

Measuring progress of the forest sector towards a Green Economy: some proposals

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Introduction

The Action Plan for the forest sector in a green economy, expected to be adopted at the Joint Session of the ECE Committee on Forests and the Forest Industry and the FAO European Forestry Commission in Rovaniemi in December 2013, proposes a wide range of possible actions. When putting in place ambitious plans, it is wise to foresee how progress in achieving them should be measured. Indeed, two of the Action Plan proposals address the measurement of progress towards the green economy: *Develop the forest sector's contribution to broader green economy indicator data sets* (E.2.3) and *Monitor green economy developments in the ECE region forest sector* (E.5.1). The Integrated Programme of Work tabled for the joint session also addresses monitoring and assessment of the Action Plan (para. 12).

The debate will give preliminary consideration to the conceptual and practical challenges involved in measuring progress of the forest sector towards a green economy. This paper lays out, as a stimulus to discussion, some preliminary ideas on measurement of this progress. The three questions for the panel are:

- How do we measure the “greenness” of the forest sector today? / What is the state of art in measuring the progress of the forest sector towards green economy?
- What are the gaps? / What is still needed to enable a more thorough measurement of this progress?
- What are the priorities that should be addressed in the UNECE/FAO Integrated Programme of Work of in this space/regard?

This paper provides background information and ideas on answers to these questions, for the consideration of participants. It has been prepared at the request of the UNECE/FAO Forest and Timber Section, but it is the responsibility of the author and is not the formal position of the Section, or of the Committee and Commission it serves.

This paper does not address the question of monitoring the implementation of the Action Plan, which is a separate issue.

Background

The concepts underlying the green economy

The green economy concept, which applies to the whole of society, not just the forest sector, takes its starting point in a new approach to values and governance, which can be summarised as the incorporation of “green” values, notably as regards sustainability, biodiversity and social inclusiveness, into the existing methods and concepts of the traditional economy, mostly articulated until now in terms of monetary values and markets. The green economy approach has been difficult to define in practice but certainly includes:

- integration of externalities into decision making (“payment for ecosystem services” and “green national accounts” are part of this),
- efficient use of all resources: not just the traditional production factors (capital, labour and land), but also raw materials, energy, carbon and ecosystems,
- sustainability over time,
- social balance.

This list, although it is not officially adopted, is used as a framework for the suggestions in this paper.

It should be stressed that a holistic approach is necessary when measuring progress of the forest sector towards a green economy, as the objective is to measure not only progress inside the sector, but also, perhaps above all, the contribution made by the sector to wide green economy goals, such as a low carbon economy, efficient resource use or renewable energies. There are complex tradeoffs for instance between carbon storage and wood energy, where it is not always easy to say what is the “right” direction to follow. This should be taken into account when deciding what constitutes “progress towards a green economy”.

Measuring progress towards a green economy is not the same as assessing sustainable forest management, so will require different tools.

The core concepts of sustainable forest management are balance between the different components, and the time element (see for instance the definition in Resolution H1 of the MCPFE).

The forest sector has invested a lot in measuring sustainable forest management, and achieved results which are useful and relevant: see for instance the series of reports on the State of Europe’s Forests, each of which has been an improvement on its predecessor, and the ongoing work on assessing the sustainability of forest management. However, many green economy dimensions, for instance efficiency of resource use, integration of externalities and social balance, are not fully addressed while measuring sustainable forest management, and some SFM concepts are approached in a highly focused way which is difficult to link to broader green economy questions. Therefore, some, but not all, of the approaches and data for measuring sustainable forest management may be useful in measuring progress towards the green economy and some of the SFM data may have to be reinterpreted and put into a different context.

Approach used in this paper

There appear to be two broad approaches possible in deciding how to measure progress of the forest sector towards a green economy. These might be summarised as follows:

- Start from forest sector work on the green economy, notably the Action Plan, identify which of the aspects/actions included can be measured, and base a measurement system on this.
- Take broader indicator sets for the green economy and see to what extent they can be applied to a specific sector¹.

This paper attempts both of these approaches and then tries to combine them into an approach which might provide a framework for measuring progress of the forest sector towards a green economy.

What questions should a measurement system try to answer?

The measurement system, when in place, should aim to answer the following questions:

- How much, and in what way, is the forest sector contributing to the green economy?
- How “green” is the forest sector? Is the forest sector becoming more “green”? Which parts of the sector (by country and activity) are more “green” and which less “green”?
- In which countries is the forest sector best integrated in (making the most contribution to) the green economy?
- How “green” is the forest sector compared to other (competing) sectors?

Whatever system is put in place to measure progress of the forest sector towards a green economy will have long term consequences as measuring a phenomenon – especially if that phenomenon is not very clearly defined – helps to clarify and communicate the concepts. An example is the creation of sets of criteria and indicators of sustainable forest management, which have gone well beyond the formal definitions (e.g. Helsinki MCPFE Resolution H1) to demonstrate what is really meant by sustainable forest management.

Two approaches to measuring progress of the forest sector towards a green economy

Measurement based on the Action Plan

The Action Plan has eight “principles” in the preamble and five “pillars” (see comparative table in Annex 1). Combining them leads to the following five headings to structure the measurement of the progress of the forest sector towards a green economy:

- Sustainable and efficient use of natural resources;
- Low carbon forest sector (e.g. contribution to mitigation of, and adaptation to, climate change);
- Sustainability of the work force;
- Integration of externalities and payment for ecosystem services;
- Good governance and evidence based decision making.

