tree species, that can be felled and turned into timber flows whose economic value can be measured or estimated. Biodiversity as a an existing and future basis of environmental, social and economic benefits from forest ecosystems is usually not included into monetary value of forest assets.

In the revision process of the SEEA, valuation of standing timber and some non-timber products seems to be areas with best possibilities in achieving international standard. Non-timber products consist mainly on food (game, berries etc.), medicines, fodder/forage for animal breeding, industrial extracts (cork, rubber et.) and forest animals as agricultural products (wild boar, reindeer, etc.).

Valuation methods for timber presented in the SEEA 2003 offer a good starting point for the revision. Stumpage value method, consumption value method, simple net present value method and net present value method allowing for management costs are acceptable for the SNA, and they are also tested and used in several countries. Market prices or estimates based on market prices can be used for non-timber products.

3. Non-timber benefits provided by forests

The SEEA 2003 presents some supplementary tables whose compilation may be useful when wooded land is being studied in depth. The topics covered are:
- Ecofloristic zones
- Protection status (protected (IUCN)/non-protected)
- Carbon binding
- Age structure of forests
- Forest health
- Biodiversity and ecosystems
- Non-timber services.

Of these topics carbon binding, biodiversity and non-timber services of forests might be the most important ones to be included into the revision of the SEEA forest accounts. Both physical and monetary accounts are possible for carbon binding. In biodiversity and non-timber services physical accounting is a more practical approach than monetary, because valuation methods fully compatible with the SNA are not as developed as e.g. in timber accounts, and statistics on value of biodiversity and non-timber services are rarely available.

Physical information plays a very important role in showing the importance of forest assets and benefits provided by them, even if they can not be directly reflected in national accounting. Physical accounts on forest-related products, services and benefits are one basic tool to provide and disseminate information on forest assets, their use and relations between different uses and benefits provided by forest.

For applications and policy uses of the SEEA, it would be of importance to develop tables and other presentation forms (e.g. indicators), in which monetary and physical information on forests can be presented together in a condensed form.

ANNEX 1. Classifications used in forest accounts

ENVIRONMENTAL ASSETS WITHIN THE 1993 SNA
    AN.1 Produced assets
        AN.11 Fixed assets
            AN.111 Tangible fixed assets
                AN.1114 Cultivated assets
                    AN.11142 **Vineyards, orchards and other plantations**
        AN.12 Inventories
            AN.122 Work in progress
                AN.1221 **Work in progress on cultivated assets**
    AN.2 Non-produced assets
        AN.21 Tangible non-produced assets
            AN.211 Land
                AN.2112 **Land under cultivation**
                AN.2113 **Recreational land and associated surface water**
                AN.2119 **Other land and associated surface water**
            AN.213 **Non-cultivated biological resources**

SEEA ASSET CLASSIFICATION
    EA.1 Natural resources
        EA.14 Biological resources
            EA.141 **Timber resources**
            EA.142 **Crop and plant resources, other than timber**
            EA.144 **Animal resources, other than aquatic**
    EA.2 Land and surface water (hectares)
        EA.23 **Wooded land and associated surface water**
    EA.3 Ecosystems
        EA.31 **Terrestrial ecosystems**
Memorandum items: Intangible assets related to environmental issues (extended SNA codes)

WOODED LAND BY COVER TYPE
    Forested land (Forests)
    Other wooded land

FORESTED LAND BY TIMBER AVAILABILITY
    Available for wood supply
    Not available for wood supply
        strictly protected
        under economic restrictions

FORESTED LAND ACCORDING TO AUTHENTICITY OR NATURALNESS
    Natural forests
    Semi-natural managed forests
    Plantations

FORESTED LAND ACCORDING TO PREDOMINANT TREE TYPES
    Coniferous, Broadleaved, Bamboo, Palms, Mixed tree types
    sub-categories e.g. by tree species

FORESTED LAND BY ECOFLORISTIC ZONES
    Tropical forests, Dry (Mediterranean-type) forests,
    Temperate forests, Boreal forests
        sub-categories e.g. by altitude range or moisture

