

Implementation of criteria for sustainable forest management

LUST, N. & NACHTERGALE, L.

Laboratory of Forestry, Ghent University, Geraardsbergsesteenweg 267, 9090 Melle, Belgium

Corresponding author

Tel ++32/9/2522113; fax ++32/9/2525466, e-mail: noël.lust@rug.ac.be

Abstract

Resolution H1 of the Second Ministerial Conference on the Protection of Forests in Europe defined sustainable forest management. Resolution L2 of the third conference in Lisbon adopted the Pan-European operational level guidelines for sustainable forest management. These guidelines are designed for sub-national applications at a practical level. They should be applied in the context of, and in full respect to, national and/or regional instruments and actions. They are directly based on the resolutions H1 and H2 and they follow the structure of the six pan-European criteria that were identified as the core elements of sustainable forest management.

The paper implements the six criteria by proposing and developing for each criteria a number of key issues that should be kept in mind for the realization of sustainable forestry at the field level. Altogether, 39 items are presented, such as forest maintenance, profitability, exploitation techniques, enhancement of biodiversity, native tree species, dead wood and old trees, participation, etc.

The major problem remains the assessment of sustainable forest management. There is a lack of knowledge. Sustainable forest management requires that no big shortcomings on a large area occur for each of the criteria. Sustainable forest management is a process of continuous improvement.

Key-words: *criteria & indicators, sustainable forest management, Lisbon conference.*

1. Background

Sustainable development, as the central concept of "**Our Common Future**", has been defined in 1987 by the independent World Commission on Environment and Development (Brundtland Commission) as follows: " a development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (WCED, 1987).

That report can be considered as a major milestone in the growing international attention for environmental problems. The theme forestry is, however, not well developed. Only the problem deforestation is underlined. On the one hand it is stated that deforestation threatens the exploitation of the material forest functions (supplier of medicines, ornamental plants, pesticides,...), but on the other hand it is rightly claimed that deforestation is less responsible for climate change than the use of fossil fuels.

Sustainable management of forests was a key point at the **United Nations Conference on Environment and Development in Rio**, 1992. The principle is described in "the forest principles" (Non legally binding authoritative statement of principles for a global consensus of the management, conservation and sustainable development of all types of forests): "Forest resources and forest lands should be sustainably managed to meet the social, economic, ecological, cultural and spiritual human needs of present and future generations. (Anon., 1992).

The role of forest resources has also strongly been stressed at the UNCED Conference in Rio in Agenda 21, chapter 11: Combating Deforestation. This chapter covers 4 program areas, viz.:

- A. Sustaining the multiple roles and functions of all types of forests, forest lands and woodlands
- B. Enhancing the protection, sustainable management and conservation of all forests, and the greening of degraded areas, through forest rehabilitation, afforestation, reforestation and other rehabilitative means
- C. Promoting efficient utilization and assessment to recover the full valuation of the goods and services provided by forests, forest lands and woodlands
- D. Establishing and/or strengthening capacities for the planning, assessment and systematic observations of forests and related programs, projects and activities, including commercial trade and processes

The second program area mainly underlines that the present situation calls for urgent and consistent action for conserving and sustaining forest resources. The objective of this program is to ensure sustainable management and, where appropriate, conservation of existing and future forest resources (Smithüsen & Ponce-Nava, 1996).

The concept of "sustainable forest management", however, has not been elaborated during the Rio Conference. It has been strongly stressed by the **Second Ministerial Conference on the Protection of Forests in Europe** (Helsinki, June 1993). A definition of sustainable forest management was given in the General Guidelines of Resolution H1: "Sustainable management means the stewardship and use of forests and forest lands in a way, and at a rate, that maintains their biodiversity, productivity, regeneration capacity, vitality and their potential to fulfil, now and in the future, relevant ecological, economic and social functions, at local, national and global levels, and that does not cause damage to other ecosystems" (Lust, 1995).