¹ Ideally it would be desirable to have the same set of green economy indicators for all materials or sectors, which would make it possible to compare and contrast sectors. Experience with life cycle assessment (LCA) has shown how difficult that is.

Annex 2, organised under these five headings, and based on the proposals of the Action Plan as well as experience with indicators of sustainable forest management, presents a list of possible indicators to measure the forest sector progress towards a green economy. This is a comprehensive list of all possibilities, and certainly too long and complex for practical use. It is intended to spark discussion and show potential.

Measurements based on broader green economy indicator sets and concepts

Many international organisations have assembled list of green economy indicators, each of which focuses on the areas covered by the organisation which generated it. A recent study by the Green Growth Knowledge Platform, a partnership including the Global Green Growth Institute, OECD, UNEP and the World Bank, surveys these sets and summarises their main characteristics²

Annex 3 presents some of the indicators used by OECD, UNEP and the World Bank for the green economy as a whole which might be adapted for use at the level of the forest sector.

Suggested approach to measuring progress of the forest sector towards a green economy

On the basis of the analysis summarised above, an approach has been developed which might be used, after appropriate discussion, review and modification, as a framework to measure the progress of the forest sector towards a green economy.

Six main areas of measurement

It is proposed that the measurement system be structured around six main areas, which are summarised below, with some explanatory justification.

1. **Conservation of forest natural capital.** The conservation over time of the forest capital has always been at the heart of the concept of sustainable forest management, and is monitored by existing systems of criteria and indicators of sustainable forest management. This aspect will not lose importance in a green economy, and must continue to be measured. However, in the emerging green economy, this centuries old forestry concept will need to be expressed in terms which are understood by and compatible with emerging green accounting systems (see next section). The expression of the value of the forest natural capital in monetary terms should include not only wood stocks and flows but also the value of the non-market functions, and any increase or reduction in the forest's capacity to supply them. This is well known to be a very challenging exercise.
2. **Multi factor productivity and efficient use of resources.** It is known that there is little waste in the forest industries, as residues are used for other products or for energy, and that recycling of paper and, increasingly, wood products, is widespread. However traditional analysis of the sector has focused on whether "enough" material is available, and less on how efficiently it is used. In a green economy, it will also be necessary to demonstrate the efficient use of all resources, notably wood, but also energy, labour and carbon.
3. **Contribution to climate change mitigation.** A green economy gives high priority to climate change mitigation, an area where the forest and forest products play an important and complex role, notably through carbon sequestration and storage, as well as substitution, for

² Moving towards a common approach on green growth indicators: a Green Growth Knowledge Platform scoping paper, April 2013.

non-renewable materials and energy sources. A “cascade” approach (using wood first as raw material, and only afterwards as energy source) is often advocated. However, at the national level, the forest sector contribution to climate change mitigation varies widely according to circumstances: extent of forests, increment/harvest balance, size and efficiency of wood processing industries, importance of renewable energy, consumption and recycling patterns etc. Furthermore this contribution can change over time, sometimes rapidly, for instance because of forest damage, market conditions or increased use of wood energy. The profile of each national contribution in this area should be described and any significant changes monitored.

4. ***Integration of externalities and payment for forest ecosystem services.*** Integration of externalities, and their correction through adapted market mechanisms, are essential parts of the green economy. There are many externalities in the forest sector, notably as regards the ecosystem services provided by forests, usually without any monetary compensation. However, systems are being developed and put in place for payment for forest ecosystem services. Quantification of these services and monitoring of efforts to correct them are essential to measure the forest sector’s contribution to the green economy.
5. ***Sustainability of the forest sector work force.*** The development of “decent green jobs” and reduction of social exclusion are part of all green economy strategies. The protection of the work force against occupational injuries and disease are part of this, as is appropriate education and training, enabling the work force to contribute to a green economy and address the new challenges which will emerge. High accident/injury rates and inadequate education and training would significantly hinder progress towards the green economy. Finally the creation or maintenance of “decent green jobs” as defined by ILO and mentioned in the Action Plan is an essential part of the green economy, and thus of the forest sector in a green economy.
6. ***Good governance and evidence based decision making.*** Good governance is an important part of the green economy. Although governance in the forest sector is already monitored in criteria and indicators of sustainable forest management, the profound changes necessary in methods and attitudes to move towards the green economy make it necessary to monitor how the sector is responding to the emerging governance challenges. In a very real sense, the green economy is based on changes in governance and decision making, using modified information input (e.g. corrected for externalities). Therefore the quality of governance should also be measured as part of the transition to a green economy.

Some indicators which might be used to measure progress of the forest sector towards the green economy

To stimulate discussion, and as an illustration of how measurement might be achieved, some indicators have been identified which might usefully be monitored to assess progress, at the national level, of the forest sector towards the green economy. The list below is an initial set of ideas, based on a combination of the approaches in annexes 1 and 2, structured according to the six areas outlined above. It is not a formal proposal, but an illustration of the type of indicators which might be useful.

For these indicators, the forest sector should be consistently divided into forest, wood products and pulp and paper.