A HIERARCHY FOR CLASSIFYING FORESTED LAND, THAT IS ALTERNATIVE
TO THE STANDARD SEEA CLASSIFICATION

```
Forests
    Forests available for wood supply
      Natural forests
            Coniferous
            Broad-leaved
            Bamboo, palms etc.
            Mixed forests
      Semi-natural forests
            Coniferous
            Broad-leaved
            Bamboo, palms etc.
            Mixed forests
      Plantations
            Coniferous
            Broad-leaved
            Bamboo, palms etc.
            Mixed forests
    Forests not available for wood production
      Strictly protected
            Coniferous
            Broad-leaved
            Bamboo, palms etc.
            Mixed forests
      Under economic restrictions
            Coniferous
            Broad-leaved
            Bamboo, palms etc.
            Mixed forests
Other wooded land
```

IUCN CLASSIFICATION OF PROTECTION STATUS FOR FORESTED LAND

I. Scientific reserves and strict nature reserves
II. National and provincial parks
**III. Natural monuments and natural landmarks containing unique geologic
formations, special animals or plants or unusual habitats**
**IV. Managed nature reserves and wildlife sanctuaries protected for specific
purposes** (e.g. conservation of significant plant or animal species)
**V. Protected landscapes and seascapes, which may be entirely natural or include
cultural landscapes** (e.g. agricultural areas)

ANNEX 2. A review on forest–related parts of chapter 7. and 8. of the SEEA 2003

The basic aim of the SEEA accounting system is to show how natural resources and ecosystem inputs are drawn into the economy, and how products and residuals are generated.

Chapter 7 of the SEEA:

- is mainly theoretical and draws significantly on the economic accounting system of the SNA.
- turns attention to the use of natural resources and ecosystem inputs in order to assess whether the stocks of these assets are being persistently depleted or degraded.
- addresses both the physical measures and monetary valuation of the depletion of natural resources.
- concentrates on establishing valuations that are consistent with market prices as currently observed.

The SEEA accounts are seen as an extension of those of the SNA. It is necessary to exam the relationship between the asset classification in the SNA and that proposed here for the SEEA. Different perspectives can be taken depending on whether the interest is in physical measures of assets or their monetary valuation.

When looking at how changes in assets are incorporated in monetary accounts, **it is necessary to make a clear distinction between those assets that are regarded as being "produced" (come into existence as products resulting from economic production) and those that are "non-produced" (occur as a result of purely natural processes).**

In the SNA, an asset – even an environmental asset – is defined in terms of the "benefit" as limited to the provision of income or a stock of wealth that can be converted to monetary terms.

Use benefits include both direct and indirect benefits.

Direct use benefits include the use of environmental assets as sources of materials, energy or space for input into human activities.
Indirect use benefits do not change the physical characteristics of the environment and are sometimes described as "non-consumptive"

Use benefits also include option and bequest benefits.

Option benefits are those derived from the continued existence of elements of the environment that may one day provide benefits for those currently living.
Bequest benefits are also derived from the continued existence of elements of the environment because they may one day provide benefits for those yet to be born.

In addition to these use benefits, an environmental entity may simply have an *existence benefit*.

The **inclusion of option, bequest and existence benefits effectively broadens the scope of the SEEA asset boundary to include all land and natural resources.** In addition, **ecosystems are included in the SEEA asset boundary on the grounds that they provide a variety of services that bring indirect use benefits to humans.**

While the SEEA asset boundary is in principle very broad, for practical reasons the environmental accounts actually compiled in any one nation will be much narrower.

The SNA is unambiguous about how assets are to be measured. If at all possible, market prices are to be used. This is usually possible for produced assets and for land. When market prices do not exist, **the next choice is to estimate the net present value of future benefits accruing from holding or using the asset.** Economic theory asserts that this is in fact how market prices of assets, are determined. **If there are no market prices and it is not possible to calculate the net present value of an asset, then the cost of producing it may be used as a lower bound of its value.**

This box provides formulae for the **valuation of standing timber**. In each case the value is a product of the area of the forest A), with the quantity of the timber in terms of cubic metres per hectare (Q) and the average stumpage price per cubic metre (p).

Stumpage value method

This is the simplest formulation; no discrimination is made for the age of the timber at the valuation date.

The value of standing timber, $\underline{S = ApQ}$

Consumption value method

The consumption value method requires data for different age classes from 1 to $\underline{n}$. The area, quantity and price for timber of age t are shown by a subscript t.