The term "sustainability" became very fashionable in and outside forestry. However, serious difficulties arose, when putting this concept into practice. The term is so imprecise and ambiguous, that depending on various interests and political intent, it can take on different meanings accordingly (Oesten, 1995). A nice contribution and progress, however, has been made by the establishment of the European criteria and most suitable quantitative indicators for sustainable forest management, as adopted by the expert level follow-up meetings of the Helsinki Conference in Geneva (1994) and Antalya (1995) (Anon., 1995). Criteria describe the different sides of sustainability on a conceptual level. A criterion is a distinguishing element or set of conditions or processes by which a forest characteristic or management is judged. Indicators show changes over time for each criterion and demonstrate how well each criterion reaches the objective set for it.

The European list of quantitative indicators was identified, keeping in mind that the indicators should be scientifically valid, technically feasible and cost-effective. It was also agreed that some aspects of the sustainability of forest management cannot be measured by a single quantitative indicator. They are too complicated or too expensive to measure. They can also be generally accepted conditions that should be fulfilled. These features are assessed by "descriptive indicators", which describe the policy instruments used in order to enhance the sustainable management of forests. They are complementary to the agreed quantitative indicators.

When adapting the list of European criteria and most suitable indicators it was stressed that:

- The criteria are to be based on scientific information, measurable, unambiguous, available to the public and open for discussion. They are intended for evaluation at national level, not at local forestry level.
- The indicators are neither final nor totally comprehensive since forests have multiple functions. The work of defining indicators and their measurement is a continuous process.

The criteria and indicators of Helsinki are a policy instrument for evaluating and reporting progress towards sustainable forest management, as described in H1, in individual European countries and in Europe as a whole. A major remark on the list is, that more attention should be paid to the ecological and social aspects. Consequently, it was not only necessary to look for guidelines for forest management at the unit level or at the management level, but also the social and ecological issues had to be better elaborated. These objectives were mainly fulfilled at the **Third Ministerial Conference on the Protection of Forests in Europe, held at Lisbon** in June 1998 (Anon., 1998). At the same time some new topics were stressed, such as the relationship between forest and rural development, employment in the forestry sector and capacity building. The vision of the General Declaration focuses on four topics:

1. Commitments of the forest sector towards society. The European forest sector must optimize its contribution to the sustainable development of society, especially to the development of rural areas, the provision of renewable resources and the protection of the global and local environment.
2. Commitments of society towards the forest. Society must support a sound development of the forest sector by providing conducive regulatory, institutional, economic and social frameworks for practising sustainable forest management and reducing existing strains on forest health and vitality.
3. Partnership between forest and society. An effective partnership between society and the forest sector must be strengthened, recognising the role of forests as a key renewable resource, the responsibility of forest owners and the responsibility of Europe.
4. Multiple functions of forests. The heritage of healthy and biologically diverse forests for future generations, the positive contribution to the global carbon and hydrological cycles, the protection of soil and water resources, the protection of population and infrastructure against

natural hazards, the creation of income and employment, particularly in rural areas, and the excellence for providing recreational and cultural values for all people are characteristics associated with forests.

The Lisbon Conference has adopted two resolutions:

- L1: People, forests and forestry - Enhancement of the socio-economic aspects of sustainable forest management.
- L2: Pan-European criteria, indicators and operational level guidelines for sustainable forest management.

This resolution includes two annexes:

1. Pan-European criteria and indicators for sustainable forest management
- 2. Pan-European operational level guidelines for sustainable forest management.**

L1 deals with the central theme of the Lisbon Conference, viz. the "socio-economic aspects" of the concept sustainable forest management. The resolution contains nine general guidelines and eleven future actions. The guidelines stress: interaction between forestry and society, regulatory, institutional and economic frameworks, structures of cooperation, contribution of forestry to sustainable rural development, services of forests, new employment and income opportunities, human resources development policies, gender aspects and production, marketing and consumption of wood and other forest products and services. Consequently for the future actions the signatories commit themselves to develop a dialogue with the public and the conditions for the participation of relevant stakeholders, to adapt education and training systems, to encourage studies on gender aspects, on wood and non-wood substitutes and on socio-economic aspects, to promote the improvement of safety standards and the quality assurance systems and programs.

L2 decides to:

1. adopt the six criteria for sustainable forest management and endorse the associated indicators as a basis for international reporting and for development of national indicators (see annex 1 of the resolution);
2. proceed to implement, continuously review and further improve the associated indicators;
3. endorse the "pan-European operational level guidelines for sustainable forest management (see annex 2) as a framework of recommendations for sustainable forest management for practical use on a voluntary basis.

