Forest monitoring for Europe

The Conference ‘Future forest monitoring in the European Union. Providing information for multifunctional forest management. Uppsala, Sweden 11-12 November 2009’ aimed at promoting a streamlined European forest monitoring1 capable of delivering the necessary information in support of policies of relevance for the European forest ecosystems.

The following informal conclusions and recommendations reflect the discussions between the ca 90 representatives of the above organizations, responsible bodies in European countries and special scientific expertise towards designing an improved, streamlined and multifunctional European Forest Monitoring Programme. We want to express our great thanks to all (chairs, rapporteurs and other experts) for their active participation the Conference.

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1 ‘Forest monitoring’ is used in a broad sense and includes data collection (by field monitoring and inventories as well as by remote sensing), data management, establishing databases and information systems etc.
Key messages

1. Forest monitoring is a prerequisite for a Sustainable Forest Management and needed for an increased number of political commitments and demands on forests related to markets and trade, climate, bioenergy, biodiversity, ecosystem services, forest fires etc.

2. The existing or newly established national forest inventories (NFIs) of each European country, ICP Forests, ICP Integrated Monitoring (IM) and the European forest fire information system (EFFIS) should be the core of a future European forest monitoring programme, building on the strength of the respective programmes. Also other data sources like administrative/statistical records, user surveys etc. should be taken into account.

3. Forest monitoring should be carried out in close cooperation with research and more intense long-term measurements to establish cause-effect relations and understanding of forest ecosystem processes such as the protective role of forests in soils and waters. This includes making monitoring data suitable and accessible for research projects.

4. A cost-efficient forest monitoring should use an optimal technology for data collection, e.g. comprise not only field data but also data collected by remote sensing. The advantages of Earth Observation for European-level monitoring should thus be fully explored.

5. Continued support should be given to harmonising activities of existing networks such as the European National Forest Inventory Network within the framework of existing global and regional standards and processes.

6. The existing international bodies involved in standardization of definitions, data handling, reporting and assessment - UNECE/FAO, ICP Forests, ICP IM, the European Forest Institute, the European Commission (including the Joint Research Centre responsible for the European Forest Data Center (EFDAC)), the European Environment Agency etc. – all have a vital role to play and should continue to work together in a successful future European forest monitoring programme.

Future policy requirements on information on European forests

Following current development of work at European and global levels an increased need for information on forest ecosystems may be expected. Beside the traditional clients, like governmental bodies (ministries, agencies, services) responsible for forests and Sustainable Forest Management, forest industry including forest owner’s organisations etc. who were

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2 The International Co-operative Programme on Assessment and Monitoring of Air Pollution Effects on Forest operating under the UNECE Convention on Long-range Transboundary Air Pollution (CLRTAP)

3 The International Co-operative Programme on Integrated Monitoring operating under the UNECE Convention on Long-range Transboundary Air Pollution (CLRTAP)

4 The Ministerial Conference for the Protection of Forests in Europe (MCPFE) has developed common principles, criteria and indicators for Sustainable Forest Management (SFM), see www.mcpfe.org
originally related to resource processing and management, a future demand will increasingly focus on:

- Climate change policies
- Challenges on forests due to changing climatic conditions (fires, storms, pests, etc.)
- Extraction of renewable energy
- ‘Green building’
- Rural development and land-use planning
- Environmental and social services
- Biodiversity and ecosystem conditions
- Invasive alien species including pathogens
- Forest certification/legality of source

Healthy forest ecosystems are a prerequisite for a sustainable production of goods and services from forests including the capability of forest ecosystems to adapt to a changing environment. Monitoring of the state and further development of biotic and abiotic damages in European forests is thus necessary.

A continuous discussion, however, is needed between the policy makers and scientists to enable fast adaptation of monitoring system (e.g. to include new indicators and/or exclude obsolete ones) and to respond to new information needs. Experience has also shown that monitoring activities themselves can identify new issues and initiate new policies. The future forest policies will also demand a quick delivery of more detailed, frequent, accurate and geographically specific data both to policy makers and the public. The efforts to communicate existing information and the capacity to produce targeted information need to be further strengthened.