The value of the stock of standing timber, $S = \sum_{t=1}^{n} A_t p_t Q_t$

Simple net present value method

In the simple version of the net present value method only receipts from harvesting mature timber are included; other receipts (from thinning) and costs are ignored. It is assumed the receipts are realized only when the timber reaches maturity at age $\underline{T}$. At this point, the price realized and quantity to be harvested have subscript $\underline{T}$. To reach the net present value, discounting using a discount rate of $\underline{r}$ for each of the (T-t) years until harvest must be applied.

the value of standing timber, $S = \sum_{t=1}^{n} \frac{A_t p_T Q_T}{(1+r)^{T-t}}$

Allowing for management costs

Suppose information on the management costs per hectare is available. This might be in the form of a simple average, $\underline{c}$, for the whole forest, or more refined information showing the costs for trees of a given age, $\underline{c_t}$, might be available.

The total costs under the net present value method is $\sum_{t=1}^{n} \frac{A_t c_T}{(1+r)^{T-t}}$

This, if available, needs to be deducted from the formulae for S given above.

If estimates of the revenue from thinnings are available, additions to the value of the standing timber can be made to each of the formulae in a similar way:

$$S = \sum_{t=1}^{n} \frac{A_t (p_T Q_T + s_T)}{(1+r)^{T-t}}$$

Section D presents accounts for wooded land, timber and forest products. Timber reserves are one category of biological resources. While it is useful and practicable to construct accounts for timber, it is more informative to look at the total value of forested land, paying attention to the timber, the land on which it grows, and other forms of ecosystems supported by the forests.

Most timber comes from forested land but some wooded land lies outside forested areas. Specific accounts are usually compiled in respect of forests but include the consequences for forested land and forest products also. Timber from other wooded land may or may not be included, depending on the circumstances. **Forests exist both as produced assets (cultivated or plantation forests) and as non-produced assets (non-cultivated or natural forests). These categories may re-semble one another very closely, hence it is not always easy to distinguish one from the other. It is important to develop accounts that make the distinction apparent and may allow for cases where an alternative view is possible on whether the extent of human intervention is sufficient to be classified as "culti-vation" or not.**

Physical accounts for forests make this distinction and also usually spell out the types of tree species involved: whether they are broad-leaved trees yielding hard-wood or conifers yielding softwood. Other aspects of forests are also regularly documented in physical accounts, for example, the age structure of the forest which determines the time until maturity of the standing timber. In addition, **information pertaining to other aspects of forests (such as by-products in the form of wild animals and fruit, and the change in biodiversity) is often presented in connec-tion with timber-related accounts for forests. Forests also provide environ-mental services including carbon sequestration.**

The standard SEEA asset classification divides wooded land and associated surface water (EA.23) first into cultivated and non-cultivated forested land. Non-cultivated forested land may be further subdivided between those previously harvested and virgin forested land. A country may develop a more extensive classi-fication when forestry is an important industry and forested land an important type of land cover.

- **Wooded land** is divided first between forests and other wooded land. Both categories exclude land predominantly used for agricultural purposes.

  - **Forested land** is defined as land with tree crown cover (or equivalent stocking level) of more than 10 per cent and an area of more than 0.5 ha.
  - **Other wooded land** is defined as land with a tree crown cover (or equiva-lent stocking level) of either 5-10 per cent of trees able to reach a height at least five metres at maturity in situ or a crown cover of more than 10 per cent of trees not able to reach a height of five metres at maturity in situ

In the next stage, forested land is subdivided according to its availability for wood supply.

- **Forested land available for wood supply** covers areas where legal, economic or environmental restrictions do not have a significant impact on the supply of wood.
- **Forested land not available for wood supply** includes areas where legal, eco-nomic or environmental restrictions prevent any significant wood production.

Forested land available for wood production can be further subdivided according to the authenticity or naturalness of the forest. The FAO classification of forests comprises:

- **Natural forests:** forests with natural species and ecological processes and for which there has been continuity of ecological processes over a very long period of time.
- **Semi-natural managed forests:** forests in which management has substantially altered the structure and ecological processes but in which growth is still mainly a natural process with no regular and continuous human intervention.
- **Plantations:** forests for intensive fuel or industrial wood production, planted or artificially regenerated and made up of exotic (non-indigenous) species and/or monocultures.

Definition of natural forests in the FAO classification is very close to that in the SNA. Timber in natural forests is clearly non-cultivated and **plantations are cultivated according to the SNA definition. Natural and cultivated aspects are mixed in semi-natural forests**, since management does not necessarily substantially alter the ecological processes or end the continuity of those processes of the forests. **According to the more stringent definition of cultivated biological assets proposed in chapter VII for use in both the SEEA and the SNA, most semi-natural forests would be classified as non-cultivated in both systems.** This is the assumption made in the remainder of this subsection.