In general, the pan-European operational level guidelines (PEOLG) are designed for sub-national applications at a practical level.

Forest management in Europe is characterized by a large proportion of private, fragmented, small-scale farm-related ownership structures in the majority of countries, as well as a large proportion of public forests and forests owned by private forest enterprises in others. The concept of sustainability has a long tradition in forestry in Europe. However, the meaning of "sustainable forest management" has evolved over time according to the changing needs of

society. Originally, sustainability in forest management was mainly considered as the sustained yield of timber to cope with historic wood shortages. During the 1980's the concern about the deterioration of forests throughout Europe led to an increasing awareness of the economic, ecological, social and cultural values of forests by the broader public. Nowadays many important aspects of sustainable forest management are covered by national and/or regional laws and regulations and are already being monitored (Anon., 1998; Lapointe, 1998).

The PEOLG have been elaborated to further promote sustainable forest management in Europe by translating the international commitments down to the level of forest management planning and practices. They are designed to be applied in the context of, and in full respect to, national and/or regional instruments and actions. Their purpose is to identify complementary actions at the operational level. This should reflect national, economic, ecological, social and cultural conditions, research and traditional knowledge, and must respect forest and environmental legislation, decisions on protected areas, other general principles, as well as codes for forest practice such as standards used for forest management in any given country. Whenever used, their content should be adapted to the specific local, economic, ecological, social and cultural conditions, as well as to the respective forest management and administrative systems already in place. In this process participation of all interested parties should be encouraged.

The potential applications and users of PEOLG are:

- forest managers and forest owners;
- sub-national organizations;
- national/governmental decision makers;
- international forest dialogue;
- communication tools and certification systems.

They represent a common framework of recommendations for reference at the field level that can be used on a voluntary basis. These guidelines are directly based on resolutions H1 and H2, and they follow the structure of the six pan-European criteria that were identified as the core elements of sustainable forest management. For clarity they are divided into "Guidelines for Forest Management Planning" and "Guidelines for Forest Management Practises", focusing on basic ecological, economical and social requirements for sustainable forest management within each criterion.

The effective implementation of these guidelines implies recognizing the major role and the legal rights of forest owners. Furthermore, the implementation of sustainable forest management in the field requires continuous extension, training and education of forest managers, owners and workers, for which the PEOLG can provide an important reference (Anon., 1998).

2. Model of implementation of pan-European operational level guidelines for sustainable forest management

Sustainable forest management fulfils a key role in many international forestry guidelines, in the process of certification of forest and wood products, in the compensation of non merchantable services and products and with the fixation of fiscal charges such as death duties.

Contrary to the criteria and indicators of sustainable forest management, in which all signatory states have committed themselves to use these instruments for the policy evaluation, the management guidelines of PEOLG have a complete voluntary character. They can be used as a test frame for the local forest management.

In order to realize the principles of sustainable forest management the management should fulfil certain criteria, which should be simple, clear, significant and verifiable. Moreover they should be adapted to the local circumstances.

The PEOLG are obviously quite suitable for this. But still other regulations and concepts can be very useful, e.g.:

- Pro Silva principles: Pro Silva aims at the maintenance, the protection and the management of forest ecosystems in such a manner that the different forest functions can be implemented in a sustainable and profitable way. The forest fulfils four major purposes viz. an ecological, an economic, a protective and a cultural function.
- FSC -international: this multinational, non governmental organization stimulates sustainable forest management by setting up an accreditation and certification system. The international, general FSC criteria can be elaborated on national or regional level into specific guidelines. (FSC, 1998).

Control of sustainable forest management implies that a monitoring system must be worked out, in which the indicators of sustainable forest management can be regularly assessed. The main instrument to achieve this is a periodical forest survey. The monitoring and evaluation system should be controlled on its turn by an external organism.

The forest manager has disposal of two major instruments to justify his vision on sustainable forest management.

1. The forest management plan. The traditional management plan obviously does not longer correspond to the requirements of sustainable forest management. Much more attention should be paid to the ecological, protective and social values. Essential parts, however, remain the growing stock, the felling and regeneration planning, the potential conversion plan and the accessibility plan. The striving at cooperation with other stakeholders should be recommended. The management plan should be as open as possible to all interested people. At least the management objectives and the map documents should be verifiable. The forest owner can make a restriction for the felling regulation and the regeneration plan.