Towards a cost-efficient European forest monitoring programme
The way forward towards a European forest monitoring programme must consider:

- Political processes at international level are a prerequisite for development of a European forest monitoring. Globally the driver has been several UN & UNECE agreements comprising reporting of forest data (Conventions like the UNFCCC, CBD, CLRTAP etc) and UN bodies (FAO, UNECE, Convention secretariats) involved in analysing and presenting forest information. The Ministerial Conference for the protection of forests in Europe (MCPFE) has established Criteria and Indicators for Sustainable Forest Management as a basis for the reporting on the state of European forests. The European Union (EU) has, as a party of global agreements and in implementing EU specific legislation, provided its member countries with substantial resources for forest monitoring but a long-term forest monitoring with a mandatory participation of all EU member states is no more in place.

- The national forest inventories (NFIs), ICP Forest, ICP IM should be the core of a future European forest monitoring programme. A large part of a European forest monitoring system is thus already in place, though this needs to be better harmonised to deliver
comparable information at the European level and integrated to take advantage of the strengths and complementary roles of the different existing programmes. Successful activities in the ICP’s are e.g. the manuals of standardised methods of forest monitoring activities, laboratory ring-tests and joint analysis and reporting. The system should also be adapted to better reflect today’s and future policy needs. Also other data sources like administrative/statistical records, user surveys etc. are highly relevant e.g. for energy and non-wood products.

- ICP Forest, operating under the UNECE Convention on Long-range Transboundary Air Pollution which was created during the 1980’s, is an outstanding example of an international monitoring programme comprising harmonized plot systems, agreed manuals and joint data handling and reporting. A way forward to a successful European forest monitoring programme is thus a close co-operation between ICP Forests and the NFI’s.

- Terms and definitions have been harmonised in most international processes comprising reporting of forest information. The challenge is currently to adjust data collected according to national definitions, in order to comply with international definitions. In particular when new variables are introduced the opportunity of international standardisation should be considered.

- Data on forest area development and forest wood resources are generally adequately covered by most European countries, but there is still room for improvements with regard to harmonization, synchronization and regularity of data. Other forest resource data (berries, fungi etc.) are in many cases incomplete, and the quality is often low, because of lack of reliable monitoring systems in some countries.

- A cost-efficient forest monitoring should use an optimal technology for the data collection, i.e. comprise not only field data but as appropriate also data collected by aerial and satellite imagery. The advantages of satellite image data for European-level monitoring should thus be fully explored (e.g. the European Forest Fire Information System (EFFIS) should be considered in this context). Joint actions in Europe for further development of methods, data handling and reporting for forest monitoring should increase the cost-efficiency of forest monitoring. The UNECE/FAO has been the main actor for harmonised reporting since several decades. Examples of more recent European activities which should be further strengthened are the European National Forest Inventory Network, the European Forest Institute, the European Commission’s European Forest Data Centre (EFDAC), the development of biodiversity indicators by the European Environment Agency etc.

- A forum should be established to promote an integrated European forest monitoring programme and to allow a closer discussion between countries, the European Commission and international bodies (UNECE, FAO, MCPFE etc.) in order to constantly update information needs and to adapt monitoring systems accordingly.

**Additionally the following specific issues must be considered:**

**Wood and non-wood forest resources**
• Information on wood resources for traditional use (roundwood) has since long been requested by national forest policies ensuring sustainability of forestry and by international processes as the global Forest Resource Assessments established by FAO and the MCPFE/UNECE/FAO reporting of state of Europe’s forests. This information is also an important element in more recent processes such as the CBD, the UNFCCC and the MCPFE/UNECE/FAO reporting of state of Europe’s forests.

• Collection of data is thus generally well established by most European countries but there is still room for improvements with regard to completeness, comparability, scale and regularity of data. The key parameters are thus well reflected in the MCPFE indicators, e.g. Area of forest and other wooded land, Area of forest and other wooded land available for wood supply, (afforestation/deforestation/reforestation), Wood resources (growing stock, increment, natural losses, harvesting, removals, quality) & Carbon (all pools – status and dynamics).

• Data on wood resources for bioenergy are still inadequate and current monitoring of wood resources (NFIs) should urgently include more comprehensive biomass measurements. Tree biomass estimates should also comprise areas outside forest land. Apart from biomass estimates information is needed to assess the biomass potentials which can be sustainably harvested, an issue which also should be addressed by research and other projects (such as the Joint Wood Energy Enquiry carried out jointly by four international organizations - UNECE, FAO, IEA and EU).