Some indicators which might be used to measure progress of the forest sector, at the national level, towards the green economy

| | | Direction of "progress" ³ |
|----------|---|--|
| 1 | <i>Conservation of forest natural capital</i> | |
| 1.1 | Change in forest natural capital: physical parameters and monetary value of land and trees, adjusted for externalities and ecosystem services | Stability or increase |
| 2 | <i>Multi-factor productivity and efficient use of resources</i> | |
| 2.1 | Material productivity in the forest sector | Increase |
| 2.2 | Energy productivity in the forest sector ⁴ | Increase |
| 2.3 | Recovery rates for paper and wood products | Increase |
| 3 | <i>Contribution to climate change mitigation</i> | |
| 3.1 | Carbon stocks and flows in forest ecosystems and harvested wood products | Increase in stocks and decrease in net emissions |
| 3.2 | Share of wood energy in total primary energy supply | Increase ⁵ |
| 3.3 | A measure of substitution or cascaded use in the forest sector | Progress would be a relatively high share of use as raw material compared to use for energy, provided wastage was kept low |
| 4 | <i>Integration of externalities and payment for forest ecosystem services</i> | |
| 4.1 | Value of ecosystem services provided by forests | Increase |
| 4.2 | Systems in place for payment of ecosystem services: number of systems and total value of transactions | Increase |
| 4.3 | Value of forest related carbon markets | Increase |
| 5 | <i>Sustainability of the forest sector work force</i> | |
| 5.1 | Occupational safety and health of the forestry work force | Increase |
| 5.2 | Investment in education and training | Increase |
| 5.3 | Number of "decent green jobs" ⁶ in the forest sector (or share of decent green jobs in total employment by the forest sector) | Increase |

³ I.e. change in the direction indicated would constitute progress towards a green economy and change in the other direction would be movement away from the green economy. In many cases, there will be some maximum achievable level which should be defined, so "increase" would not be infinitely possible.

⁴ A distinction should be made between inputs of fossil energy and of renewable energy.

⁵ This requires further discussion and putting in context. Replacement of fossil fuel by sustainably produced wood energy is presumably "progress", but if the wood energy is not sustainably produced, or, possibly, substitutes for material uses of the same wood (against the "cascade use" principle), it might not be considered progress. However, it is clear that the use of wood for energy is important and should be monitored, and compared to stated objectives.

⁶ The concept of "decent green jobs" is hard to define in practice: see Pillar C of the Action Plan and relevant ILO studies. According to the ILO, "Decent work sums up the aspirations of people in their working lives. It involves opportunities for work that is productive and delivers a fair income, security in the workplace and social protection for families, better prospects for personal development and social integration, freedom for people to express their concerns, organize and participate in the decisions that affect their lives and equality of opportunity and treatment for all women and men." (<http://www.ilo.org/global/topics/decent-work/lang-en/index.htm>). In addition, "Jobs are green when they help reduce negative environmental impact ultimately leading to

| | | | |
|-----|---|--|--|
| 6 | Good governance and evidence based decision making | | |
| 6.1 | | National forest programme integrated into broader national policies and programmes for a green economy | Existence of an NFP which complies with agreed guidelines ⁷ |
| 6.2 | | Monitoring systems capable of supplying green economy indicators and data required for national green accounting systems | Existence of systems |

Can we monitor the contribution of the forest sector to a green economy without “green national accounts”?

Conventional macro-economic analysis and policy is highly dependent on the availability of reliable, recent and comparable information on national accounts, presented according to methods which have been codified and standardised over many years, notably through the System of National Accounts (SNA). The shortcomings of conventional national accounts are widely acknowledged: failure to include natural capital, distortion through omission of externalities, failure to include human well being etc. This unsatisfactory situation has led to a major international effort to design and implement systems for economic and environmental accounting, also known as “green accounting” (see Annex 4 for a summary of the Guidelines developed by the UN Statistical Office and Eurostat). At the national level, it will not be possible to achieve truly evidence-based policy making for the green economy without a functional green national accounts system, based on sound theory and generating reliable and comprehensive data.

The forest sector is a major challenge for those who are developing green national accounts systems, for a number of reasons, including the following:

- The importance of the “natural capital” contained in forests, and the difficulty of attaching a monetary value to it;
- The multi functional nature of forestry, leading to many “non-market benefits” and other externalities, which are difficult to quantify in physical terms, and even more difficult to express in monetary terms;
- The long term nature of forestry, leading to complex issues of discount rates and assumptions as regards the future (risks over the rotation, possible changes in management objectives, future market conditions and prices etc.).

Many in the forest sector, including the designers of criteria and indicator systems for sustainable forest management, have resisted the idea of systematically expressing all forest sector indicators in monetary terms, because of the above-mentioned conceptual problems, and because such a methodology seems to imply that all values, including environmental, social and cultural values, should be subordinated to economic values.

However, the concept of green national accounts has been developed in order to incorporate environmental, social and cultural values into evidence-based policy making, and monetary measures

environmentally, economically and socially sustainable enterprises and economies." (See http://www.ilo.org/global/topics/green-jobs/news/WCMS_220248/lang-en/index.htm)

⁷ For instance, those defined by Vienna Resolution V1 and the MCPFE Approach to National Forest Programmes in Europe.

are the only possible way of expressing differing value systems in comparable units. Expressing environmental and social values in monetary terms should – if correctly implemented – be an effective way of promoting rational discussion and evidence based decision making, without unduly favouring economic values over other value systems.

Green national accounts systems are being developed and will be implemented, whatever the difficulties encountered. The conclusion to be drawn is that the forest sector, and especially researchers, should devote further efforts to putting monetary values to forest sector parameters, and generating forest sector related information in a form which can be used by the emerging green national accounts systems, despite the fact that valuation of non-market benefits of forests has, up till now, remained at the theoretical, rather than the policy level in most cases. The emergence of the green economy will probably give extra impetus and importance to these efforts.