The management plan should contain different parts. Besides the survey, the general study, the formulation of management purposes and the programming of measures, parts which normally occur, attention should also be paid to control adjustment. Each measure is assessed in an appropriate way with respect to the general objectives. The management plan contains a map with present infrastructure, on which also the use of forest roads for logging is indicated. The management plan should be revised at least every 20 years.

2. The book of specifications and duties. The logging provisions should be described in the book of specifications and duties. Each form of damage to the site and the remaining stand should be avoided during the logging.

The book of specifications and duties should at least contain: permitted harvesting methods, the maximal permitted ratio charge-capacity - tyretype, indications of roads and skid tracks to be used, weather conditions in which logging is permitted, destination of the crown wood and the bark, compensation in case of damage to the remaining stand and the soil, logging conditions during the breeding season, regulations of biodegradable oils. Oil replacements in forests are not allowed. Chemical substances and their packing, non -organic liquid and solid waste should be removed.

The implementation of the criteria for sustainable forest management should not necessarily occur according to the PEOLG criteria. Local criteria can be accepted, derived or not from PEOLG. It is obvious, however, that an international comparison is more suitable by following the PEOLG.

The major problem remains the assessment of sustainable forest management. Anyway, presently it is not possible to carry this out in a mathematical way, e.g. by adding a number of positive and negative points. To this the required knowledge is not available. There is a lack of reference conditions and measurable standards. The current indicators can only be used in an indicative way. So the comparison of situations will remain difficult.

Sustainable forest management does not require that all criteria are fulfilled. A balanced assessment should occur. Sustainable forest management supposes that no big shortcomings of each criterium are present on large areas. An intention of improvement should at least be present. Sustainable forest management is a process of continuous improvement.

The model below is mainly the result of the Flemish process. The discussion took several years and all interested partners were involved. Upon request of the Flemish government two statement papers were prepared. One by the Flemish Supreme Council of Forestry (VHB,1998), and one by the Flemish Environment and Nature Council (Mina, 1998). The document of the latter group is strongly based on the former. The main difference is in structure. The Forestry group has respected the PEOLG structure, whereas the Environment and Nature Council has reduced the structure to four units, corresponding to the common forest functions (see annex 1).

2.1. Maintenance and appropriate enhancement of forest resources and their contribution to global carbon cycles

1. **Forest maintenance.** Forest maintenance should be guaranteed. Extension of the forest area is possible by conversion of abandoned agricultural sites and by afforestation of waste lands, provided it can add an economic, ecological, social and/or cultural value.

2. **Management plan.** An extensive management plan should be elaborated. It should contain an inventory of forest resources, including a monitoring program and mapping. An evaluation of the results must be fed back into the objectives.
3. **Growing stock and allowable cut.** The growing stock and the allowable cut should be determined. There should be a balance between wood harvest and increment. Harvest should normally not exceed increment.
4. **Management types.** Management types should be mentioned. Proposals into the direction of an unevenaged forest should be presented. Rotation and characteristics of thinnings should be described.

2.2. Maintenance of forest ecosystem health and vitality

5. **Pests and diseases.** Legal regulations concerning pest and disease control should be fulfilled. The appearance of pests should be mentioned.
6. **Forest vitality.** An annual inventory of the vitality should be performed by a network of sample plots.
7. **Forest fire.** Measures for prevention and control of forest fires should be elaborated.
8. **Prevention.** A preventive policy should be issued. Only site suitable species should be used. Stability should be raised and wind fall avoided by structural diversity and appropriate thinnings.
9. **Degraded stands.** Measures should be foreseen to improve degraded stands. Conversion of stands is a mean, control of game stand and overgrazing is necessary.
10. **Pesticides.** The use of pesticides should be avoided and is only allowed in exceptional cases, after approval. By controlling of hindering vegetation, attention should be primarily focused on prevention. Generally, environmentally friendly control methods are preferred. The use of herbicides should be limited and described, e.g. which products and which methods. They are allowed in an appropriate way by controlling aggressive species, such as black cherry.
11. **Fertilization.** Fertilization should be avoided as much as possible and its use should be described. The nutrient cycle can be improved by paying more attention to the choice of species. Debarking at the spot should be recommended, at least on poor soils. Total tree harvesting is prohibited. Small crown rests, up to a diameter of 7 cm, should remain in the forest. Fertilization with the objective to increase the wood production is not allowed, because of the risk for eutrophication, soil pollution and changes in the herb layer. Controlled fertilization aiming to the planting of more requiring and soil improving tree species is principally acceptable. Soil improvement measures, aiming to the rehabilitation of degraded sites, should occur in a