• Emerging policies will require an estimation of unrecorded fellings/removals and data to establish the link between harvest of wood and characteristics of the forest where it comes from.

• Data on non-wood goods and services are in many cases incomplete, and the quality is often low, because of lack of reliable national monitoring systems. E.g. carbon in soil and litter is often estimated by means of default values or models, and verification (or development of site-specific models) is needed. Although e.g. FRA and MCPFE reporting comprises non-wood goods such as e.g. game meat, pelts, fruits and berries, mushrooms and truffles, cork, medicinal plants, Christmas trees, honey, nuts etc. the information on European-level is presently heterogeneous and hardly reflect the economic and social importance of these goods.

• Considerable efforts are made in all major international forest processes like FAO-FRA and UNECE/FAO/MCPFE and in e.g. the COST Action E43 to harmonise terms and definitions to improve the international reporting on wood resources. The challenge is currently to adjust data collected according to national definitions to comply with agreed international definitions.

• Before undertaking any further steps towards harmonisation, analysis of cost-effectiveness and efficiency of this process should be carried out. From the perspective of wood resources a 'bottom-up' approach to create a European monitoring scheme building on national forest inventories (NFIs) seems most efficient. A strong support from EU institutions will facilitate this. Further developing the European Forest Data Center (EFDAC) at the EU Commission’s Joint Research Center (JRC) is thus needed. An example is the ‘E-forest’ project supported by JRC aiming at establishing of a European database on the basis of NFI plot level information.
Monitoring of forest health and damages in a changing climate

- In response to the threats to European forests from air pollution and fires the UN Convention on Long-Range Transported Air Pollution (CLRTAP) and the first Ministerial Conference for the Protection of Forests in Europe in 1990 has initiated a broad cooperation across Europe regarding forest monitoring. This has mainly been supported by the European Union through a number of regulations including co-funding and through the activities of the European Commission’s Joint Research Centre (DG JRC). Biotic and abiotic forest damages have recently received an increased attention in the perspective of climate change.

- Presently the most important European-level monitoring activities are the standardized plot systems established by ICP Forests and ICP Integrated Monitoring set up in response of the CLRTAP as well as the European Forest Fire Information System. Key variables in this monitoring are (proxy) measures of tree health and biotic and abiotic damages, trends in element fluxes (deposition, soil, soil solution, vegetation) and ground vegetation biodiversity, water quality and cycling, drought stress effects, tree growth, tree species diversity, amount of deadwood and of several variables related to forest fires.

- Main gaps in current data collection to deliver information for existing and upcoming policies are e.g. soil biodiversity, carbon fluxes in different components of forest ecosystem, changes in soil carbon, animal biodiversity, early warning system for pests and pathogens, areal coverage of abiotic and biotic damages, economic value of damages and forest services, assessment of vulnerability of forests, full area coverage of forests, information needs of EU soil strategy (data on erosion etc), climate change adaptation potential of tree species and forest communities.

- Because data and methodological harmonization/standardization is time consuming, and further because detecting changes in spatiotemporal levels requires long time series, the work on monitoring infrastructure that has already been done (e.g. within ICP Forests and ENFIN networks) should be used as much as possible in so far it corresponds with future monitoring needs and requirements.

- A main action needed is a further integration of the European level monitoring carried out on ICP Forests Level I plots and the national forests inventories (NFI) grids. This will be facilitated by a further harmonization/standardization of NFI data e.g. in the FutMon (Life+ project) and follow-up projects.
Forest monitoring for biodiversity

- Reporting of forest biodiversity is included in several international forest processes along with other main objectives (UNECE/FAO, UNFF, MCPFE, CLRTAP, UNFCCC/REDD etc) and the main issue related to forests (with emerging reporting requirements) e.g. to the Convention on Biological Diversity (CBD) and to the EU nature policies (e.g. reporting to the Habitats Directive, indicators to assess progress in halting biodiversity loss (SEBI2010), the European Biodiversity Data Centre at the European Environment Agency, EEA etc.).