What is needed to put in place an effective system to measure the progress of the forest sector towards a green economy?

A system which is able to measure progress of the forest sector towards a green economy, in an objective, comparable and readable way, will need significant investment, of time, political will and resources, as well as flexibility and open minds from all. The possible stages could be:

- Consensus forming, at the pan-European or global level, on what should be measured, as well as concepts, definitions etc. (This paper is intended as a contribution to this initial discussion)
- Widespread consultation and briefing with national correspondents and other information providers, as well as distribution of labour between partners, along the lines already developed for SFM by the team of specialists on monitoring SFM.
- Data collection, analysis and reporting.

However in some areas, deeper research and discussion will be needed before there is a realistic prospect of obtaining reliable and comparable data. These areas are briefly described below.

Integration of monetary measures into forest sector monitoring systems. Monetary valuation of non-market goods and externalities, as well as integration of ecological processes into accounting systems is at the heart of the green economy. Therefore forest sector systems must make a major effort to bring together parameters of the sector not only in terms of m³ or ha, but also in monetary terms. This is essential not only for analysis of progress towards the green economy, but also for communication with other sectors, which cannot use forest sector original units in their work. This implies basic information collection on matters like prices, costs, salaries, revenues, and profitability, as well as new methods to put monetary values on aspects which have up till now been measured in physical units. These data should be used and monitored regularly and become a core, normal part of sector analysis, as they are for e.g. agriculture. They should be developed in accordance with existing guidelines for green national accounts, e.g. those produced by the UN Statistical Office or Eurostat. Many of these data may be being collected already, notably in the context of national accounts systems, so efforts to acquire this information should be carried out in cooperation with appropriate expert bodies, and harmonised with standard practice for national accounts.

Definition and measurement of natural capital in forests. There is a need to estimate the value, not only of growing stock at today's wood price, but also of net present value of future crops

(discount rate, demand projections), as well as of forest land, adjusted by valuation of ecosystem services/externalities. This will necessitate major consultation and research on both concepts and data.

Wood flows Efficiency of resource use and multi-factor productivity are also at the heart of the green economy concept. To estimate this, it is necessary to have a much more precise picture of flows of material and energy, something which is well understood at the level of individual plants, but much less well understood at the national level. The basis for this is available, for instance in the Wood Resource Balance, used in EFSOS II, but there are still many gaps. This is not just a research topic but needs annual collection and publication of data. It is necessary to work with industry, who are the only ones able to collect this data. Volumes of recovered wood products should be addressed in the same effort, following successful experience in a few countries (e.g. Germany and the Netherlands).

Next steps and priorities for the UNECE/FAO Integrated Programme of Work

Participants in the round table are invited to discuss and review the following proposals for follow up on the topic of measuring progress of the forest sector towards a green economy.

A workshop in 2014 is expected to prepare plans to measure the progress of the forest sector towards a green economy, for submission to the Committee and the Commission, and other partner organisations. The workshop will be prepared by a small team, including not only forest sector expertise, but also expertise on the green economy as a whole, notably green national accounts, green jobs, payment for ecosystem services and natural capital measurement. Further, the Committee and the Commission should be able to decide on future work, notably the collection and analysis of data and implementation of monitoring systems, on the basis of the workshop proposals. The aim of the process is to have usable results by 2015, so that the forest sector can be properly addressed in the rapidly emerging green economy measurement frameworks.

Annex 1

Action Plan for forest sector in a green economy: principles and goals

| Principles (from preamble) | Goals (as defined for each pillar) | Possible combination/summary |
|---|---|---|
| The forest sector uses all its resources, especially those arising from the forest, wisely and economically, minimising waste, recovering, reusing and recycling as much as possible. It consumes only products from forests which can demonstrate that they are managed sustainably. | A. Patterns of production, consumption and trade of forest products are truly sustainable | Sustainable and economic use of resources |
| The forest sector contributes to mitigation of climate change by sequestering carbon in forests and forest products, and by substituting renewable wood-based products and fuels for non-renewable products and fuels | B. The forest sector makes the best possible contribution to mitigation (sequestration, storage and substitution) of, and adaptation to, climate change | Low carbon forest sector |
| The forest sector cares for and builds up its workforce, developing the necessary skills and significantly improving the occupational safety and health of workers and giving due consideration to gender equality. | C. The workforce is able to implement sustainable forest management, and the forest sector contributes to achieving the social goals of the green economy by providing decent jobs | A skilled and safe work force (A sustainable work force) |
| The forest sector makes sure that the situation of forestry education is reviewed and improved | | |
| The forest sector takes all externalities fully into account in policy making, introducing payment for forest ecosystem services whenever appropriate | D. to identify and value forest functions and to establish payment for ecosystem services (PES), encouraging sustainable production and consumption patterns | Integration of externalities and payment for ecosystem services |
| The forest sector bases its governance on evidence-based decision making and the transparent monitoring of progress towards sustainable forest management. | E. To ensure that the forest sector in the region has policies and institutions which promote sustainable forest management, that policy making is evidence-based, policy instruments are effective, efficient and equitable, and that monitoring is adequate in order to mainstream the green economy in forest sector policies. | Good governance and evidence based decision making |
| The forest sector provides products and services of high user/consumer value | | |
| The forest sector seeks the active participation of civil society and the private sector. | | |