controlled way. Each soil improvement should be preceded by a soil investigation, performed by a recognized laboratory. It should also fulfil the regulatory provisions.

Chlorous, risky, and poisonous products are forbidden.

12. Soil preparation. Soil preparation should be restricted to a minimum to avoid erosion and loss of minerals. Deep soil tillage is excluded; superficial soil preparation, injuring of the soil, to stimulate natural regeneration, is accepted.

2.3. Maintenance and encouragement of productive functions of forests (wood and non-wood)

13. Forests as renewable resources. Forests should be considered as renewable natural resources, which provide important products. The production capacity of the site should obviously be maintained. Species choice, overall tending and logging should be directed to this.

14. Profitability. Attention should be paid to the forest profitability, although profitability on itself is not a must. The economic purpose should be described. An estimation of the anticipated merchantable products and services should be made. Necessary investments should be done in order to maintain or improve profitability. A survey of native and exotic tree species should be performed. A reasonable share of native tree species should be present, with at least 30% of the area.

Attempts for diversification of the income, e.g. by the production of non-wood products, recreation or possible subsidies for provided services, should be mentioned.

15. Cooperation. Increase of profitability can be obtained by cooperation and by forest grouping. The possibilities of this should be examined.

16. Long term planning. It should be aimed to spread costs and incomes over time. Therefore large forests should be unevenaged.

17. Fellings. Small scale fellings are preferred, since they reflect much better the natural dynamics of forest ecosystems. Clearcuts of more than 1 ha in hardwood stands and of more than 3 ha in conifer stands are only acceptable in exceptional cases and with a clear motivation. With poplar plantations the area of clearcuts must be assessed based on multiple criteria, such as total area of plantation, age structure of stands, landscape and aesthetic aspects, vitality features of the stands, marketability of products, rotation, etc. A global assessment is needed.

18. Restriction of costs. Natural regeneration can in some cases significantly contribute to the restriction of costs and so to the increase of profitability. Costs of reforestation should be limited. Nevertheless qualitative worthwhile materials should be used. With artificial afforestation suitable provenances should be used.

19. Logging. During logging operations, damage to the site, the remaining stand and to the regeneration should be restricted as much as possible; Disturbance of fauna and flora should be avoided too.

Training of workers and use of an appropriate book of specifications and duties are important instruments. A code of good forest practices should be issued by the forestry administration.

20. Rotation. Silvicultural systems with a long rotation or without a rotation (selection forest) are preferred. They offer large possibilities for biodiversity development and natural regeneration, due to the decreasing frequency of big scale disturbances and to the potential of quality and diversification of the forest products. With shorter rotations, enough criteria for sustainable forest management should be respected.

2.4. Maintenance, conservation and appropriate enhancement of biological diversity in forest ecosystems

21. Enhancement of biodiversity. Sustainable forest management has as task to increase biodiversity. Forest management disposes of several means to increase biodiversity, a.o. choice of tree species, regeneration method, forest structure, thinning systems, rotation, appearance of open places, presence of dead wood, protection of specific biotopes, protection from external disturbances, increase of forest area, connection with other nature areas, etc.

The management plan should give an overview of the situation and of the measures taken.

22. Maintenance of species and of biotopes. The "stand-still" principle should be respected. It means that existing natural values, species or biotopes should be protected. A list of present species, of protected, endangered, rare and threatened species and biotopes will be made. Measures should be taken in order to assure their survival.

Special protection should be given to riparian areas and to well areas. Drainage is not allowed and the appropriate species should be used.

Logging should keep in mind the appearance of early and late breeding birds. Generally, logging conditions should be adapted to the period of the breeding season. A non cutting period of three months should be respected.

