Tasks of Forest Biodiversity Management and Monitoring Deriving from International Agreements

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1 Ongoing Processes

Since the Rio 1992 Earth Summit governments, environmental groups, the business community and consumers have agreed, that there is a need to develop a common understanding of the definition and characteristics of sustainable forest management. Four governmental efforts are underway to reach consensus on indicators of sustainable forestry (Harmonization of... 1995.

Through the Helsinki process, European countries have developed and reached a pan-European, binding consensus (Geneva, June 24, 1994 and Antalaya Statement, January 28, 1995) on criteria and indicators. This effort has been designed to identify the important characteristics of sustainable forest management and through these criteria and indicators, provide the ability to measure progress towards that goal. Through assessments of progress, European countries inted to be able to demonstrate that on national level specific countries are sustainable managing their forestlands. The first interim report on the progress has been produced at the end of April 1995 coordinated by Liaison Unit in Helsinki (Interim Report... 1995).

The Montreal process is a parallel effort to Helsinki-process including non-European Temperate and boreal forest countries; Canada, The United States, Russia, Japan, Chile, China, Korea, New Zealand and Australia. In February 1995 an agreement was reached on a number of international level criteria and indicators (Sustaining the World's... 1995, Santiago-Agreement). Their purpose is to provide a method to describe and develop a broader list of criteria and indicators in a national process than those agreed to at the international level.

The International Tropical Timber Organization (ITTO) adapted the year 2000 as its target date for sustainable management of all topical forests. The ITTO have developed guidelines for the sustainable management of natural tropical forests as early as 1990, planted tropical forests, conservation of biodiversity in tropical production forests and tropical forest management, but they are not identical to either the Helsinki or Montreal Process lists.

In the Spring 1995 the countries around the Amazon basis have developed a joint initiative for creating guidelines of sustainable forest management of the Amazonian tropical rain forests (Tradtado de Cooperacion Amazonica, Tarapota, Peru 1995).

It is estimated that as many as 15–20 distinct processes are under way in the private sectors by nonprofit organizations and forprofit companies, some domestic and others international in scope. Through some of them, the goal is to create a certificate for "good" silviculture, an 'eco-label' or equivalent, on the basis of which consumers will be able to sense the presence of an environmentally sound forestry practice.

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Perhaps the most wide-ranging definition work of non-governmental organizations is the undertake by the Forest Stewardship Council, FSC, set up by the WWF (the World Wide Fund for Nature International). The parameters of sustainability adopted by FSC are in agreement with those brought forward in connection with the follow-up work of the European Ministerial Conference. Differences arise from the difference in emphasis given to certain aspects. Conservation bodies attach primary importance to evaluation of the sustainability of forest management from the perspective of conservation and ecology.

2 Criteria and Indicators

The term used in this connection is 'criteria of sustainability' which depict the various dimensions that sustainability has. The purpose is to use indicators in measuring changes in the criteria of sustainability; e.g. in relation to time. In actual fact, the indicators are instruments, parameters compiled from statistics of from data obtained by conducting various measurements in the forest. The information provided by indicators is then evaluated in connection with societal or international debates, and they form the basis for the setting of policies to implement sustainability.

In addition to quantitative indicators, there is a need for descriptive parameters with which to assess the realization of the measures taken (e.g. in legislation). Development work in this area has begun. The need for clarification is particularly needed with respect to the socio-economic aspects of sustainability.

Six criteria have become the characteristic features of sustainability in European forestry (Ministerial Conference... 1994):

- forest resources and the carbon cycle
- the health and vitality of forests
- multiple production functions of the forests
- the biological diversity of forest ecosystems
- maintenance of the protective functions of forests (soil and water system)
- maintenance of socio-economic functions

Each criteria consists of a number of indicators (in the group 'forest resources', for instance, trends in the development of the forested area and the centrally important characteristic stand features of the forest) and their development is monitored in relation to time. In all, at European level there are at the moment 27 agreed indicators. Taken together, the set of criteria and indicators suggests an implicit definition of the conservation and sustainable management of forest ecosystems at the county level. It is recognized that no single criterion or indicator is alone on indication of sustainability.

3 Forest Biodiversity in the Helsinki and Montreal Processes

The greatest number of indicators are been discussed during the Helsinki and Montreal processes in the criteria forest biodiversity. For the present, consensus has been reached only with regard to the factors of most central importance. In the matter of ensuring the preservation of forest biodiversity in production forests, the proportion of mixed woods and genetic biodiversity are the only factors agreed upon. Discussion have been held in issues such as fragmentation of forests, how to define naturalness, age distribution, the proportion of decaying wood in forests, and the methods to be applied in forest regeneration and timber harvesting. A uniform indicator platform, applicable in different forest vegetation zones, is still lacking.