Annex 2

**Possible indicators to measure the progress of the forest sector towards
a green economy, starting from the Action Plan**

1. Sustainable and efficient use of resources

| | Parameter/indicator | Present status |
|------|---|--|
| 1.1 | Recovery rate, for paper and wood products (volume recovered for reuse as % of consumption) | Paper: easily available Wood products: needs research on lines of Wood Resource Balance, but estimates already made for EFSOS II |
| 1.2 | Measure of efficiency of use of wood raw material: total wood input broken down into material use/energy use/waste. Perhaps split material use into solid use (sawnwood) v. particle/fibre use (panels, pulp) | Can be done, probably by WRB |
| 1.3 | Sustainability of forest management at national level (areas of concern and measures taken to address them) | Output of SoEF assessment exercise |
| 1.4 | Share of forest products consumption from legal and from sustainable sources | Legal: with EUTR/Lacey Act should be 100%. Implementation of these measures will generate data on share of "illegal" products Sustainable: use consumption of certified products as proxy. Work with PEFC/FSC/retailers to collect data |
| 1.5 | Procurement: do public procurement rules specify wood should come from sustainable sources? | Simple "yes/no" question. Private procurement is also relevant, but much more difficult to monitor. |
| 1.6 | Green building: how many forest products used in green buildings? What percent of forest product consumption is in green building? What share of materials used for green buildings is from forest products? | This could be very difficult in practice, from the definition point of view (what is "green building"?) and for data collection. |
| 1.7 | Energy intensity of forest sector. Value of production of wood and paper/input of energy (take only purchased energy, to show how industry uses internal renewable energy) | Should be possible to calculate from JWEE and SoEF/JFSQ data |
| 1.8 | Share of wood energy in renewables/total energy (measures forest sector's contribution to renewable energy) | Available from JWEE |
| 1.9 | Trends in natural resource (growing stock and forest area): demonstrate that it is not shrinking (in Europe) | Basic forest data, used by many green economy indicators. |
| 1.10 | Material productivity of wood and paper industries (Ratio of GVA of sector to wood input, in value or volume). | Data available, but careful in measuring input because of use of residues (WRB) |
| 1.11 | R&D expenditure (public and private) compared to turnover/GVA | |
| 1.12 | Number of patents (forest/wood/paper) granted, compared to GVA | |

2. Low carbon forest sector

| | Parameter/indicator | Present status |
|-----|--|--|
| 2.1 | Carbon sequestration and storage in forests | Stock covered in SoEF, carbon flows in the future |
| 2.2 | Carbon sequestration and storage in harvested wood products | Forthcoming EU study will provide this information |
| 2.3 | Existence of a national strategy/plan for adaptation of forest sector to changing climate | |
| 2.4 | Cascade use indicator (derived from 1.2): ratio of material use to energy use (higher share of material use is good, provided total waste is low) | Easy if 1.2 achieved |
| 2.5 | Carbon profiles of the three components of the sector (forest, wood, paper), with stocks and flows of GHG (emissions and sequestration, net sink or source) (overlaps 2.1) | |

3. Sustainable work force

| | Parameter/indicator | Present status |
|-----|---|---|
| 3.1 | Occupational safety and health: rate of occupational accidents and diseases | Data already collected, but low quality |
| 3.2 | Adequacy of workforce skills and qualifications to needs | Very difficult as involves many stages: identification of "needs", identification of what skills correspond to needs, measurement of skills. Consult ILO. |
| 3.3 | Gender balance in workforce and forest owners (differentiate by areas/functions) | |
| 3.4 | Ratio of expenditure on education and training to 1) GVA of sector and 2) ha of forests | Need better data on education and training expenditure. Difficult in many cases to disentangle education for forest sector from other types |

4. Integration of externalities and payment for ecosystem services

| | Parameter/indicator | Present status |
|-----|---|---|
| 4.1 | Number and value of PES schemes in place (rigorously defined, not subsidies justified by reference to non-market benefits!) | Useful to build up a data base, founded on enquiry to governments or experts. Severe definition problems: PES, "in place", value |
| 4.2 | Trends in natural capital (financial value of forests, adjusted to take account of externalities) | Work inside system of green national accounts, using agreed UN methodology. See http://unstats.un.org/unsd/envaccounting/eea_white_cover.pdf |
| 4.3 | Value of total ecosystem services provided by forests | Could be major collaborative research project |
| 4.4 | Value of forest related carbon market. Quantifies the most visible PES system | Base on Annual Review chapters |
| 4.5 | Analyse the multiple factors of production for wood: natural (land + trees), labour, economic. Need to | VERY challenging and needs input from economists, but is at the heart of the green economy |

| | |
|--|--|
| quantify in economic terms investment/capital value of forest resource | |
|--|--|

5. Good governance and evidence based decision making

| | Parameter/indicator | Present status |
|-----|---|---|
| 5.1 | Existence of NFP, integrated with wider green economy strategies. | Use outputs of EFI project on implementation of criteria and indicators |
| 5.2 | Existence of data base/reports/regular monitoring based on data structured according to national or pan European set of criteria and indicators | Can also be derived, at least in part, from EFI project |
| 5.3 | Degree of public participation in NFP dialogue | Question asked for SoEF 2001, but how to measure objectively? |
| 5.4 | Existence of forest sector communication strategy | Question asked for SoEF 2011 |