- Current European-level reporting comprise a limited number of variables related to structural, functional and compositional biodiversity (e.g. Forest types, Forest structure, Deadwood, Forest age −continuity, Ground vegetation and Naturalness) which are subject to an ongoing process of harmonisation through e.g. ICP Forests & IM (CLRTAP), ENFIN, LTER-Europe, the former EU Forest Focus scheme and EU funded projects such as Cost Actions and other research projects, LIFE+ projects (FutMon), and other projects supported by the European Commission and EEA.

- The extensive reporting of the state of priority habitats and species to the EU Habitats Directive has (up to now) not catalyzed harmonized monitoring activities in the EU member states.

- There is an urgent need to establish an operational and harmonised system for monitoring of European forest biodiversity in a changing climate and other pressures. Such a system should cover a wider spectrum of biodiversity from genetic diversity, forest species (birds, soil fauna, mushrooms, etc.) to landscape biodiversity. A complimentary data collection programme is needed on rare and infrequent species and habitats to fulfill the requirements of the EU Habitat Directive. This system should be built upon existing frameworks at European level such as the BioSoil plot network.

- Research is needed to provide a baseline for multi-temporal forest biodiversity assessment and evaluation of trends in forest biodiversity, to develop indicators of functional diversity (ecosystem functions and services), to improve the evaluation of selected indicators and in this context e.g. demonstrate the usefulness of the European Forest Types Classification for ecological analysis.

- A future European forest monitoring scheme should keep a bottom-up approach allowing the countries to also meet local needs for information. Nevertheless international processes should agree on more comprehensive requests on biodiversity reporting and encourage further harmonization of forest monitoring. The EU has a key role in supporting projects and infrastructure through e.g. the LIFE+ Regulation, the EEA European Biodiversity Data Centre, research projects etc. A further development of harmonised monitoring and reporting to the EU Habitats Directive would be a main driver for this.

- Biodiversity data are potentially immense and supporting structures such as the Global Biodiversity Information Facility, the EEA European Biodiversity Data Centre and the EC Clearing-House Mechanism, the new LIFE-Watch programme etc set up to facilitate data handling and analysis will have an important role for delivering biodiversity information to
public bodies, stake-holders, NGOs and the general public and to meet the target of halting biodiversity loss..

Forest landscape and land-use monitoring

- A number of international processes welcome landscape-level data, e.g. CBD, UNFCCC/Kyoto protocol: Land-use change, and forestry activities (LULUCF), MCPFE, EU Habitat Directive etc. The formal requests on data are (presently) limited.

- Currently the most elaborate Europe landscape monitoring is carried out by the CORINE Land cover programme set up 1985 by the European Commission. In this programme land cover is monitored by satellite according to a number of categories at three main levels. Available data for 1990 and 2000 allow a first estimation of land-cover changes and information will be further improved by the third round of monitoring was carried out in 2008. Unfortunately it has shown difficult to monitor forest area according to e.g. the definitions adopted in other forest resource monitoring (UNECE/FAO, MCPFE).

- MCPFE is in process of implementing an indicator on forest landscape pattern in cooperation with the EU Commission. The most recent MCPFE report (2007) thus presents European-level information on changes in forest landscape elements (core areas, corridors, etc).

- On a national level more comprehensive landscape monitoring has been established, e.g. the Swedish NILS programme.

- A further developed landscape monitoring should be set up in close cooperation with stakeholders. The level of analysis of the data could eventually the watershed approach (cf. EU Water Framework Directive). Information should thus also be useful at national and regional level to meet planning needs.

- Key variables in a future European landscape monitoring should address connectivity, fragmentation, number and type of forest habitats, number of land use types. Datasets at different times are required for reporting on changes in landscape pattern. Ongoing activities should be further expanded and supported by research. A major development is needed to include land use, considering general land use categories, plus forest categories.

- Introduction and implementation of landscape monitoring across the whole landscape (aerial orthophotos and high-spatial resolution satellite imagery) and, in terms of landscape, integrate with socio-economic data, at local administrative level. Need to look beyond the borders of the forests not least because of the need to include transitions from forests into other categories and vice versa. Monitoring should as appropriate be based on a sample based approach using a standard size of plots (e.g. 5x5 km and/or 1x1 km). Links must be established with other habitat monitoring systems, such as biodiversity surveys, water quality, etc.