The criteria 4 "Maintenance, conservation and appropriate enhancement of biological diversity in forest ecosystems" of the Helsinki-process contains the following indicators with separate definitions:

4.1 Changes in the area of:
   a. natural and ancient seminatural forest types
   b. strictly protected forest reserves
   c. forests protected by special management regime

4.2 Changes in the number and percentage of threatened species in relation to total number of forest species (using reference lists e.g. IUCN, Council of Europe or the EU Habitat Directive)

4.3 Changes in the proportions of stands managed for the conservation and utilisation of forest genetic resources (gene reserve forests, seed collection stands, etc.); differentiation between indigenous and introduced species

4.4 Changes in the proportions of mixed stands of 2–3 tree species

4.5 In relation to total area regenerated, proportions of annual area of natural regeneration

For comparison, the Montreal-process biodiversity is defined by indicators as follows:

Criterion 1:
Conservation of biological diversity. Biological diversity includes the elements of the diversity of ecosystems, the diversity between species, and genetic diversity in species.

Indicators:

Ecosystem diversity
a. Extent of area by forest type relative to total forest area (a)1
b. Extent of area by forest type and by age class or successional stage (b)
c. Extent of area by forest type in protected area categories as defined by IUCN2 or other classification systems (a)
d. Extent of areas by forest type in protected areas defined by age class or successional stage (b)
e. Fragmentation of forest types (b)

Species diversity
a. The number of forest-dependent species (b)
b. The status (rare, threatened, endangered, or extinct) of forest-dependent species at risk of not maintaining viable breeding populations, as determined by legislation or scientific assessment (a)

Genetic diversity
a. Number of forest-dependent species that occupy a small portion of their former range (b)
b. Population levels of representative species from diverse habitats monitored across their range (b)

1 Indicators followed by an "a" are those for which most data are available. Indicators followed by a "b" are those which may require the gathering of new or additional data and/or a new program of systematic sampling or basic research. No priority is implied in the "a" and "b" designations.

2 IUCN categories include: (1) Strict protection. (II) Ecosystem conservation and tourism, (III) Conservation of natural features, (IV) Conservation through active management, (V) Landscape/Seascape conservation and recreation, (VI) Sustainable use of natural ecosystems.

4 The Task for Research

The criteria used should be such that they produce objective information for the sustainability. An example of a criterium that works in practice is the assessment of forest health. The measurement methods used are the result of many years of research, discussion and co-operation at international level. The same techniques are applied throughout Europe. Annual assessment provide the basis for indicating general trends in forest health. Weakening in forest health condition is a sign to political decision makers to introduce emission restrictions, for instance. There is need to develop parallel system for monitoring forest biodiversity on a practical scale.

The public discussion demands for wood production oriented forest management to be replaced by a more balanced management of forest environment and the realisation of biodiversity (Oldeman et al. 1994). These goals are being approached through total protection of the foremost regionally representative natural forests and by managing production forests with more nature-oriented principles (Parviainen and Seppänen 1994).

In order that silviculture might be practised on a sufficiently high level of diversity throughout the forest ecosystems, we must learn about the development processes in undisturbed forests. The clarification of these processes require specific research on structure, succession, biodiversity and long term monitoring of natural forest ecosystems (Leibundgut 19978, Schmidt-Vogt 1991a and 1991b, Remmert 1992). Protected for-

est areas or forest reserves are the main, still remaining samples of undisturbed forests, and are therefore the basic experimental forests for research on biodiversity (Schuck et al. 1994).

Due to modern silvicultural practices many important regimes in temperate and boreal forests have disappeared or have become a rare sight (Angelstam and Rosenberg 1993, Kouki 1994): – Burnt areas with large amounts of dead wood – Dying trees, snags and down logs – Deciduous components in forests – Natural development processes: Human intervention in the natural dynamics and development of forests in spatial and temporal respects – Size: Fragmentation of existing natural and semi-natural forests in total.

Trees and stand structure are in close interaction with all other parts of the forest ecosystem e.g. soil, flora and fauna. Therefore studies on stand structure and dynamic development processes on a stand level play a key role in the description of biodiversity indicators in different forest vegetation types. Parameters of structure, giving valuable information on dynamics and development processes, are easy to measure. A large number of permanent sampling plots already exist for long periods of time in many European countries providing useful data (Schuck et al. 1994).

When measuring sustainability, attention is paid to the difference in the development of production forests as compared to that of natural forests. A central point is that of recognising the regular functional features peculiar to individual forest zones; e.g. the clear developmental difference between boreal forests and temperate forests. In the case of Finland, for example, the way in which silvicultural measures are applied is steered by historical cultural developments of forest use (slash-and-burn cultivation, diameter-based selection felling) and, from the viewpoint of natural forests, by forest fires and other natural catastrophes (Parviainen 1993, 1994, Parviainen and Seppänen 1994).

Following key topics for research needs (as practical approach) on biodiversity can be distinguished:

Biodiversity management (stand level):
— key stand indicators (parameters) for biodiversity
— differences in biodiversity indicators between undisturbed and managed forests
— influence of disturbances (fire, storm, insect attacts, avalanches) on biodiversity indicators
— influence of stand structure and successional phases on biodiversity indicators
— guidelines of forest operations for taking into account the maintenance of biodiversity by regeneration and thinnings

Monitoring of biodiversity (landscape level):
— integrating the biodiversity characteristics with the national forest inventories
— representativeness of forest protection areas (aerial distribution, site classes, age structure, geographical location)
— the influence of forest biodiversity oriented management of production forests to the need of protection areas
— the degree of naturalness of forests

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