Forested land not available for wood production can be further subdivided into areas that are **strictly protected** (IUCN classes I and II) and **forested land under economic restrictions**.

Forests can also be classified on the basis of predominant tree types: coniferous (class Gymnospermae*),* **broadleaved** (class angiospermae), **bamboo** (family Graminae) and **palms** (family Arecaceae). Forests are assigned to these categories if more than 75 per cent of the tree crown cover consists of the tree species mentioned. In **mixed forests**, none of the species groups accounts for more than 75 per cent of the tree crown area.

TBFRA-2000 (United Nations, Economic Commission for Europe, and Food and Agriculture Organization of the United Nations, 2000) introduces a specific category for **trees outside the forest**, that is, trees on land other than wooded land:.

- Trees on area less than 0.5 hectares and the width is less than 20 metres;
- Scattered trees in permanent meadows and pastures;
- Permanent tree crops such as fruit tree orchards and coconut palm plantations;
- Trees in parks and gardens, around buildings, in hedgerows and in a line along streets, roads, rivers, streams and canals;
- Trees in shelter belts and windbreaks of less than 20 metres in width and 0.5 hectares in area.

A hierarchy for classifying forested land, that is alternative to the standard SEEA classification

```
Forests
     Forests available for wood supply
        Natural forests
               Coniferous
               Broad-leaved
               Bamboo, palms etc.
               Mixed forests
        Semi-natural forests
               Coniferous
               Broad-leaved
               Bamboo, palms etc.
               Mixed forests
        Plantations
               Coniferous
               Broad-leaved
               Bamboo, palms etc.
               Mixed forests
     Forests not available for wood production
        Strictly protected
               Coniferous
               Broad-leaved
               Bamboo, palms etc.
               Mixed forests
        Under economic restrictions
               Coniferous
               Broad-leaved
               Bamboo, palms etc.
               Mixed forests
Other wooded land
```

Since the characteristics of forests have been used to classify wooded land, it is not surprising that the classification for timber is similar. **The accounts focus on timber in forests available for wood supply. However, accounts for timber in strictly protected areas and in areas under economic restrictions are also very important and should be shown separately,** since the possibility for changes in economic restrictions may affect the availability for wood supply. It is assumed here that only non-cultivated forests occur in strictly protected areas or in areas under economic restrictions.

It is desirable to have asset accounts for timber disaggregated by institutional sector (for example, government and private enterprises) but this is possible only if the basic data for these sectors are available. Forest land area by ownership category may often be available, but timber volumes, changes therein and actual market prices by the same categories can be derived only from area and statistics on timber resources. At least the main elements of monetary timber balances (opening stock, fellings, closing stock) should be presented (as estimates of shares of the totals, if necessary) by ownership (private and public).

As well as the fellings harvested, **there are non-wood products that should be estimated for a full accounting of the environmental yield of a forest.** Non-wood products for own consumption and industrial uses are grouped as:

- Food (game, berries, fruits, mushrooms, nuts, palm oil, honey, etc.);
- Medicines;
- Fodder/forage for animal breeding;
- Industrial extracts (cork, rubber, gum, tar, chemicals);
- Forest animals as agricultural products (wild boar, reindeer, etc.).

The ISIC industry forestry and logging includes silviculture, forest improvement and logging activities. This should be included in the data in the SNA for forestry and logging. Costs of environmentally sound forestry and logging methods that aim, for example, at improving biodiversity and ensuring the possibility of multiple forest uses should be separated from conventional forest management and recorded as a subcategory of expenditures

Expenditures on forest protection include conservation of protected forests (according to IUCN categories) and costs of environmental protection activities such as the prevention of forest degradation and pollution, and the restoration and reparation of forests. Restoration and reparation costs should be separated from the cost of forestry and logging purely for purposes of wood production. Actual expenditures may represent new investments or maintenance costs. Costs should be split not only by industry but also between the public and private sectors.

Some supplementary tables whose compilation may be useful when wooded land is being studied in depth. The topics covered are:

- Ecofloristic zones

- Protection status (protected (IUCN)/non-protected)

- Carbon binding

- Age structure of forests

- Forest health

- Biodiversity and ecosystems

- Non-wood services.