Annex 3

Possible indicators to measure the progress of the forest sector towards a green economy, starting from broader green economy indicator sets

Systems⁸ considered:

- OECD Green growth indicators and themes
- UNEP Indicators for green economy policy making
- World Bank Framework for measuring potential benefits from green growth policies

Note: these systems have different objectives and backgrounds and vary widely in structure and content, although they display many common features. This table takes the indicators as defined for the national level by the organisations listed, and proposes a relevant forest sector measure which might provide parallel information at the sector level. Some of these measures are already collected or could be constructed from available information, while others would require new measurement/monitoring systems.

| Source | Heading | Possible measure for forest sector |
|--------|---|--|
| OECD | CO ₂ productivity | Carbon emissions ⁹ /€ of value added or output |
| OECD | Energy productivity | Energy consumption/€ of value added or output, broken down into purchased/internal energies and/or renewable/fossil. |
| OECD | Share of renewable energy in TPES ¹⁰ | Share of wood energy in TPES/renewable energy |
| OECD | Waste generation intensities and recovery ratios | Share of wood input which goes to waste (not incorporated into products or used to provide energy) |
| OECD | Waste generation intensities and recovery ratios | Recovery: paper recovery ratio, and recovered wood products/wood products consumption |
| OECD | Material productivity | Wood input/unit of output |
| OECD | Multi- factor productivity of the forest and forest industries | inputs of energy, labour, capital, CO ₂ , material per unit of output |
| OECD | R&D expenditure of importance to green growth | R&D expenditure ¹¹ for forestry, wood products and paper products as % of turnover |
| OECD | Wildlife resources | Indicator on forest dependent species (adapted to avoid problems identified in SoEF 2011). |
| OECD | Exposure to natural or industrial risks and related economic losses | Value of protective functions of forests |
| OECD | Environmental services and amenities ¹² | Value of environmental services provided by forests: recreation, landscape, local climate ... |

⁸ Source: Green Growth Knowledge Partnership, op. cit.

⁹ For forests in ECE region, will be negative i.e. CO₂ sequester rather than emission

¹⁰ Total primary energy supply

¹¹ Including private, public and EU funded expenditure.

¹² Presumably not including biodiversity and ecosystems, covered elsewhere

| | | |
|------|--|---|
| OECD | Carbon market financing | Value of payments to forest owners for carbon sequestration/climate change mitigation |
| OECD | Water pricing and cost recovery | Number/value of systems in place for payment of forest related ecosystem services, including for watershed management |
| OECD | Environmental expenditure | Environmental expenditure for forests and forest management (value, objectives, type of instrument) |
| UNEP | Climate change: carbon emissions | Carbon emissions (sequestrations)/€ of value added or output |
| UNEP | Climate change: renewable energy | Share of wood energy in TPES/renewable energy |
| UNEP | Climate change: energy consumption per capita | Energy consumption/€ of value added or output, broken down into purchased/internal energies and/or renewable/fossil. |
| UNEP | Ecosystem management: forestland | Changes in forest natural capital |
| UNEP | Resource efficiency: energy productivity | Energy consumption/€ of value added or output, broken down into purchased/internal energies and/or renewable/fossil. |
| UNEP | Resource efficiency: material productivity | Wood input/unit of output |
| UNEP | Resource efficiency: CO ₂ productivity | Carbon emissions ¹³ /€ of value added or output |
| UNEP | Chemicals and waste management: waste collection | Paper recovery ratio, and recovered wood products/wood products consumption |
| UNEP | Chemicals and waste management: waste recycling and re-use | Recovered paper/wood as % of input (utilisation rate) |
| UNEP | Chemicals and waste management: waste generation or landfill area | Share of wood input which goes to waste |
| UNEP | Green investment: R&D investment | R&D expenditure ¹⁴ for forestry, wood products and paper products as % of turnover |
| UNEP | Green fiscal reform: fossil fuel, water and fishery subsidies | Add "forestry subsidies". Government expenditure on forests ¹⁵ |
| UNEP | Green fiscal reform: renewable energy incentives | Government subsidies for wood energy |
| UNEP | Pricing externalities and valuing ecosystem service: carbon price | Value of payments to forest owners for carbon sequestration/climate change mitigation |
| UNEP | Pricing externalities and valuing ecosystem service: value of ecosystem services | Value of ecosystem services provided by forests |
| UNEP | Pricing externalities and valuing ecosystem service: value of ecosystem services | Number/value of systems in place for payment of forest related ecosystem services, including for watershed management |
| UNEP | Green job skill training: training expenditure, number of people trained | Expenditure and number of people trained for forestry workforce ¹⁶ |
| UNEP | EGSS ¹⁷ performance: value added and | Value added and employment in forestry, in |

¹³ For forests in the ECE region, will be negative i.e. carbon sequester rather than emission

¹⁴ Including private, public and EU funded expenditure.