23. Natural forest associations. In all public forests with a minimum area of 100 ha, at least 5% of the area should be reserved as forest reserves, in which spontaneous development can occur. After a possible transition period, finally all fellings should be stopped.

In all forests with a minimum area of 50 ha, an area should be selected where the stands can develop towards the natural forest associations. However, management and harvest of wood is allowed in these forests. This area should be at least 15% in public forests and 10% in private forests.

24. Native tree species. With each afforestation and reafforestation native tree species and local provenances, appropriated to the site, are preferred. A large number of specialized species

are indeed linked to native tree species, so that their replacement by non native species can disturb the nutrient cycle and finally will lead to biological impoverishment.

As mentioned in point 14, at least 30% of the area should consist of native species. In public forests it should be aimed at 50%.

25. Structure. Varied forest structures, unevenaged and mixed stands are preferred. These elements are determining for biodiversity.

The conversion of hardwood forests into plantations of poplars or of exotic tree species is not allowed.

Mixed stands/forests are preferred. A stand/forest can be considered as mixed when it consists of two or more tree species which influence significantly the stand ecology (Dudley, 1992; Anon., 1993). In public forests it should be aimed on a short term to 30% of mixed forests, in private forests to 20%.

The mixture can occur both in the upper storey and in the middle or understorey.

In poplar stands an under or middle storey should be planted over at least 1/3 of the area. These elements can be managed as coppice. They have a.o. a function as seed trees to establish also mixed stands in the surrounding parcels.

The presence of coppice and coppice with standards should be mentioned.

26. Regeneration. Natural regeneration is to be recommended, provided the suitable species are present, the provenance is appropriate and the genetic quality of the trees is valuable. Natural regeneration should be stimulated by suitable stand structures, long rotation periods and artificial soil preparation. Regeneration under canopy is mostly to be recommended.

27. Dead wood and old trees. Measures directed towards the enhancement of more dead wood and old trees in the forest should be clearly documented. Dead wood and old trees are important elements for biodiversity.

The quantity of lying and standing dead wood should be monitored. It should be aimed to a dead wood quantity of at least 5% of the total growing stock, spread over all age classes and stands.

In each stand a certain number of trees are indicated, by preference indigenous species, in order to remain as hold-overs until their physical death. It should be aimed to some ten trees per ha, with a maximum of 10% of the basal area.

Hollow and dead trees, not having any economic value, are left standing or lying, at least when they are not a risk for recreationists, pests and forest fires.

Small crown wood and eventually pruning rests are not to be removed.

28. Hunting and game management. Hunting should be in compliance with the carrying capacity of the forest ecosystem. Special attention should be given to the regeneration. The measures should be described.

A game management plan should be worked out, with a.o. a shooting plan, the delineation of rest zones and the situation of predators and of protected species.

2.5. Maintenance and appropriate enhancement of protective functions in forest management (notably soil and water)

29. General care duty. The forest management is co-responsible for the maintenance of the environment. It should enhance the protective forest functions, such as protection of infrastructure, protection against soil erosion and protection of water resources. An environment assessment report should be conducted for each activity which might have a specific impact on the forest ecosystem.

30. Survey of sites to be protected. Forest parts deserving a specific protection should be registered and mapped, e.g. sensitive soils, areas with water protection functions, protected landscapes, etc. These sites should be protected against fertilization, dessication, fragmentation, etc.

31. Soil erosion. Inappropriate techniques, such as clear fellings on large areas, use of unsuitable machinery and deep soil tillage should be avoided on such areas.

32. Water protection. Adverse effects on the quality and quantity of water resources should be avoided. The natural level and function of water courses and river beds should be preserved. New drainage is not allowed, but maintenance of existing drainage systems is possible, provided that maintenance or the restoration of worthwhile biotopes, such as well areas, peatlands and wetlands are not endangered.

33. Pollution. Pollution of soil, air, ground and surface water should be prevented. The use of biodegradable oil is required. Oil replacements in the forest are not allowed. Disposal of waste should be strictly avoided.

34. Infrastructure. Construction of roads, bridges, buildings and other infrastructure should be carried out in a manner that minimizes the protective forests functions.