¹⁵ already included in SFM C&I, but many data problems

¹⁶ Assumes that all forestry jobs are "green jobs"

| | | |
|------------|---|--|
| | employment | countries where forest management is sustainable. |
| UNEP | Natural and human capital: value of natural resource stocks | Value of forest natural capital (to be defined!) |
| UNEP | Natural and human capital: net annual value addition/removal | Changes in forest natural capital, by harvest, afforestation, loss of amenity etc. |
| World Bank | Environmental: improved environment | Carbon emissions (sequestrations)/€ of value added or output |
| World Bank | Environmental: improved environment | Area of forest protected for conservation of biodiversity |
| World Bank | Economic: increase in factors of production | Value of forest natural capital and changes in it |
| World Bank | Economic: accelerated innovation, through correction of market failures in knowledge | Value of ecosystem services provided by forests |
| World Bank | Economic: enhanced efficiency through correction of non-environmental market failures | Wood input/unit of output |
| World Bank | Social: job creation and poverty reduction | Employment and revenue in the forest sector |

¹⁷ Environmental Goods and Services Sector: it is acknowledged that it is very difficult to define objectively which goods and services are “green”.

Annex 4

The forest sector in green national accounts

Both the UN Statistical Office and Eurostat have prepared detailed guidelines for the integrated approach to economic and environmental accounting. Both address the forest sector in the context of green national accounts. The guidelines as regards the forest sector are briefly summarised below.

Assuming that these systems, or systems based on them, will become widespread in the green economy, the forest sector should be aware of how forest related issues will be incorporated into accounts which will inform high level decision making, and what are the forest sector data needs of green accounting systems.

UN Statistical Office. System of Environmental-Economic Accounting: Central Framework 2012¹⁸

In the context of a matrix of land cover change, the system calls for an asset account for forest and other wooded land, based on changes in stock, with detailed data on additions to stock (afforestation, natural expansion) and reductions in stock (deforestation, natural regression). Physical units (hectares) are required, and the definitions used are based on those used for the Global FRA. This requires detailed data on changes in forest and other wooded land area, not just net change over a period, but otherwise is compatible with existing forest sector work, such as SoEF or the FRA.

Table 5.6.5 Physical asset account for forest and other wooded land (hectares)

| | Type of forest and other wooded land | | | | Total |
|--|--------------------------------------|------------------------------------|----------------|-------------------|-------|
| | Primary forest | Other naturally regenerated forest | Planted forest | Other wooded land | |
| Opening stock of forest and other wooded land | 20 | 100 | 150 | 130 | 400 |
| Additions to stock | | | | | |
| Afforestation | | | 2 | 5 | 7 |
| Natural expansion | | | 3 | | 3 |
| <i>Total additions to stock</i> | | | 5 | 5 | 10 |
| Reductions in stock | | | | | |
| Deforestation | 2 | 10 | | 5 | 17 |
| Natural regression | | | | 3 | 3 |
| <i>Total reductions in stock</i> | 2 | 10 | 0 | 8 | 20 |
| Closing stock of forest and other wooded land | 18 | 95 | 155 | 122 | 390 |

The system also calls for monetary asset accounts for land, with one land use being forestry. This is also based on stock at the beginning of the period, additions, reductions and closing value. However, it is expressed in currency units, which implies estimating a price for the different types of land, which is revised each accounting period. The underlying physical changes in land use (in hectares), derived from the asset account for forest land are converted to monetary units by an estimated price. Putting a monetary value of forest land will be a major challenge for existing forest sector systems, as there is only a small liquid market in forest land, which is in no way typical of most forests, many of which are publicly owned and thus not usually put on the market.

¹⁸ Prepared by a partnership of the European Commission, FAO, IMF, OECD, World Bank and UN. The forest related definitions are compatible with, and based on, FRA terminology.

Table 5.6.6 Monetary asset account for land (currency units)

| | Type of land use | | | | | | | Total |
|---------------------------------------|------------------|----------|---------------------------|-----------------------------------|--|---------------------------|-----------------|-----------|
| | Agriculture | Forestry | Land used for aquaculture | Use of built up and related areas | Land used for maintenance & restoration of environmental functions | Other uses of land n.e.c. | Land not in use | |
| Opening value of stock of land | 420 000 | 187 500 | | 385 000 | 2 000 | | | 995 500 |
| Additions to stock | | | | | | | | |
| Acquisitions of land | 3 500 | | | | | | | 3 500 |
| Reclassifications | | 200 | | 2 500 | | | | 2 700 |
| <i>Total additions to stock</i> | 3 500 | 200 | | 2 500 | | | | 6 200 |
| Reductions in stock | | | | | | | | |
| Disposals of land | | 3 500 | | | | | | 3 500 |
| Reclassifications | | 1 250 | | | 200 | | | 1 450 |
| <i>Total reductions in stock</i> | | 4 750 | | | 200 | | | 4 950 |
| Revaluations | 18 250 | 15 350 | | 65 000 | | | | 98 600 |
| Closing value of stock of land | 441 750 | 198 300 | | 453 500 | 1 800 | | | 1 095 350 |

In addition, there is a physical and a monetary asset account for “timber resources” – growing stock in forest sector terms. Additions to stock are natural growth and reclassification, reductions are removals, felling residues, natural losses, catastrophic losses and reclassification, as well as revaluations (changes in price/value of the growing stock). Assessing the net present value of the growing stock would imply knowledge of the age class structure and future growth, as well as the choice of a discount rate, which would be very difficult at the national level, even with excellent forest inventories and well developed wood supply models. However, the system allows for a simpler approach whereby present average stumpage prices are applied to the whole resource.

Table 5.8.2 Monetary asset account for timber resources (currency units)

| | Type of timber resource | | Total |
|--|-----------------------------|--|---------|
| | Cultivated timber resources | Natural timber resources (available for wood supply) | |
| Opening stock of timber resources | 86 549 | 82 428 | 168 977 |
| Additions to stock | | | |
| Natural growth | 12 364 | 11 334 | 23 698 |
| Reclassification | 515 | 1 546 | 2 061 |
| <i>Total additions to stock</i> | 12 879 | 12 879 | 25 759 |
| Reductions in stock | | | |
| Removals | 13 395 | 10 303 | 23 698 |
| Felling residues | 1 752 | 1 236 | 2 988 |
| Natural losses | 309 | 309 | 618 |
| Catastrophic losses | | | |
| Reclassification | 1 546 | | 1 546 |
| <i>Total reductions in stock</i> | 17 001 | 11 849 | 28 850 |
| Revaluations | | 16 692 | 16 692 |
| Closing stock of timber resources | 82 428 | 100 150 | 182 578 |

These detailed asset accounts for forest land and for growing stock (“timber resources”) are then combined with more conventional national accounts data by industry sector, households etc. to produce a “combined presentation” in both physical and monetary units, which can then be compared to parallel combined presentations for energy, water and emissions, in a comprehensive

national analysis. The ambition of the forest sector might be to put itself in a position where it can supply the data necessary for such a combined presentation

Table 6.5.4 Combined presentation for forest products

| | Industries (by ISIC categories) | | | | Households | Accumulation | Flows with the rest of the world | Type of timber resources | |
|--|---------------------------------|--------|--------|---------|------------|--------------|----------------------------------|--------------------------|---------|
| | ISIC 1-2 | ISIC 3 | ISIC 4 | Other | | | | Cultivated | Natural |
| 1. Supply of forest products (currency units) | | | | | | | | | |
| Timber logged | 135 680 | 1 200 | 1 800 | | | | 5 400 | | |
| Othergoods (cork, gum, fodder, medicine, peat, etc) | 27 500 | | | 6 550 | | | 250 | | |
| 2. Supply of forest products (physical units) | | | | | | | | | |
| Timber logged ('000 m3) | 2 250 | 20 | 30 | | | | | | |
| Othergoods (cork, gum, fodder, medicine, peat, etc) (tonnes) | 1 375 | | | 328 | | | | | |
| 3. Intermediate consumption and final use of forest products | | | | | | | | | |
| Timber logged | 3 205 | 87 025 | 4 560 | 35 880 | 2 560 | | 10 850 | | |
| Othergoods (cork, gum, fodder, medicine, peat, etc) | 590 | 29 575 | | 2 175 | 1 860 | | 100 | | |
| 4. Intermediate consumption and final use of forest products | | | | | | | | | |
| Timber logged ('000 m3) | 48 | 1 390 | 76 | 495 | 35 | | 256 | | |
| Othergoods (cork, gum, fodder, medicine, peat, etc) (tonnes) | 30 | 1 465 | | 106 | 95 | | 7 | | |
| 5. Gross Value Added (currency units) | 18 695 | 5 546 | 21 407 | 773 753 | | | | | |
| 6. Employment ('000 people) | 293 | 78 | 165 | 10 295 | | | | | |
| 7. Extraction and depletion of timber resources | | | | | | | | | |
| Re. Removals ('000 m3) | 2 250 | 20 | 30 | | | | | 1 300 | 1 000 |
| Fell Felling residues ('000 m3) | 290 | | | | | | | 170 | 120 |
| Dep Depletion ('000 m3) | 50 | | | | | | | | 50 |
| 8. Closingstocks of timber resources (physical units) | | | | | | | | | |
| Area of land with timber resources (incl. forest and other wooded land) ('000 hectares) | | | | | | | | 225 | 165 |
| Volume of standing timber ('000 m3) | | | | | | | | 8 000 | 8 100 |
| 9. Closingstock of fixed assets for extraction of timber resources (currency units) | 204 000 | 24 000 | 28 000 | | | | | | |

Note: Dark grey cells indicate zero entries by definition.

The European Framework for Integrated Environmental and Economic Accounting for Forests – IEEAF. Eurostat, 2002¹⁹

Eurostat Natural resource accounts for Forests (1999 data), 2002

Eurostat has also developed a methodology for economic accounts, for both agriculture and forestry, and collected data.

The 2002 Framework lays out an agreed methodology and definitions for the integrated accounts. Twenty tables have been drafted for a first implementation of the Framework. They cover the main aspects of the IEEAF:

- Balance sheets for land and standing timber (tables 1a – physical balances of wooded land areas, 1b – monetary balances of wooded land areas, 2a - physical balances of standing timber and 2b –monetary balances of standing timber). Table 2c records defoliation.
- Output related to wooded land (table 3a), detailed accounts for forestry and logging (table 3b) and economic accounts for forestry and logging (table 3c)
- Supply and use tables, in physical (tables 4a and 4b) and in monetary units (tables 5a and 5b).
- Material balances (tables 6a and 6b)

¹⁹ Available at http://epp.eurostat.ec.europa.eu/cache/ITY_OFFPUB/KS-BE-02-003/EN/KS-BE-02-003-EN.PDF

- Tables describing origins and destinations of waste containing wood or paper (7a and 7b), of black liquors (7c) and the corresponding wood contents (8a, 8b and 8c).

Estimates, prepared in 2002 on the basis of data for 1999, are based on a pilot study to which only 6 countries replied. However these countries together accounted for over 80% of the EU-15 growing stock. The estimated value of the standing timber ranged from €16/m³ to €30/m³, but the forest land value showed a very wide variation, from €55/ha to €4937/ha, which can only be partly explained by differences in national circumstances.