2.6. Maintenance of other socio-economic functions and conditions

35. Legislation. All existing national/regional legislation should be fulfilled. Legal, customary and traditional forest rights should be clarified and respected.

For each management measure the necessary licenses should be present.

Social regulations should be respected towards the personnel employed in the forest. The General Labour Regulation (International Labour Organization) should be followed. Working conditions should be safe and training in working practice should be provided.

36. Accessibility. Access to the forest should be stimulated. Measures should be taken to avoid that the recreational function does not disturb or make impossible the other forest functions.

37. Cultural values. Attention should be paid to sites with a specific historical, cultural, archaeological or spiritual significance. They should be protected and managed in a way that takes due regard of the sites.

38. Participation. The management plan should be established in participation with all involved partners, such as forest owners, local communities, local people, local associations, etc.

39. Training. The personnel should have the opportunity for continuous training, with specific attention for the concept of sustainable forest management and for the workers involved with the logging.

3. References

- Anon. (1992). United Nations Conference on Environment and development (UNCED): agenda 21, Rio Declaration, Forest Principles; Geneva, United Nations Publications.
- Anon. (1993). Proceedings of FAO/ECE Meeting of Experts on Global Forest Resources Assessment in cooperation with UNEP and with support of FINNIDA (Kotkall), 1993. Nyssönen, A. (ed.). The Finnish Forest Research Institute. Research Papers 469, 214 pp.
- Anon. (1995). The second Expert Level Follow-up meeting of the Helsinki Ministerial Conference, Antalya.
- Anon. (1998). Third Ministerial Conference on the Protection of Forests in Europe. Lisbon, Portugal.
- Dudley, N. (1992). Forests in trouble. A review of the status of temperate forests worldwide. WWF, 260 pp.
- FSC Arbeitsgruppe Deutschland (1998). Deutsche FSC-Standards. AFZ/Der Wald, 21, 1324-1326.
- Lapointe, G. (1998). Sustainable forest management certification: The Canadian programme. Forestry-Chronicle, Mar-Apr, 74 (2): 227-230.
- Lust, N. (1995). Elements of sustainable forest management. *Silva Gandavensis*, 60, 1-20.
- Mina (1998). Ontwerpadvies criteria voor duurzaam bosbeheer (Draft advice for sustainable forest management). Intern document, Mina-raad, Brussel.
- Oesten, G. (1995). Some remarks on sustained yield as a model for an economy in accordance with nature. In Koch, N. (ed.): The scientific basis for sustainable multiple-use forestry in the European community. Dir.-Gen. for Agriculture, 9-21.
- Smithüsen, F., Ponce-Nava, D. (1996). A selection of texts of international conventions and other legal instruments relating to forests; Professur Forstpolitik und Forstökonomie- ETH Zürich.
- VHB (1998). Advies betreffende criteria voor duurzaam bosbeheer (Advice concerning criteria for sustainable forest management) Intern document, VHB, Brussel.
- WCED (Brundtland Commission) (1987). Our Common Future. The report of the World Commission on Environment and Development. Oxford University Press, United Kingdom, 393 pp.

Annex 1. Review of criteria for sustainable forestry (by the Flemish Environment and Nature Council)

A. Criteria related to "the guaranteeing of the socio-cultural functions"

1. Compliance with legal instruments and regulations
2. Facilities for training, health and safety provisions
3. Attention for recreational and cultural-historical elements

B. Criteria related to " the guaranteeing of the productive and economic functions"

4. Maintenance of the forest and of the site quality
5. Attention for profitability and income diversification
6. Preference for natural regeneration
7. Preference for small-scale fellings
8. Justified forest management and exploitation forms
9. Preference for long rotations
10. Management of non-wooded forest products

C Criteria related to "the maintenance and the conservation of the environment"

11. Care duty for the environment
12. Preference for a closed nutrient cycle
13. Combating pollution
14. Preference for biological and environmentally friendly control methods
15. Combating drying out

D. Criteria related to " the maintenance and the enhancement of biodiversity"

16. Maintenance and protection of valuable species and biotopes
17. Development of valuable biotopes
18. Preference for indigenous and site appropriate species
19. Stimulation of structure and species richness
20. Attention for dead wood and old trees